

NAPA CONFERENCE 2020 SECOND BIENNIAL CONFERENCE

September 25-28, 2020 (VIRTUAL)

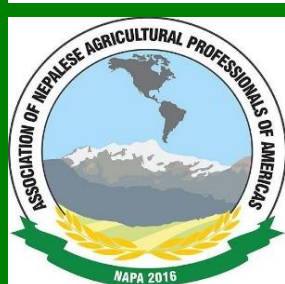
Previously planned to be held in Atlanta, Georgia, USA on May 22-24, 2020

CONFERENCE PROCEEDINGS



Global Food Security Through Agricultural Transformation

Compiled and Edited by:
Scientific and Organizing Committee



ASSOCIATION OF NEPALESE
AGRICULTURAL PROFESSIONALS OF
AMERICAS

E-mail: napa2072@gmail.com

URL www.napaamericas.org

Conference Theme: Global Food Security Through Agricultural Transformation

Rapidly increasing demand for food, feed, fiber, and fuel (4F) due to increasing global population and per capita resource utilization around the world is a critical challenge that agricultural and allied science professionals will need to address in the next several decades. Increasing uncertain and variable weather events and changing climate patterns exacerbate the issue of producing sufficient 4F and creates enormous challenges for maintaining productivity and quality of produce in a wide range of agricultural sectors. Innovation in agriculture such as resilient farming systems, productive crop varieties and livestock breeds, optimal input management, and smart agricultural systems (to name a few) are more important in modern agriculture than ever before.

The second biennial NAPA Conference 2020 aims to bring faculty, researchers, scientists, practitioners, professionals, scholars, students, and other stakeholders to a common platform and share the latest findings from cutting-edge research in agricultural and allied sciences. The topics covered include advanced agricultural innovations, best management practices, and environmentally friendly, sustainable agricultural production systems with equitable distribution in a world of widening inequalities, dynamic changes in land-use practices, and volatile agricultural markets. As mentioned at www.napaamericas.org/conference2020/, the conference features keynote and invited presentations, panel discussions, and many concurrent technical sessions to promote knowledge and experience sharing, and discussion on past achievements and future directions. The conference is also expected to provide a venue for leveraging advances in other lateral technologies such as robotics, artificial intelligence, biotechnology, precision farming, and big data analytics that help to enhance the productivity and quality of produce in agriculture. Our goal is to help achieving the secured and sustainable supplies of 4F and meet the needs of the current generation without compromising the opportunities of future generations to meet their own needs.

Conference Organizing Committee

Association of Nepalese Agricultural Professionals of Americas (NAPA)

Message from Conference Chair

Greetings All,

Initially, the Second Biennial International Scientific Conference of Association of Nepalese Agricultural Professionals of Americas (NAPA) was scheduled for May 22-25, 2020, in the great metropolitan city of Atlanta, Georgia, USA. While all preparations were in full swing and Atlanta was eager to welcome us, we were forced to suspend the plans for a conference in May because of the COVID-19 pandemic. Even though we were dismayed for an unexpected suspension of the conference, I am much elated that NAPA Executive Committee, after a careful review of the current COVID-19 situation, and no likely prospect of onsite conferences in the near future, decided to host the conference during September 25-28, 2020, VIRTUALLY.



On behalf of the Virtual Conference Expediting Committee (VCEC) and Conference Organizing Committee (COC), along with various subcommittees (Scientific Program, Student Essay, Agri-Poem (Literary), Fundraising, Information Technology, and others), I would like to welcome all the participants (presenters, panelists, moderators, judges, invited speakers, technical coordinators, volunteers, and all attendees) to the historic second NAPA Biennial International Scientific Conference being held in a virtual setting.

We are delighted to have 161 scientific presentations (professional oral 49, Professional poster 14, student competitive oral 36, student competitive poster 45, and student competitive rapid-fire 17) at the very virtual conference along with other literary, book authors' platform, NAPA strategic visioning, entrepreneurial roundtable, women in agricultural and allied professional roundtable, and cultural event. A students' essay writing contest is another appealing opportunity for talented students, where 14 essays have been received for the competition from several universities. In addition, the literary Agri-Poem event attracted 67 artistic poets to showcase their creativity while targeting for attractive cash prizes.

Moreover, this conference brought together over 358 scientific scholars to this platform as authors and co-authors from seven countries (US, Nepal, Nigeria, Australia, Canada, Benin Republic, and Morocco), who are directly working and/or collaborating with, representing 83 institutions. A strong scientific foundation established by the first NAPA conference in 2018 helped to increase the member participation and broaden scope, content, and value of this conference. This VIRTUAL conference has greatly energized the NAPA family in accelerating strategic efforts in achieving NAPA's mission and vision. On behalf of VCEC and COC, I am thrilled to welcome participants from across many agricultural and allied disciplines and from around the world. Equally, I am delighted to witness the invaluable scientific contributions that address the conference theme '**Global Food Security through Agricultural Transformation.**'

This conference is uniquely structured to provide opportunity and access to many emerging and young scholars by allowing numerous technical sessions, student competitive oral and poster presentations, student essay writing contest, agri-poem competition, student rapid-fire presentations, panel discussions, round table sessions, and socio-cultural and professional networking. The VCEC has also planned for a fun-filled cultural event to engage our varied group of participants.

It is our endless pleasure to have managed monetary prizes of over \$2,200 (two thousand and two hundred US dollars) and appreciation certificates for the competitive events. I salute all the hardworking individuals for their unwavering commitment in this enduring journey of hosting the VIRTUAL conference. The extraordinary support and dedication of the executive committee led by Dr. Megha Nath Parajulee, VCEC, COC, committed members, well-wishers, and presenters made this conference possible in this unusual situation. Last but not least, I greatly appreciate the relentless hard work tendered by the committee and sub-committee chairs and members, moderators, judges, and outstanding support by the technical coordinators (IT personnel). Finally, the conference organizing team, together with the executive committee, wishes all of you an exciting virtual conference and I trust that this conference will bring great value to your professional endeavor.

Together, we can make a difference. Stay safe and healthy.

Lila B. Karki, PhD
Chair
Conference Organizing Committee

September 11, 2020

Message from NAPA President

Dear Delegates,

It is my profound honor to welcome you to our Second Biennial International Scientific Conference. While I regret not having the opportunity to greet you all in Atlanta in person at a meticulously planned onsite conference, modern technology has allowed us to accomplish our goals of sharing great scientific information and interacting with colleagues through an international “gathering” of agricultural and allied science professionals and students despite the COVID-19 pandemic. I am pleased to say that the virtual mode of this conference is going to bring more value to the conference and not less – opening address by the Ambassador of Nepal to the United States and two keynote presentations highlight the informative plenary session on Day 1, followed by 161 scientific presentations, student oral, poster, and rapid-fire presentation competitions, student essay contest, several workshops and roundtable sessions on timely topics, and agri-poem competition, and closing the conference on Day 4 with a cultural gala that will welcome internationally famed seasoned as well as emerging artists.



I am particularly indebted to the Conference Organizing Committee for their hard work, perseverance, and collective efforts to bring this conference together in this difficult circumstance. I have personally reviewed the entire Program including each of 161 abstracts, and I am particularly pleased with the quality and content of these research presentations. The conference theme of “achieving food security through agricultural transformation” is the central motto of NAPA, and the entire program strives to critically examine the aspects of agricultural research, training, and outreach toward achieving that goal. As President, I sincerely believe that our organization’s march towards achieving our mission is on a great trajectory, and this undoubtedly represents a strong step toward that march. The critical milestones achieved by this 4-year old organization is clear evidence that the collective talent emanated from professionals representing diverse disciplines can make a significant and instant positive impact on science and society if the institutional vision is clearly defined and members embody that vision.

Our current members, and the large population of agricultural and allied professionals who we expect to join NAPA and share their untapped expertise to achieve our goal, must take great pride in the founding of NAPA and its vision. NAPA has actively participated in professional, scientific, and social dialogues with relevant stakeholders to develop strategies toward addressing NAPA’s stated goals and has already made significant advances in many areas. In the last four years, NAPA advanced from a simple thought of establishing a possible agricultural society to a >400-member strong international organization with a robust online Newsletter (16 issues), impactful webinar sessions (23 sessions), informative Policy Briefs (6 issues), refereed international journal (2 volumes), a seminal book on food security, sponsored scholarships and research mini-grants at major agricultural institutions of Nepal, various charity functions, and two biennial scientific conferences. It has been particularly noteworthy for NAPA to showcase the completion of the first phase of research mini-grant (RMG) program at a two-day RMG Conference in July 2020. This program began in 2018 and funded 18 collaborative research projects under Agriculture and Forestry University (8), Tribhuvan University (3), Kathmandu University (1), and College of Live Sciences (6) in Nepal. Several of those research projects will be presented at this conference. We are highly encouraged by the enormous success of this program and the heartwarming feedback

from our stakeholders; therefore, we plan to strengthen this program and initiate the second RMG cycle later this year.

A successful publication of the second volume of the NAPA refereed journal *Global Journal of Agricultural and Allied Sciences* (GJAAS) and increased submissions of high-quality research papers set the stage for its continued success. Another historic triumph of NAPA has been the publication of a book entitled ***‘Principles and Practices of Food Security: Sustainable, Sufficient, and Safe Food for Healthy Living in Nepal’***. One session will be devoted to having all book chapter authors and editors in this conference review the book for our conference attendees. On global outreach, NAPA has been a regular contributor to all regional and global Non-Resident Nepali Association (NRNA) conferences as the authoritative agricultural organization to conduct symposia and workshops. Upon invitation by NRNA National Coordination Council, NAPA organized the ***Agriculture Transformation for Food Security*** symposium at NRNA Knowledge Convention on July 4, 2020. Also, following its first presentation about food security at the Global Knowledge Convention in 2018 in Nepal, NAPA will also be presenting its vision and program activities at Global Knowledge Convention in Kathmandu next month. We anticipate these types of activities will continue to help bring NAPA into global prominence as a leading professional organization for championing agriculture and food security issues. NAPA continues to focus on harnessing strategic partnerships and collaboration with government and non-government organizations and institutions globally toward achieving agricultural transformation for food security.

NAPA has the vision to integrate research, teaching, and outreach to make a significant positive impact on knowledge sharing and technology adoption for the end-users. Therefore, we continue to enhance and expand our effort in distance teaching, topical symposia, and workshops, and mentoring of students and young scientists to ensure that we contribute to generating next-generation scientists and professionals. Examples of such effort include NAPA’s recent 5-day Joint Symposium and Workshop on *Applied Bioinformatics in Agriculture and Medicine* with Agriculture and Forestry University (AFU) in Nepal, distance teaching of a full course - *An Introduction to Survey Data Analysis* - across five colleges simultaneously, and a 3-day joint NAPA-AFU-UNCON (USA-Nepal Community Outreach Network) symposium on *Public Speaking and Science Communication*.

It is clearly an exciting time for NAPA as we witness its growth and transformation from a newly founded initiative to a vibrant professional society and its impact on reaching all intended stakeholders. The current pandemic has forced us to do certain things differently than we had ever imagined, but we have adapted admirably to the situation presented to us. This conference is an example of our commitment to our stated mission. Please join hands to connect, advocate, engage, and contribute to continue to move NAPA forward. Enjoy the conference and stay safe!

Megha N. Parajulee, PhD
President
Association of Nepalese Agricultural Professionals of Americas (NAPA)

September 15, 2020

Message from the Scientific Committee

Commonly accepted population growth models predict that there will be more than nine billion people by 2050. Increasing population, along with growing affluence around the world, will significantly increase the demand for food, feed, fiber, and fuel (4F), which need to be met with static or decreasing agricultural resources such as water, soil nutrients, and labor. Therefore, securing these basic needs (4F) for current and future generations has been a significant challenge faced by agricultural and allied science professionals around the world. Advances in agricultural innovations, best management practices, and environmentally friendly, sustainable agricultural production systems are needed to improve food security in the context of increasing climate variability, dynamic changes in land-uses practices, and volatile agrarian markets. In this context, the second NAPA biennial conference was scheduled for May 22-24, 2020, with the theme of "**Global Food Security through Agricultural Transformation.**" Due to the evolving global pandemic situation, the NAPA Executive Committee and Conference Organizing Committee decided to hold the conference on September 25-28, 2020 using a virtual platform.

These conference proceedings contain abstracts that were accepted for oral and poster presentations. The Scientific Committee received **158** abstracts. The submissions were from **Seven** countries: USA, Nepal, Nigeria, Australia, Canada, Morocco, Benin. The abstracts cover a wide range of disciplines in agricultural and allied sciences: agronomy, animal science, horticulture, entomology, social sciences, economics, agro-forestry, engineering, and more. After the review process, a total of 144 abstracts (85 for oral and 59 for poster presentations) were accepted for the conference. Seventeen additional abstracts are received for student rapid-fire competition, totaling 161 abstracts.

Each abstract has been assigned a unique ID and has been designated as oral or poster presentation (**O** or **P**). A table has been provided in alphabetical order of the last name of the first author linking each abstract with its 'Abstract ID'. Following the table, the abstracts are presented in the order of their IDs. We have also presented a table at the end of the abstracts where we can find individual authors and the abstract IDs they are associated with. In preparing these proceedings, we tried our best to minimize errors an omission; however, we would greatly appreciate readers' feedback on any errors, mistakes or omissions identified, and suggestions for future publications.

The publication of the proceedings would not have been possible without the full support of dedicated and hardworking scientific committee members, who spent hundreds of hours communicating with the authors and various committees, and worked day and night for compiling, revising, and editing the submissions. We sincerely thank Dr. Lila Bahadur Karki, NAPA Founding President and Chair of the Conference Organizing Committee (COC), and Dr. Megha Nath Parajulee, current NAPA President and Co-Chair of the COC, for providing us this opportunity, and for their continuous encouragement and support during the entire process. Second, we would like to thank the members of the conference organizing committee and colleagues from various other committees and sub-committees for their support during the entire

process of proceedings preparation. Last, but not the least, we owe the authors a big hand for their scientific contributions.

We look forward to meeting and interacting with all of you at the conference, and to discuss how can we move forward to make NAPA best serve our members and friends to meet their aspirations as scientists, engineers, and professionals.

Scientific and Proceedings Committee

Manoj Karkee, Chair
Aditya Khanal
Rajan Ghimire
Sushil Thapa
Santosh Dhakal
Ramjee Ghimire
Pradeep Wagle
Megha N. Parajulee
Lila B. Karki

Keynote Speakers

Srinivasa Rao Mentreddy, Ph.D.

Professor

Alabama Agricultural and Mechanical (A&M) University
Huntsville, Alabama, USA

Srinivasa.mentreddy@aamu.edu



Dr. Srinivasa Rao Mentreddy completed B.S. in Agriculture and M.S. in Agronomy from the Andhra Pradesh Agricultural University, India and a Ph.D. in Agricultural Sciences from the University of Tasmania, Australia. His current research focuses on the development of sustainable cover crop-based organic production systems for specialty vegetables and medicinal crops in open and agroforestry systems; and harnessing low temperature plasma for food safety and for improving seed germination, plant growth, yield, and quality. Before joining Alabama, A&M University, Dr. Mentreddy worked at Fort Valley State University, Georgia, on the evaluation of growth and yield of a wide range of varieties of sweet potato, edible soybean, white potato, and genetically modified crops. In addition to conducting research, Dr. Mentreddy teaches several undergraduate and graduate-level courses and serves as a major advisor for M.S. and Ph.D. students. He serves on editorial boards of several journals and is a reviewer of manuscripts, books, and proposals. He is the Chairman of the 1890 Agroforestry Consortium and also serves on Board of Directors and advisory committees of professional organizations. Dr. Mentreddy has published more than three dozen papers in peer reviewed journals and presented and published abstracts in over 150 conferences.

Ram Kumar Phuyal, Ph.D.

Member

National Planning Commission
Government of Nepal

Phuyal_ram5@yahoo.com



Dr. Phuyal is a member of the National Planning Commission (NPC), Government of Nepal since 26 April 2018. His current portfolio in NPC is on economic sector which broadly includes industry, commerce, supplies, tourism, labor and employment, social security, statistics, and sustainable development goals 8, 10, and 12. He is an accomplished economist with over 17 years of experience in teaching various fields of economics to graduate students and conducting evidence-based policy research in Nepal and abroad. Before joining NPC, he was an associate professor of economics at Tribhuvan University. Earlier, he served as a visiting faculty/scholar at Chonnam National University, National University of Singapore, South Asian University, Kathmandu University, Pokhara University, and Mid-Western University. He has served as chief editor of peer review journals in economics and editorial board member in various scholarly journals. He has authored/co-authored several book chapters and contributed over three dozen academic and policy papers in indexed journals. He presented papers, delivered invited presentations and guest speeches, and served as a panelist, discussant, and rapporteur in several national and international meetings. He holds a Ph.D. in Economics from Chonnam National University, South Korea.

**"A sustainable agriculture is one
which depletes neither the people
nor the land."**

- Wendell Berry

Second NAPA Biennial International Scientific Conference September 25-28, 2020 (Virtual)

Virtual Conference Expediting Committee (VCEC)

| Name | Responsibility | Affiliation |
|------------------------|------------------------------------------------------------------|-----------------------------------------------------------|
| Lila B. Karki, PhD | Conference Chair | Tuskegee University, Alabama, USA |
| Megha N Parajulee, PhD | President | Texas A&M University, Texas, USA |
| Pradeep Wagle, PhD | Chair, Fund Raising and Social/Cultural Event | USDA-ARS, Grazinglands Research Laboratory, Oklahoma, USA |
| Ramjee Ghimire, PhD | Chair, Strategic Coordination & General Poster | Michigan State University, Michigan, USA |
| Santosh Dhakal, PhD | Conference Secretary | Johns Hopkins University, Maryland, USA |
| Manoj Karkee, PhD | Chair, Scientific Committee | Washington State University, Washington, USA |
| Aditya Khanal, PhD | Chair, Student Competitive Oral | Tennessee State University, Tennessee, USA |
| Rajan Ghimire, PhD | Chair, Student Competitive Poster | New Mexico State University, New Mexico, USA |
| Sushil Thapa, PhD | Member, Scientific Committee | University of Central Missouri, Missouri, USA |
| Bharat Pokharel, PhD | Chair, Student Essay Writing | Tennessee State University, Tennessee, USA |
| Omkar Joshi, PhD | Chair, Student Competitive Rapid-Fire | Oklahoma State University, Oklahoma, USA |
| Ambika Tiwari, MSc | Chair, Agri-Poem | Mississippi State University, Mississippi, USA |
| Ananta Acharya, PhD | Chair, Information Technology (IT) | Corteva Agrisciences, Iowa, USA |
| Dev Poudel, PhD | IT Coordinator | University of Florida, Florida, USA |
| Prem Bhandari, PhD | Chair, Book Journey: Authors' Platform | University of Michigan, Michigan, USA |
| Gita K. Bhandari, MS | Women in Agricultural and Allied Professionals (WAAP) Roundtable | NAPA/WAAP Coordinator, Texas, USA |
| Bhim Chaulagain, PhD | Member | Oregon State University, Oregon, USA |
| Mahesh KC, PhD | Member | Nationwide Children's Hospital, Ohio, USA |

Conference Organizing Committee (COC): Created before COVID-19 to facilitate onsite conference in Atlanta, Georgia, USA

| Name | Responsibility | Affiliation |
|-------------------------|------------------------------------------|-----------------------------------------------------------|
| Lila B. Karki, PhD | Chair | Tuskegee University, Alabama, USA |
| Megha N. Parajulee, PhD | Co-Chair | Texas A&M University, Texas, USA |
| Ramesh C. Khanal, PhD | Co-Chair | Envigo, Wisconsin, USA |
| Ramjee Ghimire, PhD | Co-Chair | Michigan State University, Michigan, USA |
| Nityananda Khanal, PhD | Co-Chair | Agriculture and Agri-Food, Alberta, Canada |
| Santosh Dhakal, PhD | Secretary | Johns Hopkins University, Maryland, USA |
| Shiva Makaju, PhD | Joint Secretary | University of Georgia Athens, Georgia, USA |
| Nanda P. Joshi, PhD | Chair, Annual General Meeting | Michigan State University, Michigan, USA |
| Krishna P. Paudel, PhD | Chair, Quiz Bowl | Louisiana State University, Louisiana, USA |
| Pradeep Wagle, PhD | Chair, Fundraising | USDA-ARS, Grazinglands Research Laboratory, Oklahoma, USA |
| Manoj Karkee, PhD | Chair, Scientific Committee | Washington State University, Washington, USA |
| Ananta Acharya, PhD | Chair, IT and Registration | Corteva Agrisciences, Iowa, USA |
| Ambika Tiwari, MS | Chair, Conference Logistics | Mississippi State University, Mississippi, USA |
| Kemika Bhandari, BScAg | Chair, Sports and Culture | NAPA Sports & Culture Coordinator, Maryland, USA |
| Bharat Pokharel, PhD | Chair, Student Essay Contest | Tennessee State University, Tennessee, USA |
| Kiran Ojha, MA, MSc | Chair, Printing and Communication, Nepal | Lutheran World Relief Nepal |
| Omkar Joshi, PhD | Chair, Student Competitive Rapid-Fire | Oklahoma State University, Oklahoma, USA |
| Indira Paudel, PhD | Chair, Agri-poem | Purdue University, Indiana, USA |
| Rajan Ghimire, PhD | Member, Scientific Committee | New Mexico State University, New Mexico, USA |

| | | |
|----------------------------------|------------------------------------|--------------------------------------------------------------------|
| Aditya R. Khanal, PhD | Member, Scientific Committee | Tennessee State University, Tennessee, USA |
| Sushil Thapa, PhD | Member, Scientific Committee | University of Central Missouri, Missouri, USA |
| Shyam Adhikari, PhD | Student Essay Contest | Aon Plc, Illinois, USA |
| Jay Dhungel, PhD | Member | Institute for Study and Development, New South Wales, Australia |
| Buddhi Lamsal, PhD, PE | Member | Iowa State University, Iowa, USA |
| Bhawani Mishra, PhD | Member | University of Missouri, Missouri, USA |
| Pragyan Burlakoti, PhD | Member | Ministry of Agriculture, British Columbia, Canada |
| Dev Paudel, PhD | Member | University of Florida, Florida, USA |
| Shyam Kandel, PhD | Member | USDA-ARS, California, USA |
| Satis C. Devkota, PhD | Member | University of Minnesota, Morris, Minnesota |
| Bikash Poudel, PhD student | Member | North Dakota State University, North Dakota, USA |
| Ram B. Khadka, PhD student | Member | Ohio State University, Ohio, USA |
| Manoj Pandey, PhD student | Member | Louisiana State University, Louisiana, USA |
| Ishwora Dhungana, MSc student | Member | University of Hawaii, Nai Ho, USA |
| Madhav Parajuli, MSc student | Member | Tennessee State University, Tennessee, USA |

Local management committee formed for onsite conference

Chandra Dhakal, Chair
Mukti Ghimire
Anil Koirala
Bikash Ghimire
Deepak Vitrakoti
Maha P. Gelal
Manoj Sapkota
Nabin Sedhain
Shailes Bhattarai
Shiva Makaju
Sulakshan Neupane
Tej Acharya
Usha Bhatta

Program Outline

Second NAPA Biennial International Scientific Conference

DAY 1: Friday, September 25

Inaugural and Plenary Session

Timeframe: 9:00 AM – 1:00 PM EST

Nepal Time: 6:45 – 10:45 PM

Moderator: Santosh Dhakal

Technical Coordinator: Ananta Acharya

| Time | Program | Speaker |
|-------|----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| 9:00 | Conference Start/Opening | Santosh Dhakal Conference Secretary and Treasurer, NAPA |
| 9:05 | Conference Journey | Lila B. Karki Conference Chair & Immediate Past President, NAPA |
| 9:20 | Welcome Remarks | Megha N. Parajulee President, NAPA |
| 9:30 | Inaugural Remarks | His Excellency Ambassador Arjun K. Karki Ambassador of Nepal to the US |
| 10:00 | Keynote Presentation <i>Forest Farming and Medicinal Plants for Sustaining Small Landowners: Scope and Opportunities</i> | Srinivasa Rao Mentreddy Professor Alabama Agricultural & Mechanical University, Alabama, USA |
| 11:05 | Break/NAPA Highlights | |
| 11:10 | Keynote Presentation <i>Impact of COVID -19 on Socio-Economic Transformation of Nepal: Recovery Strategies and Challenges</i> | Ram Kumar Phuyal Honorable Member National Planning Commission, Nepal |
| 12:10 | Invited Presentation: <i>Youth and Agriculture: Challenges & Opportunities</i> | Kiran Ojha NAPA Liaison, Nepal Country Director, Lutheran World Relief, Nepal |
| 12:40 | Scientific presentations at the conference | Manoj Karkee Chair, Scientific Committee, NAPA |
| 12:50 | Zoom Technology/Information | Ananta Acharya Chair, Information and Technology, NAPA |
| 12:55 | Adjourn | Ramjee Ghimire General Secretary, NAPA |

1:00 PM

End of the Day 1 Program

Program Outline

Second NAPA Biennial International Scientific Conference

DAY 1: Friday, September 25

Inaugural and Plenary Session

Timeframe: 9:00 AM – 1:00 PM EST

Nepal Time: 6:45 PM – 10:45 PM

Moderator: Santosh Dhakal

Technical Coordinator: Ananta Acharya

| Time | Program | Speaker |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| 9:00 | Conference Start/Opening | Santosh Dhakal Conference Secretary and Treasurer, NAPA |
| 9:05 | Inaugural Remarks | His Excellency Ambassador Arjun K. Karki Ambassador of Nepal to the US |
| 9:35 | Conference Journey | Lila B. Karki Conference Chair & Immediate Past President, NAPA |
| 9:50 | Welcome Remarks | Megha N. Parajulee President, NAPA |
| 10:00 | Keynote Presentation <i>Forest Farming and Medicinal Plants for Sustaining Small Landowners: Scope and Opportunities</i> | Srinivasa Rao Mentreddy Professor Alabama Agricultural & Mechanical University, Alabama, USA |
| 11:05 | Break/NAPA Highlights | |
| 11:10 | Keynote Presentation <i>Impact of COVID -19 on Socio- Economic Transformation of Nepal: Recovery Strategies and Challenges</i> | Ram Kumar Phuyal Honorable Member National Planning Commission, Nepal |
| 12:10 | Invited Presentation: <i>Youth and Agriculture: Challenges & Opportunities</i> | Kiran Ojha NAPA Liaison, Nepal Country Director, Lutheran World Relief, Nepal |
| 12:40 | Scientific presentations at the conference | Manoj Karkee Chair, Scientific Committee, NAPA |
| 12:50 | Zoom Technology/Information | Ananta Acharya Chair, Information and Technology, NAPA |
| 12:55 | Adjourn | Ramjee Ghimire General Secretary, NAPA |

1:00 PM

End of the Day 1 Program

Program Outline

Second NAPA Biennial International Scientific Conference

September 25-28, 2020

SUMMARY PRESENTATION TABLE

| Day | 9-10 AM EST Nepal time: 6:45-7:45 PM | 10-11 AM EST Nepal time: 7:45-8:45 PM | 11 AM-12 PM EST Nepal time: 8:45-9:45 PM | 12-1 PM EST Nepal time: 9:45-10:45 PM |
|--------------------------------------------------------------|-----------------------------------------|------------------------------------------|---------------------------------------------|------------------------------------------|
| SATURDAY, 26th September, 2020 | SLOT 1 | SLOT 2 | SLOT 3 | SLOT 4 |
| | 1A: Professional Oral (3) | 2A: Professional Oral (5) | 3A: Professional Oral (4) | 4A: Professional Oral (3) |
| | 1B: Student Oral (4) | 2B: Ag Poem | 3B: Student Oral (3) | 4B: Student Oral (3) |
| | 1C: Student Poster (5) | 2C: Entrepreneur's Roundtable | 3C: Student Poster (7) | 4C: NAPA Strategic Roundtable |
| Day | 9-10 AM EST Nepal time: 6:45-7:45 PM | 10-11 AM EST Nepal time: 7:45-8:45 PM | 11 AM-12 PM EST Nepal time: 8:45-9:45 PM | 12-1 PM EST Nepal time: 9:45-10:45 PM |
| SUNDAY, 27th September, 2020 | SLOT 5 | SLOT 6 | SLOT 7 | SLOT 8 |
| | 5A: Professional Oral (5) | 6A: Professional Oral (4) | 7A: Professional Oral (5) | 8A: Professional Oral (4) |
| | 5B: Student Poster (7) | 6B: Student Poster (6) | 7B: Student Rapid-Fire (6) | 8B: WAAP's Roundtable |
| | 5C: Student Oral (5) | 6C: Ag Poem | 7C: Student Oral (4) | 8C: Professional Poster (2) |

Note: Numbers in the parentheses indicate number of presentations in each session

| Color legend |
|---------------------------|
| Professional Oral |
| Professional Poster |
| Student Oral |
| Student Poster |
| Student Rapid-Fire |
| WAAP's Roundtable |
| Ag. Poem |
| Entrepreneur's Roundtable |
| NAPA Strategic Roundtable |

Scientific Presentations

DAY 2: Saturday, September 26

Chair: Manoj Karkee, Washington State University, USA

SLOT: 1

Timeframe: 09:00 AM – 10:00 AM EST (6:45 – 7:45 PM Nepal Time)

Concurrent Session: Agricultural/Applied Economics: 1A

Moderator: Nilhari Neupane, ICIMOD, Nepal

Technical Coordinator: Pramod Pokhrel

| Time | ID | Topic |
|-------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 09:00 | 199 | Biodiversity-based Value Chain Development of Traditional Crops for Nutrition Sensitive Agriculture in Nepal Devendra Gauchan Biodiversity International, Kathmandu, Nepal |
| 09:10 | 105 | Payments for Begnas Lake Watershed Services in Kaski District Nepal Thaneshwar Bhandari Tribhuvan University, Lamjung Campus, Nepal |
| 09:20 | 207 | Economic Potential of Specialty Vegetable – Bitter Melon in the Southeast USA ¹ Lila Karki, ¹ Uma Karki, ³ Srinivasa R. Mentreddy ² Alabama A&M University, Alabama, USA |
| 09:30 | | Q & A Combined Session |

Concurrent Session: Student Competitive Oral – 1B

Moderator: Aditya R. Khanal, Tennessee State University, Tennessee

Technical Coordinator: Asmita Nagila

| Time | ID | Topic |
|-------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 09:00 | 101 | Molecular Mapping of Quantitative Trait Loci for Fusarium Head Blight Resistance in the Brazilian Spring Wheat Cultivar 'Surpresa' Bikash Poudel, Krishna D. Puri, Yueqiang Leng, Joseph Mullins, Anil Karmacharya, Yuan Liu, Justin Hegstad, Xuehui Li, Kishore Chittem, Shaobin Zhong North Dakota State University, Fargo, North Dakota, USA |
| 09:10 | 118 | Energy Use, GHG Emission and Global Warming Potential for Spring Paddy Production in Jhapa District Nepal Padam Prasad Paudel Tribhuvan University, Dharan, Nepal |

| Time | ID | Topic |
|-------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 09:20 | 122 | Diversity of Fusarium Fungi Causing Fusarium Head Blight (FHB) of Wheat in Georgia Bikash Ghimire, Mohamed Mergoum, John Youmans, Alfredo D. Martinez, James W. Buck University of Georgia, Griffin Campus, Griffin, Georgia, USA |
| 09:30 | 151 | Production and Marketing of Ginger: A Case Study in Salyan District, Nepal ¹ Shristi Upadhyaya, ¹ O. P. Singh, ² Lila B. Karki, ³ Raj Kumar Adhikari ¹ Agriculture and Forestry University, Rampur, Chitwan, Nepal ² Tuskegee University, Cooperative Extension, Tuskegee, Alabama, USA ³ Himalayan College of Agricultural Science and Technology, Kathmandu, Nepal |
| 09:40 | | Q & A Combined Session |

Concurrent Session: Student Competitive Poster – 1C
Moderator: Rajan Ghimire, New Mexico State University, USA
Technical Coordinator: Mahesh KC

| Time | ID | Topic |
|------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9:00 | 210 | Ethnoveterinary Practices among Small Scale Goat Farmers of Nawalpur, Nepal ¹ Sachin Regmi, ¹ Mohan Sharma, ² Santosh Dhakal, ¹ Bal Krishna Pandey ¹ Agriculture and Forestry University, Rampur, Chitwan, Nepal ² Johns Hopkins University, Maryland, USA |
| 9:05 | 13 | In-vitro Screening on Germination and Seedling Growth of Wheat (<i>Triticum aestivum</i>) Genotypes for Drought Tolerance Aakriti Khanal, Sumitra Pantha, Dhruba B. Thapa, Ankur Paudel Nepal Agricultural Research Council, Khumaltar, Nepal |
| 9:10 | 218 | Status of Veterinary Vaccine Production in Nepal ¹ Uddab Poudel, ² Umesh Dahal, ² Saroj Chaudhari, ³ Santosh Dhakal ¹ Institute of Agriculture and Animal Sciences, Tribhuvan University, Paklihawa, Rupandehi, Nepal ² Department of Livestock Services, Kathmandu, Nepal ³ Johns Hopkins Bloomberg School of Public Health, Maryland, USA |
| 9:15 | 226 | Comparing Fruit Characteristics of KSU Pawpaw Cultivars with Commercially Available Cultivars Anju Chaudhary, Manisha Hamal, Jeremiah Lowe, Sheri Crabtree, Kirk W. Pomper Kentucky State University, Frankfort, Kentucky, USA |
| 9:20 | 149 | Analyzing Determinants of Adaptation to Flood in Eastern Nepal Using Parametric and Semiparametric Approach Santosh Pathak Louisiana State University, Baton Rouge, Louisiana, USA |
| 9:25 | | Q & A Combined Session |

SLOT: 2

Timeframe: 10:00 AM – 11:00 AM EST (7:45 – 8:45 PM Nepal Time)

Concurrent Session: Agricultural Education, Extension, & Outreach – 2A

Moderator: Basu Deb Bhandari, Comerica Bank, USA

Technical Coordinator: Pramod Pokhrel

| Time | ID | Topic |
|-------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10:00 | 159 | Need for Financial Education in High School Curricula: A Case of Rural Nepal Lila B. Karki, Uma Karki Tuskegee University, Alabama, USA |
| 10:10 | 14 | Roadmap for Agriculture Education under the New Federal System of Nepal ¹ Mahesh Jaishi, ² Megha N. Parajulee ¹ Lamjung Campus, Tribhuvan University, Nepal ² Texas A&M University, Texas, USA |
| 10:20 | 230 | Revamping Agriculture Service Delivery Mechanism in Nepal Ramjee Ghimire, Nanda Joshi Michigan State University, Michigan, USA |
| 10:30 | 170 | Database of Women in Agricultural and Allied Professions and Future Direction ¹ Prakriti Bista, ² Ambika Tiwari, ³ Shristi Ghimire, ⁴ Ranjana Rawal ¹ Clovis, New Mexico, USA ² Mississippi State University, Stoneville, Mississippi, USA ³ The Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland, USA |
| 10:40 | 198 | Students' Preference for and Perception of Agricultural Education: A Case of Rural Nepal ¹ Lila B. Karki, ¹ Uma Karki, ² Ganesh Joshi, ³ Jacob Yabi ¹ Tuskegee University, Alabama, USA ² Commission for Investigation of Abuse of Authority, Nepal ³ University of Parakou, Benin |
| 10:50 | | Q & A Combined Session |

Concurrent Session: Agri-Poem Recitation: – 2B

Moderator: Ambika Tiwari, Mississippi State University, USA

Technical Coordinator: Bishwoyog Bhattarai

Concurrent Session: Entrepreneurs' Roundtable– 2C

Moderator: Purna Kandel, LIAM International Corporation, Canada

Technical Coordinator: Ananta Acharya

SLOT: 3

Timeframe: 11:00 AM – 12:00 PM EST (8:45 – 9:45 PM Nepal Time)

Concurrent Session: Agriculture Policy and Planning – 3A

Moderator: Manoj Karkee, Washington State University, USA

Technical Coordinator: Pramod Pokhrel

| Time | ID | Topic |
|-------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11:00 | 150 | Agricultural Productivity Growth in Nepal: Potentials, Trend and Determinants ¹ Ganesh R. Joshi, ² Narayan B Joshi, ³ Lila B. Karki ¹ Central Department of Environmental Sciences, Tribhuvan University, Kathmandu, Nepal ² Sustainable Research & Development Center, Kathmandu, Nepal ³ Tuskegee University, Alabama, USA |
| 11:10 | 03 | Agriculture Policy of South Asia: Pathways for 2020-30 Y. B. Thapa Poverty Alleviation Fund, Nepal |
| 11:20 | 27 | Opportunity and Constraints of Agriculture Development in Nepal Maha Prasad Gelal Atlanta, Georgia, USA |
| 11:30 | 05 | Food, Water, and Energy Nexus Development Planning Framework: A Basis for Sustainable Development and Food Security in Nepal - May need to go to policy Gopi Upreti ManTech International Corporation, Fairfax, Virginia, USA |
| 11:40 | | |
| 11:50 | | Q & A Combined Session |

Concurrent Session: Student Competitive Oral – 3B

Moderators: Aditya R. Khanal, Tennessee State University, Tennessee

and Shubhechchha Sharma, Michigan State University

Technical Coordinator: Asmita Nagila

| Time | ID | Topic |
|-------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11:00 | 156 | Biological Control of <i>Sclerotium rolfsii</i> and Growth Promotion of Sweet Pepper by Selected Bacillus Species Bandana Bhusal, Margaret T. Mmbaga Tennessee State University, Nashville, Tennessee, USA |
| 11:10 | 178 | Time-course Analysis of Physiological and Molecular Traits Associated with Efficient Nitrogen Uptake and Transport in Wheat Suman Lamichhane Department of Crop and Environmental Sciences, Blacksburg, Virginia, USA |

| Time | ID | Topic |
|-------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11:20 | 147 | Biotic and Abiotic Stress Conditions and Rice Production Efficiency: Evidence from Nepal ¹ Sudip Adhikari, ¹ Aditya Khanal, ² Gokul Poudel ¹ College of Agriculture, Tennessee State University, Nashville, Tennessee, USA ² International Maize and Wheat Improvement Center (CIMMYT), South Asia office, Kathmandu, Nepal |
| 11:30 | | Q & A Combined Session |

Concurrent Session: Student Competitive Poster – 3C
Moderator: Rajan Ghimire, New Mexico State University, USA
Technical Coordinator: Mahesh KC

| Time | ID | Topic |
|-------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11:00 | 168 | Vegetable Grafting: Uses, Outlook and Opportunities for Nepal Sudarshan Kharal, Arjun Kumar Shrestha Agriculture and Forestry University, Chitwan, Nepal |
| 11:05 | 134 | Identification of Potential Overwintering Host of Cotton Leaf Roll Dwarf Virus in Georgia Nabin Prasad Sedhain, Sudeep Bag, Jared Whitaker, Ping Chee, Phillip Roberts, Robert Kemerait University of Georgia, Tifton, Georgia, USA |
| 11:10 | 138 | Varietal Evaluation of Promising Maize Genotypes in Mid Hills of Nepal ¹ Bipin Neupane, ¹ Ankur Poudel, ² Pradeep Wagle ¹ Institute of Agriculture and Animal Science, Lamjung Campus, Lamjung, Nepal ² USDA, Agricultural Research Service, Grazingland Research Laboratory, El Reno, Oklahoma, USA |
| 11:15 | 152 | Sprouting and Canopy Development Pattern of Browse Species Suitable for Grazing Small Ruminants ¹ Bidur Paneru, ² Shailes Bhattra, ¹ Nevershi Ellis, ¹ Uma Karki ¹ Department of Agricultural and Environmental Sciences, Tuskegee University, Tuskegee, Alabama, USA ² University of Georgia, Athens, Georgia, USA |
| 11:20 | 157 | Weed Control in Cutting Propagation of Nursery Crops Isha Poudel, Anthony Witcher Tennessee State University, Nashville, Tennessee, USA |
| 11:25 | 158 | Exploring Hidden Root Traits for Improving Spring Wheat in the Pacific Northwest ¹ Bikash Ghimire, ² Scot H. Hulbert, ³ Camille M. Steber, ³ Kim Garland Campbell, ² Karen A. Sanguinet ¹ University of Georgia, Griffin Campus, Griffin, Georgia, USA ² Washington State University, Pullman, Washington, USA ³ USDA Agricultural Research Services, Pullman, Washington, USA |

| Time | ID | Topic |
|-------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11:30 | 167 | Efficacy of Organic and Inorganic Sources of Nitrogen on Growth, Yield, and Quality of Beetroot Varieties in Chitwan, Nepal. Arati Sapkota Agriculture and Forestry University, Rampur, Chitwan, Nepal |
| 11:35 | | Q & A Combined Session |

SLOT: 4

Timeframe: 12:00 PM – 1:00 PM EST (9:45 – 10:45 PM Nepal Time)

Concurrent Session: Seeds, Germplasms, and Food Security: 4A

Moderator: Dirghajibi Ghimire, University of Michigan, USA

Technical Coordinator: Pramod Pokhrel

| Time | ID | Topic |
|-------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12:00 | 21 | Toxin Minimization and Disaster Preparedness Food Technologies Complement Nutrition, Health Security and Hunger and Poverty Alleviation ¹ Peetambar Dahal, ² Meghnath Dhimal, ³ Krishna Belbase, ⁴ Sundar Tiwari, ⁴ Ishwari P. Dhakal, ⁵ Jwala Bajracharya, ⁵ Sunil Aryal, ⁵ Tek B. Gurung, ⁶ Achyut Sharma, ⁷ John D. Groopman, ⁷ Keith West, ¹ Christine P. Stewart, ⁸ Govind Bhandary, ⁹ Rosina Poudel, ¹⁰ Gokarna Gharti-Chhetri, ¹¹ Manish Neupane, ¹² Amod Pokhrel, ¹³ John V. Ashbrouck, ¹ Elizabeth Mitcham, ¹ Kent Bradford ¹ University of California, Davis, USA ² Nepal Health Research Council, Kathmandu, Nepal ³ Nutrition Evaluation Program (Former), UNICEF, New York, USA ⁴ Agricultural and Forestry University, Chitwan, Nepal ⁵ Nepal Agricultural Research Council, Lalitpur, Nepal ⁶ American Mold Experts, Avon, Indiana, USA ⁷ The Johns Hopkins University, Baltimore, USA ⁸ Partnership for Sustainable Development, Kathmandu, Nepal ⁹ Leonard J. Chabert Medical Center, Louisiana, USA ¹⁰ Palm Beach State University, Florida, USA ¹¹ Thomas Jefferson University, Pennsylvania, USA ¹² University of California, Berkeley, California, USA ¹³ Rhino Research, Bangkok, Thailand |
| 12:10 | 155 | Decline of Agropastoralism in the Upper Gandaki River Basin: Food Security and Livelihood Diversification Implications Milan Shrestha School of Sustainability, Arizona State University, Tempe, Arizona, USA |
| 12:20 | 216 | Development of Community-Based Eco-Farming as a Center of Excellence ¹ Sadhuram Singh Basnyat, ² Tilak Bhandari ¹ Kanjirowa Agro Consultant Pvt Ltd (KACPL), Kathmandu, Nepal ² Institute of Rubber and Jatropha Research-Nepal (IRJR-N), USA |
| 12:30 | | Q & A Combined Session |

Concurrent Session: Student Competitive Oral – 4B

Moderator: Aditya R. Khanal, Tennessee State University, Tennessee
Technical Coordinator: Asmita Nagila

| Time | ID | Topic |
|-------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12:00 | 184 | Characterization of hyper-virulent mutants of soft rot pathogen- <i>Pectobacterium carotovorum</i> Bimala Acharya, Korsi Dumenyo Department of Agricultural and Environmental Sciences, Tennessee State University, Nashville, Tennessee, USA |
| 12:10 | 193 | Potential of Beneficial Trichoderma isolates in Alleviating Drought Stress in Tomato ¹ Ranjana Rawal, Joseph Scheerens, Maria Soledad Benitez Ponce The Ohio State University, Wooster, Ohio, USA |
| 12:20 | 197 | Evaluation of Row Covers in Yield Performance of the Leafy Green Vegetables in Organic Management System Kripa Dhakal Department of Agricultural and Environmental Sciences, Tennessee State University, Nashville, Tennessee, USA |
| 12:30 | | Q & A Combined Session |

NAPA Strategic Visioning Roundtable – 4C

NAPA’s Accomplishment, Expectation, Networking, Contribution, & Strategy
Moderators: Lila B. Karki/Megha N. Parajulee
Technical Coordinator: Dev Paudel

End of the Day 2 Program

Scientific Presentation

DAY 3: Sunday, September 27

Chair: Manoj Karkee, Washington State University, USA

SLOT: 5

Timeframe: 09:00 AM – 10:00 PM EST (6:45 – 7:45 PM Nepal Time)

Concurrent Session: Crop and Soil Sciences I – 5A

Moderator: Rajen Bajgain, USDA-ARS, USA

Technical Coordinator: Pramod Pokhrel

| Time | ID | Topic |
|-------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 09:00 | 140 | Multi-Year Prediction of Rice and Wheat Yields Over Changing Agro-Climatic Scenarios in Nepalese Central Terai Using DSSAT Ver 4.7 Crop Model ¹ Lal. P. Amgain, ² Devi Dhakal, ² Sailesh Adhikari, ³ Saurav Suman ¹ Far-western University, Tikapur Kailali, Nepal ² Tribhuvan University, Kirtipur, Kathmandu, Nepal ³ Agriculture and Food Security Program, World Food Organization, Nepal |
| 09:10 | 139 | Analyzing Soil Nutrient Balance in Hills of Nepal: Do Socio-economic Factors Matter for Sustainable Land Use? Romy Das Karna Salem College, Winston-Salem, North Carolina, USA |
| 09:20 | 222 | Elucidating the Effects of Organic Vs Conventional Cropping Practice and Rhizobia Inoculation on Peanut Yield and Rhizosphere Microbial Diversity. Dev Paudel, Liping Wang, Janam Acharya, Cleber Henrique Lopes de Souza, Esteban Rios, Jianping Wang Agronomy Department, University of Florida, Gainesville, Florida, USA |
| 09:30 | 123 | Examining the Factors Influencing Contract Farming Choice Decisions of Ginger Growers in Nepal ¹ Aditya R. Khanal, ² Ashok Mishra, ¹ Sudip Adhikari, and ³ Anjani Kumar ¹ Tennessee State University, Tennessee, USA ² Arizona State University, Arizona, USA ³ International Food Policy Research Institute, South Asia Office, New Delhi, India |
| 09:40 | 26 | Status of Large Cardamom Cultivation in Nepal Dol P. Dhakal, Megha N. Parajulee Texas A&M AgriLife Research and Extension Center, Lubbock Texas, USA |
| 09:50 | | Q & A Combined Session |

Concurrent Session: Student Competitive Poster – 5B

Moderators: Rajan Ghimire, New Mexico State University, USA
and Ranjana Rawal, The Ohio State University, USA
Technical Coordinator: Mahesh KC

| Time | ID | Topic |
|------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9:00 | 10 | Agronomic Performance of Maize Hybrid Cultivars Under Different Plant Densities in Spring Season in Dang, Nepal ¹ Rupak Karn, ¹ Shrawan Kumar Sah, ¹ Puspa Raj Dulal, ² Nityananda Khanal ¹ Agriculture and Forestry University, Rampur, Chitwan, Nepal ² Agriculture and Agri-Food Canada, Alberta, Canada |
| 9:05 | 15 | Adoption of Recommended Production Practices of Cardinal Variety of Potato in Dadeldhura, Nepal Sangam Panta, Dipika Parajulee, Udit Prakash Sigdel Agriculture and Forestry University, Rampur, Chitwan, Nepal |
| 9:10 | 145 | Growth and Profitability of Maize (<i>Zea Mays</i> L.) Under Different Organic and Inorganic Nutrient Management in Chitwan, Nepal. Kailash Raman Bhatt Agriculture and Forestry University, Rampur, Chiwan, Nepal |
| 9:15 | 164 | Study on Zoonotic Helminths in the Gastrointestinal Tract of Dogs in Kathmandu Valley, Nepal. ¹ Bibek Bhattachan, ¹ Birendra Kumar Bhattachan, ² A. Jha ¹ Agriculture and Forestry University Rampur, Chitwan, Nepal ² Central Veterinary Hospital, Tripureshwor Kathmandu Nepal |
| 9:20 | 175 | Impact of Climate Change on Livestock Production in Bharatpur, Chitwan, Nepal Prakash Gurung Agriculture and Forestry University, Rampur, Chitwan, Nepal |
| 9:25 | 02 | Effect of Site-specific Nutrient Management Approach in Productivity of Spring Rice in Kanchanpur, Nepal Chudamani pant, Pankaj Prasad Joshi Agriculture and Forestry University, Chitwan, Nepal |
| 9:30 | 07 | Integrated Management of Fruit Borer of Tomato in Nepal Swodesh Rijal, Bhishma Raj Dahal Agriculture and Forestry University, Rampur, Chitwan, Nepal |
| 9:35 | | Q & A Combined Session |

Concurrent Session: Student Competitive Oral – 5C
Moderator: Aditya R. Khanal, Tennessee State University, TN
Technical Coordinator: Bishwoyog Bhattarai

| Time | ID | Topic |
|-------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 09:00 | 106 | Machine Vision System for Occlusion Free Robotic Harvesting in Apple Orchards. ¹ Santosh Bhusal, ² Or Hirshfeld, ¹ Uddhav Bhattarai, ¹ Manoj Karkee, ¹ Qin Zhang, ² Avi Kahani ¹ Washington State University, Prosser, Washington, USA, ² FFRobotics Inc, Israel |
| 09:10 | 173 | Efficacy of Botanicals for Management of Green Mould Disease (<i>Trichoderma spp.</i>) In Oyster Mushroom (<i>Pleurotus Sajor-Caju</i>) Gaurav Adhikari, Ashutosh Poudel, Anish Bhattarai, Kriti Poudel, Dikshya Sapkota, Ritesh Kumar Yadav Department of Plant Pathology, Agriculture and Forestry University, Chitwan, Nepal |
| 09:20 | 209 | Efficacy of Sulfur and Copper as Fungicides to Control Pawpaw Leaf and Fruit Spot. ¹ Manisha Hamal, ² Sijan Pandit, ¹ Jeremy Lowe, ¹ Sheri Crabtree, ¹ Kirk W. Pomper ¹ Horticulture Department, Kentucky State University, Frankfort, Kentucky, USA ² Department of Pathology, University of Lethbridge, Lethbridge, Alberta, Canada |
| 09:30 | 132 | Combined Effects of Inundative Biocontrol and Anaerobic Soil Disinfestation Using Non-Host Cover Crops as Carbon Sources for Clubroot Management in Mustard Greens Ram B. Khadka, Sally A. Miller The Ohio State University, Ohio Agricultural Research and Development Center, Wooster, Ohio, USA |
| 09:40 | 227 | Assessment of Urban Heat Island (UHI) in Relation to Normalized Difference Vegetation Index (NDVI): A Case Study of Bharatpur, Nepal Smriti Kandel, Jeremy Sandifer, Buddhi Gyawali, College of Agriculture Communities and the Environment, Kentucky State University, Frankfort, Kentucky, USA |
| 09:50 | | Q & A Combined Session |

SLOT: 6

Timeframe: 10:00 AM – 11:00 AM (7:45 – 8:45 PM Nepal Time)

Concurrent Session: Animal Science and Veterinary Medicine – 6A

Moderator: Prafulla Regmi, North Carolina State University, USA

Technical Coordinator: Pramod Pokhrel

| Time | ID | Topic |
|-------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10:00 | 219 | Integrating Woodlands and Animal Production: Whole System Approach to Promote the Sustainable Agriculture ¹ Uma Karki, ¹ Bidur Paneru, ² Shailes Bhattarai, ³ Rishi Khatri, ¹ Nevershi Ellis, ¹ Lila Karki, ⁵ Sanjok Poudel ¹ Tuskegee University, Tuskegee, Alabama, USA ² University of Georgia, Athens, Georgia, USA ³ Mississippi State University, Starkville, Mississippi, USA ⁴ Cooperative ⁵ Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA |
| 10:10 | 121 | Road to Commercialization: Lessons Nepalese Dairy Industry Can Learn from Dairy Farms in the USA Sushil Paudyal Texas A&M University, College Station, Texas, USA |
| 10:20 | 125 | Progress in Development of Nanoparticle-Based Swine Influenza Vaccines ¹ Santosh Dhakal, ¹ Shristi Ghimire, ² Renukaradhya Gourapura ¹ The Ohio State University, USA. Current affiliation: Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland, USA ² Ohio Agricultural Research and Development Center, The Ohio State University, Wooster, Ohio, USA |
| 10:30 | 08 | Animal Feed Resources and their Management in Nepal ¹ Netra P. Osti, ² Naba R. Devkota, ³ Devendra P. Yadav ¹ National Animal Science Research Institute, Khumaltar, Nepal ² Agriculture and Forestry University, Nepal ³ Department of Livestock Service, Nepal |
| 10:40 | | Q & A Combined Session |

Concurrent Session: Student Competitive Poster - 6B

Moderators: Rajan Ghimire, New Mexico State University, New Mexico, USA and Kripa Dhakal, Tennessee State University, USA

Technical Coordinator: Mahesh KC

| Time | ID | Topic |
|-------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10:00 | 111 | Survey of the Village-Based Indigenous Duck Production Systems in Nawalparasi, Nepal Anju Sharma Chapagain, Prem Lal Mahato, Nirajan Bhattarai Agriculture and Forestry University, Chitwan, Nepal |

| Time | ID | Topic |
|-------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10:05 | 129 | Goats' Productivity Status under Small Holder Farmers' Management in Bharatpur, Chitwan, Nepal Bijay Paudel, Gokarna Gautam, Shiva Prasad Bhusal, Sachin Upadhayaya Agriculture and Forestry University, Chitwan, Nepal |
| 10:10 | 126 | Effects of Planting Depth and Bacillus Subtilis Treatment on Saffron (<i>Crocus Sativa</i> L.) Production in Green Roof Production System Pradip Poudel, Hideka Kobayashi, Shawn Lucas, Leigh Whittinghill Kentucky State University, Frankfort, Kentucky, USA |
| 10:15 | 183 | Soil Hydraulic Properties in a Plastic Mulch Raised Bed System Mounika Pudota, Michelle Mbia, Srinivasa Rao Mentreddy, Dedrick D. Davis Alabama A&M University, Normal, Alabama, USA |
| 10:20 | 160 | Functional Relationship Study of Symbiotic Component Doesn't Make Infections with the Endoparasitic Nematode Infection Rishi Khatri, Mandeep Adhikari, Vincent Klink ¹ Biological Sciences, Mississippi State University, Starkville, Mississippi, USA |
| 10:25 | 176 | Agriculture Degree Aspirants in Nepal: Geography and Gender Dimensions ¹ Dikshit Poudel, ¹ Saurav Raj Kunwar, ² Shweta Ghimire, ² Keshab Subedi ¹ University of Georgia, Athens, Georgia, USA ² University of Delaware, USA |
| 10:30 | | Q & A Combined Session |

Concurrent Session: Agri-Poem Recitation: 6C

Moderator: Ambika Tiwari, Mississippi State University, USA

Technical Coordinator: Bishwoyog Bhattarai

SLOT: 7

Timeframe: 11:00 AM – 12:00 PM (8:45 – 9:45 PM Nepal Time)

Concurrent Session: Agribusiness, Plant Protection/Diseases and Pests –7A

Moderators: Devendra Gauchan, Biodiversity International, Nepal
and Pragyan Gautam Burlakoti, BC Ministry of Agriculture, Canada

Technical Coordinator: Pramod Pokhrel

| Time | ID | Topic |
|-------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11:00 | 211 | Agribusiness between Nepal and North America: Trends, Challenges and opportunities ¹ Purna Kandel, ² Tulsi Dharel ¹ Liam International Corporation, Toronto, Canada, ² Centennial College, Toronto, Canada |
| 11:10 | 23 | Similarities of Tools Used in Evaluating Biological Control Agents of Forest Pests in Eastern Forests Versus Cotton Pests in Western Cotton Fields |

| Time | ID | Topic |
|-------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | ¹ Abdul Hakeem, ¹ Megha Parajulee, ² Jerome Grant, ² Paris Lambdin, ² Frank Hale and ² Greg Wiggins ¹ Texas A&M AgriLife Research and Extension Center, Lubbock, Texas, USA ² The University of Tennessee, Knoxville, Tennessee, USA |
| 11:20 | 131 | Ecology and Epidemiological Modeling of Infectious Diseases in the Framework of Sustainable Development of Nepal ¹ Bhim Chaulagain and ² Ram Bahadur Khadka ¹ Oregon State University, Corvallis, Oregon, USA ² The Ohio State University, Wooster, Ohio, USA; Nepal Agricultural Research Council, Nepalgunj, Nepal |
| 11:30 | 124 | Cannabis as an Economic Crop: Prospect and Possible Use in Nepalese Context - Crop Production Niranjan Aryal Lab Director at Certus Analytics, Murrieta, California, USA |
| 11:40 | 09 | Photostatis: A Useful Concept for Plant Hardening for Transplant Establishment in Horticultural Operations Nityananda Khanal Agriculture and Agri-Food Canada, Beaverlodge Research Farm, Canada |
| 11:50 | | Q & A Combined Session |

Concurrent Session: Student Competitive Rapid Fire – 7B
Moderator: Omkar Joshi, Oklahoma State University, USA
Technical Coordinator: Asmita Nagila

| Time | ID | Topic |
|-------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11:00 | 106 | Machine Vision System for Occlusion Free Robotic Harvesting in Apple Orchards ¹ Santosh Bhusal, ² Or Hirshfeld, ¹ Uddhav Bhattarai, ¹ Manoj Karkee, ¹ Qin Zhang, ² Avi Kahani ¹ Washington State University, Prosser, Washington, USA ² FFRobotics Inc, Israel |
| 11:03 | 132 | Combined Effects of Inundative Biocontrol and Anaerobic Soil Disinfestation Using Non-Host Cover Crops as Carbon Sources for Clubroot Management in Mustard Greens Ram B. Khadka, Sally A. Miller The Ohio State University, Ohio Agricultural Research and Development Center, Wooster, Ohio, USA |
| 11:06 | 149 | Analyzing Determinants of Adaptation to Flood in Eastern Nepal Using Parametric and Semiparametric Approach Santosh Pathak Louisiana State University, Baton Rouge, Louisiana, USA |

| Time | ID | Topic |
|-------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11:09 | 168 | Vegetable Grafting: Uses, Outlook and Opportunities for Nepal Sudarshan Kharal, Arjun Kumar Shrestha Agriculture and Forestry University, Chitwan, Nepal |
| 11:12 | 209 | Efficacy of Sulfur and Copper as Fungicides to Control Pawpaw Leaf and Fruit Spot ¹ Manisha Hamal, ² Sijan Pandit, ¹ Jeremy Lowe, ¹ Sheri Crabtree, ¹ Kirk W. Pomper ¹ Kentucky State University, Frankfort, Kentucky, USA ² University of Lethbridge, Lethbridge, Alberta, Canada |
| 11:15 | 210 | Ethnoveterinary Practices among Small Scale Goat Farmers of Nawalpur, Nepal ¹ Sachin Regmi, ¹ Mohan Sharma, ² Santosh Dhakal, ¹ Bal Krishna Pandey ¹ Agriculture and Forestry University, Rampur, Chitwan, Nepal ² Johns Hopkins University, Maryland, USA |

Concurrent Session: Student Competitive Oral – 7C
Moderator: Aditya R. Khanal, Tennessee State University, TN
Technical Coordinator: Bishwoyog Bhattarai

| Time | ID | Topic |
|-------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11:00 | 11 | Vegetation Preference and Browsing Height of Kiko Wethers and Katahdin Rams Co-Stocked in Woodlands ¹ Bidur Paneru, ¹ Uma Karki, ¹ Nevershi Ellis, ² Shailes Bhattra ¹ Tuskegee University, Tuskegee, Alabama, USA ² University of Georgia, Athens, Georgia, USA |
| 11:10 | 128 | Biratnagar Jute Mill: Situation, Machineries, Recommence Feasibility and Potentiality - An Industrial Case Study Dikshit Poudel The University of Georgia, Athens, Georgia, USA |
| 11:20 | 192 | Enhanced Precipitation Stimulated Soil Respiratory Loss and Extracellular Hydrolases in a Switchgrass Experiment Madhav Parajuli, Jianwei Li Department of Agricultural and Environmental Science, Tennessee State University, Nashville, Tennessee, USA |
| 11:30 | 204 | Colonization of Soybean Stems and Toxin Production by the Stem Canker Pathogen, <i>Diaporthe aspalathi</i> ¹ Bhawana Ghimire, ¹ Saurabh Gautam, ¹ Rajagopalbabu Srinivasan, ² Ethan Menke, ² Zenglu Li, ¹ James W. Buck ¹ University of Georgia, Griffin, Georgia, USA ² University of Georgia, Athens, Georgia, USA |
| 11:40 | | Q & A Combined Session |

SLOT: 8

Timeframe: 12:00 PM – 1:00 PM EST (9:45 – 10:45 PM Nepal Time)

Concurrent Session: Hydrology/Environment and Climate – 8A

Moderator: Yadu Pokhrel, Michigan State University, USA

Technical Coordinator: Pramod Pokhrel

| Time | ID | Topic |
|-------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12:00 | 18 | Yield Potential of Bio-Energy Sorghum Under Different Water Regimes ¹ Sushil Thapa, ¹ Qingwu Xue, ¹ Kirk Jessup, ² Robert Aiken, ³ Jourdan Bell, ⁴ William Rooney ¹ Texas A&M AgriLife Research at Amarillo, Texas, USA ² Kansas State University, Kansas, USA ³ Texas A&M AgriLife Extension Service at Amarillo, Texas, USA ⁴ Texas A&M University, College Station, Texas, USA |
| 12:10 | 201 | Comparison of Evapotranspiration of Differently Managed Pasture System of Oklahoma ¹ Rajen Bajgain, ¹ Xiangming Xiao, ² Jefferey Basara, ³ Pradeep Wagle ¹ University of Oklahoma, Norman, Oklahoma, USA ² University of Oklahoma, Norman, Oklahoma, USA ³ USDA-ARS, El Reno, Oklahoma, USA |
| 12:20 | 104 | Flux Variance Similarity-Based Partitioning of Evapotranspiration Over a Rainfed Alfalfa Field Using High Frequency Eddy Covariance Data ¹ Pradeep Wagle, ² Todd H. Skaggs, ³ Prasanna H. Gowda, ¹ Brian K. Northup, ¹ James P. S. Neel ¹ USDA-ARS, Grazinglands Research Laboratory, El Reno, Oklahoma, USA ² USDA-ARS, U.S. Salinity Laboratory, Riverside, California, USA |
| 12:30 | 20 | Nepal Agriculture Adaptation to Climate Change Gehendra B. Gurung Climate Adaptation, Nepal |
| 12:40 | | Q & A Combined Session |

Concurrent Session: WAAP Round Table – 8B

Moderator: Gita Koirala Bhandari, WAAP/NAPA, USA

Technical Coordinator: Asmita Nagila

Concurrent Session: General Poster – 8C

Moderator: Ramjee Ghimire, Michigan State University, USA

Technical Coordinator: Dev Paudel

| Time | ID | Topic |
|-------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12:00 | 169 | Soil and Plant Health Management for Sustainable Vegetable Production System in Nepal ¹ Rajan Ghimire, ² Rajendra Regmi, ³ Jhalendra Rijal, ⁴ Nirajan Bhattarai ¹ New Mexico State University Agricultural Science Center, Clovis, New Mexico, USA ² Agriculture and Forestry University, Rampur, Chitwan, Nepal ³ University of California Cooperative Extension, Modesto, California, USA ⁴ Agriculture and Forestry University, Rampur, Chitwan, Nepal |
| 12:05 | 163 | Post-anthesis Leaf Health as Potential Determinant of Yield in Early Evaluation Trial of Wheat Genotypes Deependra Dhakal Agriculture and Forestry University, Rampur, Chitwan, Nepal |
| 12:10 | | Q & A Combined Session |

End of the Day 3 Program

Second NAPA Biennial International Scientific Conference **DAY 4: Monday, September 28**

Closing Ceremony

Timeframe: 8:00 PM – 11:00 PM EST

Nepal Time: 5:45 – 8:45 AM (Tuesday, September 29th)

Moderator: Lila B. Karki

Technical Coordinator: Dev Paudel

| Time | Program | Responsibility |
|---------------|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8:00 | Conference/Program Highlights | Lila B. Karki Conference Chair & Immediate Past President, NAPA |
| 8:05 | Closing Remarks | Prem Raja Mahat Honoraray Consul General of Nepal for USA |
| 8:10 – 9:10 | Agri-poem Recitation | Ambika Tiwari Coordinator, Agri-poem competition |
| 8:10 – 9:10 | Book Journey: Authors' Platform/Interaction | Prem Bhandari Co-Editor-In-Chief and Managing Editor, NAPA Book Publication |
| 9:10 -9:15 | Break/Recess/NAPA Highlights | |
| 9:15 – 10:20 | Social/Cultural Event | Pradeep Wagle Vice President, NAPA |
| 10:20 – 10:50 | Awards Ceremony | - Student oral presentation: Aditya Khanal - Student poster presentation: Rajan Ghimire - Rapid-fire presentation: Omkar Joshi - Student essay writing: Bharat Pokharel - Agri-poem recitation: Ambika Tiwari - Volunteers' recognition: Lila B. Karki |
| 10:50 | Conference Review and Observation | Nanda Prakash Joshi NAPA Advisor |
| 10:55 | Closing Remarks | Megha N. Parajulee President, NAPA |

End of the Conference

List of Abstracts

| Author(s) | Abstract Title | Category | Abstract ID |
|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------|
| Acharya, B., and Dumenyo, K. | Characterization of Hyper-virulent Mutants of Soft Rot Pathogen - <i>Pectobacterium carotovorum</i> | Oral | 184 |
| Acharya, B., Shrestha, S. M., Manandhar, H. K., and Chaudhary, B. | Screening of Local, Improved and Hybrid Rice (<i>Oryza sativa</i>) Genotypes against Blast Disease (<i>Pyricularia oryzae</i>) in Surkhet Condition | Poster | 17 |
| Acharya, J., Lopez, Y., de bem Oliveira, I., Resende, M., Munoz, P., and Rios, E. | Genome-wide Family Prediction in Alfalfa | Oral | 232 |
| Adhikari, G., Poudel, A., Bhattarai, A., Poudel, K., Sapkota, D., and Yadav, R. K. | Efficacy of Botanicals for Management of Green Mould Disease (<i>Trichoderma spp.</i>) in Oyster Mushroom (<i>Pleurotus sajor-caju</i>) | Oral | 173 |
| Adhikari, M. | Computational Method to Predict Drought Resistance Gene in Rice | Poster | 195 |
| Adhikari, N. R., Kafle, S., Shrestha, J., Amgain, L. P., Adhikari, B. B., and Sharma, S. | Red Light Absorbance-transmittance, Fluorescence and Electron Transport Measures from PS II on the T4 and E1 and Leaves of Eight Maize Hybrids | Oral | 133 |
| Adhikari, P., Jha, D. K., Poudel, M., and Acharya, M. C. | Economics of Chhari and Marketable-size Carps in Bara, Nepal | Oral | 143 |
| Adhikari, S. | Incorporation of Diverse Fusarium Head Blight Resistance QTL in Hard Red Winter Wheat Breeding Germplasm. | Poster | 189 |
| Adhikari, S. P., Rola-Rubzen, M. F., Ghimire, Y. N., Thapa-Magar, D. B., and Shrestha, R. | Factors Influencing the Adoption of Conservation Agriculture in the Eastern Gangetic Region of Nepal | Poster | 137 |
| Adhikari, S., Khanal, A. R., and Poudel, G. | Biotic and Abiotic Stress Conditions and Rice Production Efficiency: Evidence from Nepal | Oral | 147 |
| Amgain, L. P., Dhakal, D., Adhikari, S., and Suman, S. | Multi-year Prediction of Rice and Wheat Yields over Changing Agro-climatic Scenarios in Central Terai of Nepal | Oral | 140 |
| Aryal, N. | Cannabis as an Economic Crop: Prospect and Possible Use in Nepalese Context | Oral | 124 |
| Bajgain, R., Xiao, X., Basara, J., and Wagle, P. | Comparison of evapotranspiration of differently managed pasture system of Oklahoma | Oral | 201 |
| Basnyat, S.S., and Bhandari, T. | Development of Community-based Eco-farming as a Center of Excellence | Oral | 216 |
| Bhandari, T. | Payments for Begnas Lake Watershed Services in Kaski District Nepal | Oral | 105 |
| Bhatt, K. R. | Growth and Profitability of Maize (<i>Zea mays</i> L.) under Different Organic and Inorganic Nutrient Management in Chitwan, Nepal. | Poster | 145 |
| Bhattachan, B. K. | Seed Yield Performance of Rainfed Upland Rice Varieties Under organic and Inorganic Fertilizer in Chitwan, Nepal | Oral | 165 |
| Bhattachan, B. K. | Grain Yield Performance of Ramdhan Rice under Different Date of Transplanting and Age of Seedlings in Rampur Chitwan Nepal | Oral | 166 |
| Bhattachan, B. K., and Timilsina, A. | Seed Yield and Profit of Wheat Seed Varieties Collected from Farmers and Government Sector of Nepal | Oral | 144 |

| Author(s) | Abstract Title | Category | Abstract ID |
|---------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------|
| Bhattachan, B., Bhattachan, B. K., and Jha, A. | Study on Zoonotic Helminths in the Gastro-intestinal Tract of Dogs in Kathmandu Valley of Nepal | Poster | 164 |
| Bhattarai, S. K. | Production Economics and Marketing of Large Cardamom in Sankhuwasabha, Nepal | Poster | 112 |
| Bhusal, B., and Mmbaga, M. T. | Biological Control of <i>Sclerotium rolfsii</i> and Growth Promotion of Sweet Pepper by Selected <i>Bacillus</i> Species. | Oral | 156 |
| Bhusal, S., Hirshfeld, O., Bhattarai, U., Karkee, M., Zhang, Q., and Kahani, A. | Machine Vision System for Occlusion Free Robotic Harvesting in Apple Orchards. | Oral | 106 |
| Bista, P., Tiwari, A., Ghimire, S., and Rawal, R. | Database of Women in Agricultural and Allied Professions and Future Direction | Oral | 170 |
| Bohara, S., Acharya, B., and Joshi, D. | Screening of Local, Improved and Hybrid Rice Genotypes against Blast Disease (<i>Pyricularia oryzae</i>) in Bangaun, Lamahi, Dang, Nepal | Poster | 215 |
| Byanju, B., and Lamsal, B. | Effect of Physicochemical Modifications on Extraction and Physicochemical Properties of Some Legume Protein Ingredients | Poster | 231 |
| Chakraborty, A., Li, H., Iqbal, S., Jones M. G. K., and Wylie, S. J. | CRISPR/Cas9 Genome Editing System as a Versatile Tool for Functional Genomics | Poster | 127 |
| Chapagain, A. S., Mahato, P. L., and Bhattarai, N. | Survey of the Village-based Indigenous Duck Production Systems in Nawalparasi, Nepal | Poster | 111 |
| Chapagain, S., and Subudhi, P. K. | Screening and Evaluation of Multi-parental Rice Genotypes for Seedling Stage Salinity Tolerance | Oral | 196 |
| Chaudhary, A. | Varietal Screening of Okra (<i>Abelmoschus esculentus</i> L. Moench) against Okra Yellow Vein Mosaic Virus (OYVMV) under Different Management Practices in the Institute of Agriculture and Animal Science (IAAS), Paklihawa Campus, Rupandehi, Nepal. | Oral | 161 |
| Chaudhary, A., Hamal, M., Lowe, J., Crabtree, S., and Pomper, K. W. | Comparing Fruit Characteristics of KSU Pawpaw Cultivars with Commercially Available Cultivars. | Poster | 226 |
| Chaulagain, B., and Khadka, R. B. | Ecology and Epidemiological Modeling of Infectious Diseases in the Framework of Sustainable Development of Nepal | Oral | 131 |
| Dahal, P. et al. | Toxin Minimization and Disaster Preparedness Food Technologies Complement Nutrition, Health Security and Hunger and Poverty Alleviation | Oral | 21 |
| Devkota, A. | CRISPR/Cas9-mediated Genome Editing of CPC TRY in Soybean | Poster | 229 |
| Devkota, I., and Basnet, H. B. | Existing Cattle Milk Production and Marketing Chain in Bharatpur-16, Chitwan, Nepal | Poster | 206 |
| Dhakal, B., Rana, R. B., Poudel, N. R., Tiwari, M. R., K.C., D., Subedi, S., and Gurung, T. B. | Morphological and Biometric Characterization on Indigenous Lampuchhre Sheep in Terai region of Nepal | Poster | 182 |
| Dhakal, B., Subedi, S., Pant, S. R., and Devkota, N. R. | Effect of Inter-cropping at Varying Irrigation Level on Yield and Water Use Efficiency of Winter Forage Species in Mid-hills Condition of Nepal | Oral | 187 |
| Dhakal, C. K. | Nitrogen Optimization in Cotton Production with the Bayesian Hierarchical Approach | Oral | 194 |
| Dhakal, D. | Post-anthesis Leaf Health as Potential Determinant of Yield in Early Evaluation Trial of Wheat Genotypes. | Poster | 163 |

| Author(s) | Abstract Title | Category | Abstract ID |
|----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|----------|-------------|
| Dhakal, D. P., and Parajulee, M. N. | Status of Large Cardamom Cultivation in Nepal | Oral | 26 |
| Dhakal, K. | Evaluation of Row Covers in Performance of the Leafy Green Vegetables in Organic Management System | Oral | 197 |
| Dhakal, M., West, C. P., Deb, S. K., Villalobos, C., and Kharel, G. | Interseeding Alfalfa into Native Grassland for Minimal Trade-off in Soil Water Consumption | Oral | 205 |
| Dhakal, S., Ghimire, S., and Gourapura, R. | Progress in Development of Nanoparticle-based Swine Influenza Vaccines | Oral | 125 |
| Dhungeel, J.K., Bhattarai, S. P., and Parajulee, M. N. | Effect of Oxygation on Crops with Varying Rooting Systems: Crop Growth, Yield, and Quality | Poster | 24 |
| Dumre, A., Dhakal, S. C., Acharya, M., and Poudel, P. | Agricultural Growth and Its Determinants in Nepal | Poster | 119 |
| Edewor, K., and Edewor, S. | Effect of Trade Liberalisation on Agricultural Household Welfare in Nigeria | Oral | 190 |
| Edewor, S., Edewor, K., Dipeolu, A., Ashaolu, O., and Akinbode, S. | Trade Liberalisation Effect on Agricultural Export Performance in Nigeria | Poster | 191 |
| Ellis, N., Karki, U., Paneru, B., and Bhattra, S. | Health Parameters of Hair Sheep Raised in Silvopasture and Woodland Systems | Poster | 200 |
| Gairhe, S., Karki, T. B., Subedi, S., Acharya, Y., and Das, S. | Perceptions and Practices of Direct Seeded Rice in Terai Region of Nepal | Oral | 120 |
| Gauchan, D. | Biodiversity-based Value Chain Development of Traditional Crops for Nutrition Sensitive Agriculture in Nepal | Oral | 199 |
| Gelal, M. P. | Opportunity and Constraints of Agriculture Development in Nepal | Oral | 27 |
| Ghimire, B., Gautam, S., Srinivasan, R., Menke, E., Li, Z., and Buck, J. W. | Colonization of Soybean and Toxin Production by the Stem Canker Pathogen, <i>Diaporthe aspalathi</i> | Oral | 204 |
| Ghimire, B., Hulbert, S. H., Steber, C. M., Garland, K., and Sanguinet, K. A. | Exploring Hidden Root Traits for Improving Spring Wheat in the Pacific Northwest | Poster | 158 |
| Ghimire, B., Mergoum, M., Youmans, M., Martinez, A. D., and Buck, J. W. | Diversity of Fusarium Fungi Causing Fusarium Head Blight (FHB) of Wheat in Georgia | Oral | 122 |
| Ghimire, L. | Effect of Irrigation Water pH on the Performance of Healthy and Huanglongbing-affected Citrus: a Transcriptomic Analysis | Oral | 174 |
| Ghimire, R., and Joshi, N. | Revamping Agriculture Service Delivery Mechanism in Nepal | Oral | 230 |
| Ghimire, R., Regmi, R., Rijal, J., and Bhattarai, N. | Soil and Plant Health Management for Sustainable Vegetable Production in Nepal | Poster | 169 |
| Ghimire, S., Devkota, S., and Koirala, B. | Food Security and Socio-economic Status of Chepang Community in Province No. 3 of Nepal | Oral | 1 |
| Ghimire, S., Khanal, A., Kohar, G. R., Acharya, B., Basnet, A., Kandel, P., Subedi, B., Shrestha, J., and Dhakal, K. | Variability and Path Coefficient Analysis for Yield Attributing Traits of Mungbean (<i>Vigna radiata</i> L.) | Poster | 214 |
| Gurung, G. B. | Nepal Agriculture Adaptation to Climate Change | Oral | 20 |

| Author(s) | Abstract Title | Category | Abstract ID |
|-----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------|
| Gurung, P. | Impact of Climate Change on Livestock Production in Bharatpur, Chitwan, Nepal | Poster | 175 |
| Gyawali, B., Felts, A., and Aziz, A. N. | Genotyping of Individual Microspores as Natural Protoplasts from Sweet Sorghum Varieties for Biofuel Production | Oral | 228 |
| Hakeem, A., Parajulee, M. N., Grant, J., Lambdin, P., Hale, F., and Wiggins, G. | Similarities of Tools Used in Evaluating Biological Control Agents of Forest Pests in Eastern Forests versus Cotton Pests in Western Cotton Fields | Oral | 23 |
| Hamal, M., Pandit, S., Lowe, J., Crabtree, S., and Pomper, K.W. | Efficacy of Sulfur and Copper as Fungicides to Control Pawpaw Leaf and Fruit Spot | Oral | 209 |
| Jaishi, M., and Parajulee, M. N. | Roadmap for Agriculture Education under the New Federal System of Nepal | Oral | 14 |
| Jha, R. K., Shrestha, A. K., Adhikari, B., Shrestha, B. K., and Kandel, S. | Influence of GA3 and NAA on Tomato Production under Protected Cultivation in Kaski, Nepal | Oral | 108 |
| Joshi, D. P., Bhatt, G. S., and Pokharel, B. | Predictive Mapping of Above-Ground Woody Biomass using NAIP Images and LiDAR data in Tennessee | Oral | 223 |
| Joshi, G. R., Joshi, N. B., and Karki, L. B. | Agricultural Productivity Growth in Nepal: Potentials, Trend and Determinants | Oral | 150 |
| Kagulire, J. | Effectiveness of a Nutrition Education Intervention in Reducing Overweight and Obesity in Bullock County, Alabama: Case Study | Poster | 28 |
| Kandel, and P. Dharel, T. | Agribusiness between Nepal and North America: Trends, Challenges and Opportunities | Oral | 211 |
| Kandel, S., Sandifer, J., and Gyawali, B. | Assessment of Urban Heat Island (UHI) in Relation to Normalized Difference Vegetation Index (NDVI): A Case Study of Bharatpur, Nepal | Oral | 227 |
| Kandel, S., Sandifer, J., Hamal, M., Chaudhary, A. and Gyawali, B. | NDVI Comparison of Farm Parcel of Owen County, Kentucky | Poster | 130 |
| Karki, L. B., and Karki, U. | Need for Financial Education in High School Curricula: A Case of Rural Nepal | Oral | 159 |
| Karki, L. B., Karki, U., and Mentreddy, S. R. | Economic Potential of Specialty Vegetable – Bitter Melon in the Southeast USA | Oral | 207 |
| Karki, L. B., Karki, U., Joshi, G., and Yabi., J. | Student's Preference for and Perception of Agricultural Education: A Case of Rural Nepal | Oral | 198 |
| Karki, S., Acharya, B., and Joshi, D. | Effect of Different Chemicals on the Management of Bacterial Stalk Rot (<i>Erwinia carotovora</i>) of Maize in the Field Condition in Bangaun, Lamahi, Dang, Nepal | Oral | 213 |
| Karki, S., Shange, R., Ankumah, R., McElhenney, W., and Idehen, O. | Comparative Assessment of Soil Health Indicators in Response to Woodland and Silvopasture Land Use Systems | Oral | 141 |
| Karki, U., Paneru, B., Bhattra, S., Khatri, R., Ellis, N., Karki, L. B., and Poudel, S. | Integrating Woodlands and Animal Production: Whole System Approach to Promote the Sustainable Agriculture | Oral | 219 |
| Karn, R., Sah, S. K., Dulal, P. R., and Khanal, N. | Agronomic Performance of Maize Hybrid Cultivars under Different Plant Densities in Spring Season in Dang, Nepal | Poster | 10 |
| Karna, R. D. | Analyzing Soil Nutrient Balance in Hills of Nepal: Do Socio-economic Factors Matter for Sustainable Land Use? | Oral | 139 |

| Author(s) | Abstract Title | Category | Abstract ID |
|-------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------|
| K.C., S., Paudel, K., Pokharel, S., Adhikari, S., and Shrestha, A. K. | Effect of Foliar Spray of Boron and Zinc on Performance of Cucumber (<i>Cucumis sativus</i> L.) cv. Bhaktapur Local under Net House in Kaski, Nepal | Poster | 107 |
| Kehinde, M., Shittu, A., and Ogunnaike, M. | Effects of Gender on Adoption of Climate-smart Agricultural Practices among Smallholders in Nigeria | Oral | 181 |
| Khadka, R. B., and Miller, S. A. | Combined Effects of Inundative Biocontrol and Anaerobic Soil Disinfestation (ASD) using Non-host Cover Crops as Carbon Sources for Clubroot Management in Mustard Greens | Oral | 132 |
| Khanal, A. R., Mishra, A. K., Adhikari, S., and Kumar, A. | Examining the Factors Influencing Contract Farming Choice Decisions of Ginger Growers in Nepal | Oral | 123 |
| Khanal, A., Pantha, S., Thapa, D. B., and Paudel, A. | In-vitro Screening on Germination and Seedling Growth of Wheat (<i>Triticum aestivum</i>) Genotypes for Drought Tolerance | Poster | 13 |
| Khanal, N. | Photostatis: a Useful Concept for Plant Hardening for Transplant Establishment in Horticultural Operations | Oral | 9 |
| Khanal, T. R. | Factors Explaining Neonatal Mortality in Agriculturally Dominated Areas in Nepal | Poster | 110 |
| Kharal, S., and Shrestha, A. K. | Vegetable Grafting: Uses, Outlook and Opportunities for Nepal | Poster | 168 |
| Khatri, R., Klink, V., and Adhikari, M. | Functional Relationship Study of Symbiotic Component Doesn't Make Infections (DMI) with the Endoparasitic Nematode Infection | Poster | 160 |
| Lamichhane, S. | Time-course Analysis of Physiological and Molecular Traits Associated with Efficient Nitrogen Uptake and Transport in Wheat | Oral | 178 |
| Magar, P. B., Mahto, B. N., Yadav, R. B., Upadhyay, K. P., Pokhrel, K. R., and Pandey, S. | Evaluation of Potato Germplasm for Late Blight Disease Resistance under Field Condition in Surkhet, Nepal | Oral | 136 |
| Mishra, A. | Effects of Biochar on Physico-chemical Properties of Soil, Yield, and Water Use Efficiency of Soybean under Different Irrigation Regimes | Oral | 162 |
| Mishra, B. P., and Mishra, K. | Holding of Cut Gladiolus Spike in Preservative Solutions for Enhancing Postharvest Quality and Vase Life | Poster | 188 |
| Neupane, B., Poudel, A., and Wagle, P. | Varietal Evaluation of Promising Maize Genotypes in Mid-hills of Nepal | Poster | 138 |
| Ogbe, A., Dipeolu, A., Obayelu, A., and Porbeni, J. | Technical Efficiency and Rice Productivity in South East Nigeria: a Metafrontier Approach | Oral | 186 |
| Ogbe, O. | Whitefly Population and Incidence of Cassava Mosaic Disease (CMD) on Twelve Cassava Genotype/Varieties at the Seedling Nursery in NRCRI Southeastern Nigeria. | Poster | 172 |
| Ogunnaike, M.G., Shittu, A.M., Bayelu, A.E., Sodiya, C. I., and Fapojuwo, O.E. | Influence of Adoption of Climate Smart Practices among Cereal Farmers on Household Food Security Status in Southern Nigeria | Oral | 6 |
| Oke, M. A. | The Livelihood Diversification Strategies, Landscaping of a Typical Fish Farms in Gwagwalada Abuja Nigeria | Poster | 116 |
| Oke, M. A. | Current situation of Agricultural Business and Technology Development in Nigeria | Poster | 117 |
| Osti, N. P., Devkota, N. R., and Yadav, D. P. | Animal Feed Resources and Their Management in Nepal | Oral | 8 |

| Author(s) | Abstract Title | Category | Abstract ID |
|--------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------|
| Paneru, B., Karki, U., Ellis, N. and Bhattraai, S. | Sprouting and Canopy Development Pattern of Browse Species Suitable for Grazing Small Ruminants | Poster | 152 |
| Paneru, B., Karki, U., Ellis, N., and Bhattraai, S. | Vegetation Preference and Browsing Height of Kiko Wethers and Katahdin Rams Co-stocked in Woodlands | Oral | 11 |
| Pant, C., and Joshi, P. P. | Effect of Site-specific Nutrient Management Approach in Productivity of Spring Rice in Kanchanpur, Nepal | Poster | 2 |
| Panta, S., Parajulee, D., and Sigdel, U. P. | Adoption of Recommended Production Practices of Cardinal Variety of Potato in Dadeldhura, Nepal | Poster | 15 |
| Panth, B. P., Bhusal, B., and Dhakal, S. C. | Factors Affecting Adoption of Good Agricultural Practices on Mandarin Orange (<i>Citrus reticulata</i> Blanco) Production in Arghakhanchi, Nepal | Oral | 146 |
| Parajuli, D. | Effect of River Engineering, Excessive Nitrogen, and Climate on Hydroecology of upper Mississippi River | Oral | 153 |
| Parajuli, M., and Li, J. | Enhanced Precipitation Stimulated Soil Respiratory Loss and Extracellular Hydrolases in a Switchgrass Experiment | Oral | 192 |
| Pathak, S. | Analyzing Determinants of Adaptation to Flood in Eastern Nepal Using Parametric and Semiparametric Approach | Poster | 149 |
| Paudel, B., Gautam, G., Bhusal, S. P., and Upadhyaya, S. | Goats Productivity Status under Small Holder Farmers' Management in Bharatpur, Chitwan, Nepal | Poster | 129 |
| Paudel, D., Wang, L., Acharya, J., de Souza, C. H. L., Rios, E., and Wang, J. | Elucidating the Effects of Organic vs Conventional Cropping Practice and Rhizobia Inoculation on Peanut Yield and Rhizosphere Microbial Diversity. | Oral | 222 |
| Paudel, P. P. | Energy Use, GHG Emission and Global Warming Potential for Spring Paddy Production in Jhapa District Nepal | Oral | 118 |
| Paudyal, S. | Road to Commercialization: Lessons Nepalese Dairy Industry Can Learn from Dairy Farms in the USA | Oral | 121 |
| Pokhrel, S. | Effects of Cover Crop and Fertility Management on Soil Biological Properties in Dryland Soybean | Poster | 154 |
| Poudel, B., Puri, K. D., Leng, Y., Mullins, J., Karmacharya, A., Liu, Y., Hegstad, J., Li, X., Chittem, K. and Zhong, S. | Molecular Mapping of Quantitative Trait Loci for Fusarium Head Blight Resistance in the Brazilian Spring Wheat Cultivar 'Surpresa' | Oral | 101 |
| Poudel, D. | Biratnagar Jute Mill: Situation, Machineries, Recommence Feasibility and Potentiality: an Industrial Case Study, 2018 | Oral | 128 |
| Poudel, D., Kunwar, S. R., Ghimire, S., and Subedi, K. | Agriculture Degree Aspirants in Nepal: Geography and Gender Dimensions | Poster | 176 |
| Poudel, I., and Witcher, A. | Weed Control in Cutting Propagation of Nursery Crops | Poster | 157 |
| Poudel, M., Dhungana, S. M., Adhikari, P., Bidari, A., and Paudel, S. | Economics of Rubber Production in Jhapa, Nepal | Poster | 185 |
| Poudel, P., Kobayashi, H., Lucas, S., and Whittinghill, L. | Evaluation the Effect of Planting Depth and Bacillus subtilis Treatment on Saffron (<i>Crocus sativa</i> L) Production in Green Roof Production System | Poster | 126 |
| Poudel, U., Dahal, U., Chaudhari, S., and Dhakal, S. | Status of Veterinary Vaccine Production in Nepal | Poster | 218 |
| Pudota, M., Mbia, M., Mentreddy, S.R., and Davis, D.D. | Soil Hydraulic Properties in a Plastic Mulch Raised Bed System | Poster | 12 |

| Author(s) | Abstract Title | Category | Abstract ID |
|--------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------|
| Rawal, R., Scheerens, J., and Ponce, M. S. B. | Potential of Beneficial Trichoderma isolates in Alleviating Drought Stress in Tomato | Oral | 193 |
| Regmi, S., Sharma, M., Dhakal, S., and Pandey, B. K. | Ethnoveterinary Practices among Small-scale Goat Farmers of Nawalpur, Nepal | Poster | 210 |
| Rijal, S., and Dahal, B. R. | Integrated Management of Fruit Borer (<i>Helicoverpa armigera</i>) of Tomato in Nepal | Poster | 7 |
| Roka, K., and Bhattachan, B. K. | Effect of Different Types of Mulch and Variety on Growth and Curd Yield of Cauliflower in Parewadin, Dhankuta, Nepal | Oral | 221 |
| Sanjel, S., Clohessy, J., Tillman, B., Wright, D., and Small, I. M. | Use of Image Analysis and Photogrammetry as Tools to Quantify Tomato Spotted Wilt Virus Symptom Severity in Peanuts | Poster | 224 |
| Sapkota, A. | Efficacy of Organic and Inorganic Sources of on Growth, Yield, and Quality of Beetroot (<i>Beta vulgaris</i> L.) Varieties in Chitwan, Nepal | Poster | 167 |
| Sapkota, B., Rola-Rubzen, M. F., Burton, M., and Murray-Prior, R. | Farmers' Willingness to Pay for Crop Insurance in Nepal | Oral | 109 |
| Sapkota, S., Gorkhali, N. A., Adhikari, D., and Bhattarai, N. | Chyangra and Chyangra Fibre: Current Status and Future Prospects | Poster | 148 |
| Sedhain, N. P., Bag, S., Whitaker, J., Chee, P., Roberts, P., and Kemerait, R. | Identification of Potential Overwintering Host of Cotton Leafroll Dwarf Virus (CLRDV) in Georgia | Poster | 134 |
| Sharma, K. P., and Bhattachan, B. K. | Seed Quality Performance of Eight Varieties of Rice Seeds Collected from Four Seed Production Centers of Nepal | Poster | 142 |
| Sharma, S. | Estimating Biomass of Cover Crop grown under Different Grazing Management using WorldView-3 Spectral Reflectance and Forage Tower. | Poster | 135 |
| Shrestha, M. | Decline of Agropastoralism in the Upper Gandaki River Basin: Food Security and Livelihood Diversification Implications | Oral | 155 |
| Sigdel, S., Adhikari, K., Adhikari, G., Khanal, S., and Shrestha, B. | Effect of Plant Growth Regulators Growth, Flowering and Yield Attributes of (<i>Tagetes sp.</i>) | Oral | 179 |
| Subedi, S., Dhakal, B., Pant S. R., and Devkota, N. R. | Assessment of Major Feed Resources and Its Utilization in Manaslu Conservation Area (MCA), Nepal | Oral | 177 |
| Subedi, S., Dhakal, B., Pant, S.R., and Devkota, N.R. | Comparative Study of Stall-feeding and Pasture Grazing Systems of Goats in Smallholder Farms of Shaktikhor, Chitwan, the Eastern Mid-hills of Nepal | Poster | 180 |
| Thapa, S., Xue, Q., Jessup, K., Aiken, R., Bell, J., and Rooney, W. | Yield Potential of Bio-energy Sorghum under Different Water Regimes | Oral | 18 |
| Thapa, Y. B. | Agriculture Policy of South Asia: Pathways for 2020-30 | Oral | 3 |
| Upadhyaya, S., Singh, O. P., Karki, L. B., and Adhikari, R. K. | Production and Marketing of Ginger: a Case Study in Salyan District, Nepal | Oral | 151 |
| Upreti, G. | Food, Water, and Energy Nexus Development Planning Framework: A Basis for Sustainable Development and Food Security in Nepal | Oral | 5 |

| Author(s) | Abstract Title | Category | Abstract ID |
|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------|
| Wagle, P., Skaggs, T. H., Gowda, P. H., Northup, B. K., and Neel, J. P. S. | Flux Variance Similarity-based Partitioning of Evapotranspiration over a Rainfed Alfalfa Field Using High Frequency Eddy Covariance Data | Oral | 104 |
| Yabi, J. A., Olodo, V., Labiya, I., and Karki, L. | Analysis of Technical and Economic Efficiency of Soil Fertility Management Practices in Maize Farming in Northern Benin | Oral | 4 |
| Zhao, Y. | Genetic Associations for Flower Traits of Miscanthus Grown in the Southeast United States | Oral | 212 |

Note: In the abstracts presented below, O stands for Oral and P stands for Poster

ABSTRACTS

001 O - Food Security and Socio-economic Status of Chepang Community in Bagmati Pradesh of Nepal

Sujan Ghimire, Shivahari Devkota, Binaya Koirala

Department of Agricultural Economics and Agri-business Management, Agriculture and Forestry University, Nepal

Correspondence Email: sghimire225@gmail.com

Food security and socio-economic status of the marginalized community like Chepang is not revealed by the national and district level agriculture production and socio-economic status. Bagmati Pradesh (Province) is located in the central part of the country and is food sufficient, but food insecurity and poverty are still major concerns for under-privileged ethnic groups and rural societies. Therefore, this study was conducted to assess the major socio-economic factors influencing household food security. In addition, the food security situation, as well as coping strategies of households, was investigated. A total of 150 households in 3 districts (Chitwan, Dhading and Makawanpur) were used in the study conducted during September-December 2018. The respondents were interviewed with a pre-tested, semi-structured questionnaire for collection of primary data, and, the results were subjected to descriptive and inferential analysis. Two types of analyses were carried out. First, household food adequacy percentage (HHFAP) was employed to assess the degree of food security status. Second, correlation analysis and an ordinary least square regression (OLS) were used to analyze factors affecting food insecurity. The existing production system of Chepang community was not sufficient for sustaining their livelihoods. The analysis showed that 29% of Chepang households were food secure, 38% were marginally food secure, and the remaining 33% of households were food insecure. Correlation analysis showed a highly significant relationship between the numbers of food insufficient months and livestock in households. The factors found to be influencing food insecurity included low technical supports, low level of assets, and an insignificant number of crops and animal husbandry products. Consequently, most of the Chepang families were food insecure, and they adopted food coping strategies, including the collection of wild vegetables and shifting cultivation.

Keywords: Chepang community, Food security, Food adequacy, Food coping strategies, Socio-economic status

~*~

002 P - Effect of Site-Specific Nutrient Management Approach in Productivity of Spring Rice in Kanchanpur District, Nepal

¹Chudamani Pant, ²Pankaj P. Joshi

¹Faculty of Agriculture, Agriculture and Forestry University (AFU), Chitwan, Nepal

²Department of Agronomy, Agriculture and Forestry University (AFU), Chitwan, Nepal

Correspondence Email: pantchudamani@gmail.com

A field experiment was carried out in the sub-tropical climate of Bhimdattanager, Kanchanpur district, to assess the effect of a site-specific nutrient management approach in the productivity of spring rice. The experiment was carried out in single factor randomized completely block design with four replications, in four different farmers' fields, each farmer's field used as single

replication. The seedlings were grown in the mat nursery bed and transplanted in the experimental plots with different nutrient management practices. Nutrient management practices were site-specific nutrient management with nutrient expert (SSNM-NE) dose (109:28:38 kg NPK/ha), government recommendation dose (100:30:30 kg NPK/ha +6 ton FYM), farmer's field practice (FFP) (different among farmers) with three omission plots viz. omission of nitrogen (0:28:38 kg NPK/ha), omission of phosphorus (109:0:38 kg NPK/ha) and omission of potassium (109:28:0 kg NPK/ha). SSNM-NE dose was obtained by household surveys in the respective area and using the nutrient expert model. The growth parameters, yield, yield-attributing traits, and total cost of production were recorded. Data were analyzed using Duncan's Multiple Range Test (DMRT) in Genstat. Results indicated that the highest grain yield (5.81 t/ha) was obtained from SSNM-NE, which was statistically similar to the government recommendation (5.54 t/ha). Similarly, thousand grains weight and straw yield in the experiment (23.20g, 6.90t/ha) were significantly higher in SSNM-NE. Straw yield, grain yield, and thousand grain weight in SSNM-NE were similar with that in the government recommendation treatment. The economic analysis revealed that a higher B:C ratio (1.91), net return and gross return were also higher in SSNM-NE than others. Therefore, it appears that SSNM-NE can be used for nutrient management for better productivity and profitability in spring rice in Kanchanpur. This information may also be applicable to other similar rice growing regions of Nepal.

Keywords: Productivity, Spring rice, SSNM-NE, Yield

~*~

003 O - Agriculture Policy of South Asia: Pathways for 2020-2030

Y. B. Thapa

Poverty Alleviation Fund, Nepal

Correspondence Email: yb.thapa@ntc.net.np

The 'South Asia Agriculture Policy Pathways 2020-30' paper deals with priority programs for considerations by the SAARC Agriculture Center (SAC) and its stakeholders. South Asian agriculture (SAA) is facing modernizations in supply as demands for the food security of its countries, food sovereignty, and nutrition need of populations rise. This requires efforts to increase competitiveness with innovations and factor price adjustments. It is noteworthy that over 60% of the farm holdings in South Asia are below one hectare and cultivate about 15% of the arable area. The agricultural marketing, agro-industry, and trade are important enterprises because of the 'market demand-driven' approach, marketed surplus ratios, consumers' awareness of HACCP-ISO (Hazard Analysis and Critical Control Points – International Organization for Standards), and export-demands. The marketed surplus in the region has increased from 76% to 80% during 2013-2015. We emphasize the development of an integrated agricultural market in the region through the PPP approaches. It shows that the land/man ratio is already about 0.12 ha in 2016 and may decline to about 0.05 by 2030, which may have implications for the efficiency of agriculture, land, and labor markets. State investment in the agriculture sector is low and is in a declining trend. Further, FDI in South Asia increased by only US\$0.87 million in agriculture, forestry, and fishing, and by US\$1.13 million in foods, beverage, and tobacco sectors. The 3.31% SAA growth rate in 2010-2018 has to be increased to 4.86% for the 2019-2024 period. There is a need to examine its feasibility and its adequacy in relation to the UN 2030 Sustainable Development Goals (SDG) agenda. This paper lays emphasis on a common framework for agricultural policy and programs

for the region. So, the SAC may contribute to strengthening the cornerstones of agriculture - agro-industry development in the region and bridge the agri-productivity gap between South Asia and the world. Hence, there is a lot of outreach and advocacy needed to address these issues.

Keywords: Agricultural efficiency, Agrarian reform, Planning strategy, South Asian agriculture

~*~

004 O - Analysis of Technical and Economic Efficiency of Soil Fertility Management Practices in Maize Farming in Northern Benin, Benin

¹Jacob A. Yabi, ¹Victorine Olodo, ¹Innocent Labiyi, ²Lila B. Karki

¹University of Parakou, Benin Republic

²Tuskegee University, Alabama, USA

Correspondence Email: ja_yabi@yahoo.com

The objective of this study was to identify the soil fertility management practices that help to improve maize yield and enable farmers to gain profit from fertility inputs. Data were collected from 280 farmers randomly selected in the districts of Tchaourou, N'dali, Kandi and Karimama. The data included relative prices and quantities of inputs used in production and outputs. Data analysis revealed that the average yield per hectare was 1510.15 ± 1368.40 kg. It was significantly higher in Kandi district (1905.58 ± 786.97 kg/ha) than in the three other municipal areas as the district of Tchaourou obtained the lowest yield (1101.30 ± 459.51 kg/ha). As for technical efficiency, it shows that the practices of mineral and organic fertilizers and the adoption of fallow increased the yield of maize production. In addition, the results showed that soil fertility management practices except that of mineral fertilizer were economically profitable regarding net margin and the return on capital. Only agroforestry practices and cultural associations/rotation are economically profitable regarding their labor productivity. From these results, it is important that agricultural policies include the options of promoting organic practices of soil fertility management for more sustainable agriculture production.

Keywords: Maize yield, Soil fertility management, Sustainable agriculture

~*~

005 O - Food, Water, and Energy Nexus Development Planning Framework: A Basis for Sustainable Development and Food Security in Nepal

Gopi Upreti

ManTech International Corporation, Fairfax, Virginia, USA

Correspondence Email: goupreti@gmail.com

The recent trend of declining agricultural productivity in Nepal has been attributed to the lack of adequate irrigation facilities and energy, increased fallow lands due to the shortage of agricultural labors in the rural area, erosion of top fertile soil, lack of appropriate crop protection technology and crop varieties, shortage of credit, and ineffective implementation of government's policies. Nepal's development planning framework must depart from its existing sectoral planning framework and integrate two important dimensions; ecological land uses and food, water, and energy nexus to address the issues of ever-increasing food insecurity. The planning framework in the past and the present not only carried the development planning in sectoral silos but also

failed to understand the intricate nexus linkages among water, energy, and food production. The existing planning needs to be replaced by a more holistic planning framework to ensure greater food security and the sustainable development agenda. Such a planning framework is even more important for countries like Nepal where water, energy and land resources constitute the primary resource base and the synergy harnessed from a nexus development planning framework can have far greater impacts on the development and the prosperity of the country. Nepal must adopt its agriculture production strategy based on ecological land use and food-water-energy nexus planning in its predominantly four agroecological zones: tropical, subtropical, temperate and alpine. Such a production strategy and the system should entail two important goals: obtaining food security for its population, and production of high-value cash crops such as tea, cardamom, and herbal medicinal plants. Agroecological and food-water-energy nexus planning needs to focus on developing an agricultural production system that has comparative advantages in exploiting the diversity, niches and micro-climates of the agroecological region. Development of minimum tillage agroforestry production systems, the rainwater harvesting, and conservation practices play a key role in sustainable production in Nepal, especially in the Siwalik region.

Keywords: Ecological planning, Food-Water-Energy nexus, Food security, Nexus planning framework, Sustainable development

~*~

006 O - Influence of Adoption of Climate-Smart Practices among Cereal Farmers on Household Food Security Status in Southern Nigeria

¹M. G. Ogunnaike, ¹A. M. Shittu, ¹A. E. Obayelu, ²C. I. Sodiya, ³O. E. Fapojuwo

¹Department of Agricultural Economics and Farm Management, Federal University of Agriculture, Abeokuta PMB 2240, Ogun State, Nigeria

²Department of Agricultural Extension and Rural Development, Federal University of Agriculture, Abeokuta PMB 2240, Ogun State, Nigeria

³Department of Agricultural Administration, Federal University of Agriculture, Abeokuta PMB 2240, Ogun State, Nigeria

Correspondence Email: oluwagbemisolami@gmail.com

Agriculture plays a central role in increasing food availability and incomes, supporting the livelihoods of rural farm households, and contributing to the overall economy. Thus, it is a key factor in efforts to improve food security. This study examined the influence of the adoption of climate-smart agricultural practices among cereal farmers on food security of farm households in Southern Nigeria. A multi-stage sampling technique was used to select 521 farmers across five states in Southern Nigeria. Data were collected on socio-economic characteristics, food security, and adoption of climate-smart practices using a structured questionnaire. Household food security (HFS) was assessed using the United States Department of Agriculture's HFS survey module. Data were analyzed using frequency distribution, percentages, mean, and Ordered Probit model. Results revealed that 34% of farmers adopted use of minimum tillage, while 52.1% of the farmers retained residue on their farmland. The household food security status revealed that 26% of the households were highly food secure, while 29%, 23.2%, and 21.8% have marginal, low, and very low food security, respectively. Ordered Probit of household food security results revealed that households that adopted agroforestry ($\beta = 0.3269$, $p < 0.05$) and use of organic compost ($\beta = -0.2925$, $p < 0.05$) were significantly more likely to be food secure. The study concluded that adoption of climate-smart agricultural practices among smallholder farmers should be encouraged as it will improve

the household food security status in Southern Nigeria. The study, therefore, recommended that public sensitization, better participation, and favorable policy to encourage continued use of climate-smart practices should be put in place as their use tends to have a positive influence on the household food security status in Southern Nigeria.

Keywords: Climate-smart agriculture, Food security, Farm households

~*~

007 P - Integrated Management of Fruit Borer (*Helicoverpa armigera*) of Tomato in Nepal

Swodesh Rijal, Bhisma R. Dahal

Agriculture and Forestry University, Chitwan, Nepal

Correspondence Email: swodeshrijal@gmail.com

Tomato is one of the major vegetable crops in Nepal. It is one of the major sources of income for smallholder farmers. However, it is attacked by many insects and *Helicoverpa armigera* is one of the major insects causing damage to tomatoes in Nepal. Tomato growing farmers of Nepal apply an exceptionally high amount of chemical insecticide. Chemical management of *Helicoverpa armigera* is increasing at an alarming rate, which is a threat to human health and the agro-ecosystem. Also, this practice has led to the development of resistant pests. Thus, there are increasing concerns to develop sustainable management strategies that rely less on chemical pesticides. Achieving such a magnificent goal requires in-depth knowledge about biology and the method of spread of the pest. Management of *Helicoverpa armigera* requires an integrated pest management method, which aims at producing healthy crops and maintaining a better sustainable agro-ecosystem. Integrated pest management aims to maintain pest population below economic injury level. It is an integration of an appropriate measure that inhibits the development of the pest population. Integrated pest management aims to grow healthy crops with least damage to agro-ecosystem. *Helicoverpa armigera* can damage 90% of fruit and reduce yield by 30-40%. Recent research findings have recommended biological and cultural management of *Helicoverpa armigera*, but the development of a resistant variety is the best option. Flubendiamide 40SC @ 0.21ml/l and Emamectin benzoate are the best chemicals, whereas Trichogramma @30 cards/ha, *Heliothis nucleopolyhedrosis* and neem-based pesticides are the best biological methods for its management. LA1230 is the most resistant cultivar of tomato for *Helicoverpa* management. Three times weeding, three times handpicking, and indoxacarb @ 370 ml/ha is most effective for management of *Helicoverpa* larva, but hand-picking is best from an economic point of view. Light trap and pheromone trap are the best options for monitoring adult *H. armigera* population.

Keywords: *Helicoverpa armigera*, Integrated management, Pest management

~*~

008 O - Animal Feed Resources and Their Management in Nepal

¹Netra P. Osti, ²Naba R. Devkota, ³Devendra P. Yadav

¹National Animal Science Research Institute (NASRI), Khumaltar, Nepal

²Agriculture and Forestry University (AFU), Chitwan, Nepal

³Department of Livestock Service (DLS), Kathmandu, Nepal

Correspondence Email: ostinp02@gmail.com

Nepal is an agriculture-based country, and livestock is an integral part of the Nepalese economy, contributing about 26% to the agricultural gross domestic products (AGDP). The overall low production of livestock is mainly due to the low supply of quality animal feeds and inefficient use of available feed resources. The majority of the livestock holdings are small. Among ruminants, the buffalo population has increased from 4 to 5 million in the last ten years, contributing 72% of milk and 65% of domestic meat supply. Lime, Parkote, and Gaddi buffaloes are native breeds, while Murrah and their crosses are the improved breeds of buffalo in Nepal. The cattle population has remained stable for the last decade, and its contribution is 28% to the national milk supply. Shree, Pahadi, Khaila, and Terai cattle are native, while Jersey and Holstein are exotic breeds of cattle in Nepal. The sheep population has decreased in the last ten years, while goat numbers are steadily increasing. Among the non-ruminant livestock species, chicken production has increased considerably in recent years. Crop residues, rice and wheat straw, maize stover, tree fodder, leaf litters and other green fodders collected from cultivated lands and forests are the major feeding resources. Maize is the main feed ingredient followed by rice bran, wheat bran, soybean meals, mustard cake, sunflower cake, and legume byproducts. The local production of maize and soybean does not meet national feed demand and are imported from India and other countries. There is a deficit of 33% in dry matter, 38% in crude protein and 42% in metabolizable energy. The human-edible protein output per unit of protein consumed by livestock is higher in ruminants, especially in sheep and goats. This demonstrates the scope of ruminant livestock contribution to food security in Nepal.

Keywords: Feed resources, Food security, Livestock production, Ruminants

~*~

009 O - Photostasis: A Useful Concept for Plant Hardening for Transplant Establishment in Horticultural Operations

Nityananda Khanal

Agriculture and Agri-Food Canada, Beaverlodge Research Farm, Canada

Correspondence Email: nityananda.khanal@canada.ca

Plants experience some degree of shock when they are transplanted from nursery to the main field or when they are transferred from indoor to outdoor conditions or vice versa. Abrupt and big changes in the environmental conditions may debilitate and kill the plants, while a gradual change in the environment within the survival range triggers modulating responses enabling the plants to thrive in the altered conditions. In this process, plants undergo genetic, biochemical, histological, and morphological changes from cellular to organismal level, altering their growth and reproductive strategies, from very short to long time scale. It involves cascades from sensing environmental cues, transducing the signals through various biochemical and neural networks, and reconfiguration of metabolic machinery and developmental strategies through extensive genetic reprogramming, the process known as acclimation. Photosynthesis acts as an environmental sensor

for plant response to environmental cues. In the short-term, plants control light interception and regulate energy transformation by way of pre-existing flexibilities. Plants' responses to long-term environmental cues involve varied acclimatory adjustments for attaining a new state of photosynthetic balance, known as photostasis. This presentation discusses how plants undergo photo-inhibition (impaired photosynthesis), photo-destruction (permanent damage to photosynthetic machinery) or restore the photostasis in the changing environments. Beneficial practices that facilitate plant acclimatory responses in the plant transfer or transplant establishment processes, especially in horticultural operations, are highlighted.

Keywords: Acclimation, Photo-inhibition, Photo-destruction, Photosynthesis

~*~

010 P - Agronomic Performance of Maize Hybrid Cultivars Under Different Plant Densities in Spring Season in Dang District, Nepal

¹Rupak Karn, ¹Shrawan K. Sah, ¹Puspa R. Dulal, ²Nityananda Khanal

¹Agriculture and Forestry University, Chitwan, Nepal

²Agriculture and Agri-Food Canada, Alberta, Canada

Correspondence Email: coolrupak99@gmail.com

Crop cultivars exhibit differential responses to plant densities under different growing seasons and climatic conditions. A field experiment was carried out to identify best-adapted maize hybrids and determine their optimal plant densities at Lamahi, Dang during the spring season in 2019. The treatments consisted of a combination of three commercial maize hybrids, namely Rajkumar, Pioneer-3533 and Bioseed-9220, and three plant densities, i.e., 55,555, 66,666, 83,333 plants ha⁻¹. The experiment was conducted in a split-plot design with crop density as the main plot factor and maize hybrids as a sub-plot factor, replicated three times. Various phenotypic and yield parameters were recorded, and the data were analyzed using MSTAT-C and Genstat. In general, grain yields were significantly correlated with plant densities, leaf area index, and various yield attributes, including the number of cobs per unit area ($r=0.84$). Pioneer-3533 produced the highest grain yield means of 11,608 kg ha⁻¹, which was 11.98% and 10.28% higher over Rajkumar and Bioseed-9220, respectively. A significantly higher yield (12,887 kg ha⁻¹; $p=0.001$) was attained at 83,333 plants ha⁻¹ and was 30.92% and 18.90% higher over the plant densities of 55,555 and 66,666 plants ha⁻¹, respectively. The higher yield at plant density 83,333 plants ha⁻¹ was attributable to a significantly higher leaf area index (4.02 at 90 DAS; $p=0.04$). Though statistically non-significant, the yield parameters like the number of kernels/row (38.1), number of kernels/cob (597.2), and shelling percentage (70.2%) were higher for Pioneer-3533. However, the number of cobs ha⁻¹ (66,646; $p=0.018$) for Pioneer-3533 at plant density 83,333 plants ha⁻¹ was significantly higher than that in other varieties and plant density correlated to the yield. Therefore, the maize hybrid Pioneer-3533 at the plant density of 83,333 is recommended for higher productivity during the spring season in Dang and similar agro-ecological regions in Nepal.

Keywords: Cultivar, Hybrid, Plant density, Yield attributes

~*~

011 O - Vegetation Preference and Browsing Height of Kiko Wethers and Katahdin Rams Co-stocked in Woodlands

¹Bidur Paneru, ¹Uma Karki, ¹Nevershi Ellis, ²Shailes Bhattra

¹Department of Agricultural and Environmental Sciences, Tuskegee University, Tuskegee, Alabama, USA

²University of Georgia, Athens, Georgia, USA

Correspondence Email: spaneru9661@tuskegee.edu

Woodland occupies a major landcover (69%) in Alabama and offers a huge potential for small-ruminant grazing. Understory vegetation present in woodlands can serve as an important feed resource for small ruminants. However, limited information is available on the vegetation preference and utilization pattern of these resources when goats and sheep are co-stocked. The study objective was to evaluate the preference and browsing height of Kiko wethers and Katahdin rams co-stocked in woodlands. Eight Kiko wethers and five Katahdin rams were co-stocked in three woodland plots (1-acre each) from mid-May to mid-October, 2019. Each plot had four different virtual sections that were created in 2017 by either cutting non-pine plant species to 0', 3', 5' from the ground level (treatments) or left uncut (control), and vegetation regrowth was managed with small ruminants. Before stocking animals in each plot, canopy height of the understory vegetation was measured. Vegetation preference and browsing height data were taken within two days after animals were moved out of each plot. Preference scale ranged from zero to five (0=no defoliation, 5=80-100% defoliation). The before-grazing canopy height was the greatest in the control area (68±0.2 in) and the lowest in 0' area (33±0.2 in) (p<0.0001). Out of 35 major plant species present in the study plots, blackberry was the most preferred species (81-100% defoliation) followed by nine species highly preferred (61-80% defoliation), nine species moderately preferred (41-60% defoliation), and four species with a low preference (21-40% defoliation). The remaining 12 species were the least preferred (0-20% defoliation). The browsing height was the greatest in 5' area (53±0.3 in) and the lowest in 0' area (31±0.3 in) (p<0.0001). Results suggest that the understory vegetation should be maintained within the reach of small ruminants, in this case 53 inches, to be utilized by goats and sheep when co-stocked in woodlands.

Keywords: Defoliation, Grazing, Small ruminants, Understory vegetation

~*~

012 P - Soil Hydraulic Properties in a Plastic Mulch Raised Bed System

Mounika Pudota, Michelle Mbia, Srinivasa R. Mentreddy, Dedrick D. Davis

Alabama A&M University, Alabama, USA

Correspondence Email: dedrick.davis@aamu.edu

Soil hydraulic properties play an important role in crop productivity and the movement of water, chemicals, and nutrients in the soil. Factors such as soil texture, structure, bulk density, and porosity affect soil hydraulic properties. These factors are further influenced by crops and human activities such as tillage and compaction. Plastic mulch raised beds are a standard tillage practice in most vegetable crop production systems. The plastic mulch is used to warm the soil, prevent weed growth, and retain soil moisture. The raised bed allows for a deeper profile and better drainage near the root zone. Due to the need for soil moisture control and improved drainage, understanding the effects of vegetable crops on soil hydraulic properties in plastic mulch raised bed systems is important. The objective of this study was to determine the effects of six specialty

vegetable crops on hydraulic properties of soil from plastic mulch raised beds in an alley crop-based agroforestry system. Undisturbed soil core samples were obtained from plastic mulch raised beds under six specialty vegetable crops in an alley crop-based agroforestry system. The soil cores were obtained from the 15 cm raised bed in 5 cm increments and the soil immediately beneath the raised bed (15 – 20 cm). Saturated hydraulic conductivity will be measured using the falling head method. Soil water retention curves will be measured using an automated evaporation method and a chilled mirror dewpoint technique. Measurements of saturated hydraulic conductivity and estimates of plant available water and unsaturated hydraulic conductivity will be reported. Soil hydraulic properties are expected to vary with depth. These results will provide information for the management of water in irrigated plastic mulch raised bed systems.

Keywords: Bulk density, Hydraulic, Soil core, Vegetable

~*~

013 P - In-vitro Screening on Germination and Seedling Growth of Wheat (*Triticum aestivum*) Genotypes for Drought Tolerance

Aakriti Khanal, Sumitra Pantha, Dhruba B. Thapa, Ankur Paudel
Nepal Agricultural Research Council, Lalitpur, Nepal
Correspondence Email: aakritikhanal3@gmail.com

Drought, a major abiotic stress in modern-day agriculture, hinders crop productivity and wheat as a rain-fed winter crop suffers the most worldwide. Breeding for drought tolerance using novel genetic resources is a significant mitigation strategy. A 2018 study at the Plant Breeding Laboratory of the Nepal Agricultural Research Council in Kathmandu evaluated the performance of fifteen wheat genotypes under three drought levels (control, 10% and 20% PEG-8000; equivalent to osmotic potential of -0.001 , -0.54 and -1.09 MPa) in a completely randomized design (CRD) with three replications. Genotypes included WK2414, WK2123, WK2438, WK2675, WK1204, WK1712, WK2257, WK2278, WK2437, WK2415, WK2286, Pawai, Chyakhura, Munal, and Dharwar dry. The objective of the experiment was to screen the potential drought tolerance of the tested wheat genotypes based on germination and seedling growth parameters measured 8 and 14 days after sowing. Parameters measured included germination percentage, germination energy, vigor index, shoot length, root length, root-to-shoot ratio, leaf area, and root and shoot biomass. Considerable variations existed across the 15 genotypes tested. Overall, Munal and WK2675 showed relatively better performance with increased drought conditions (PEG concentrations), followed by WK1204. Genotypes Dharwar dry and WK2278 showed moderate tolerance to the moisture stress, whereas WK2414 and WK2415 showed the least tolerance to the moisture stress. The result suggests that the tolerant genotypes in the laboratory evaluation may have the potential for further evaluation in the field setting toward screening for drought-tolerant cultivars.

Keywords: Drought stress, PEG, Screening, Wheat genotypes

~*~

014 O - Roadmap for Agriculture Education under the New Federal System of Nepal

¹Mahesh Jaishi, ²Megha N. Parajulee

¹Department of Social Science, Lamjung Campus, Tribhuvan University, Nepal

²Texas A&M University, Lubbock, Texas, USA

Correspondence E-mail: mahesh.jaishi@gmail.com

The traditional functions of universities are teaching and research. In their teaching activities, universities provide professional training for high-level jobs, as well as the education necessary for the development of soft and inter-personal skills. The extension of university education and research to relevant stakeholders for their adoption and utilization, particularly in the agricultural sector, has not been clearly articulated in Nepal. In the context of the country's recent restructuring and federalist dynamics, a comprehensive roadmap is necessary for agricultural education to ensure that a tripartite goal of agriculture – research, education, and extension (REE) – is fully met. Without a coordinated national agriculture education plan, agriculture extension is likely to evolve differently across newly installed provinces in the country. Differing university contexts and needs will also drive the future of extension at the state level. For example, where universities are heavily committed to basic research, extension will increasingly engage in integrative and adaptive research. In other university environments, an extension may specialize in technical advice for a fee or the coordination and facilitation of community activities around food and agricultural issues. A multi-stakeholder engagement in the implementation of the REE mechanism will illustrate the unique depth and breadth of community participation that can be achieved when academic institutions are focused on engagement to strengthen the agriculture knowledge system. Agriculture institutions need transformation institutionally, in revisiting their vision, consolidation, investment, capacity generation, and quality assurance and widening their scope to offer formal, informal, and distance education and innovation to agricultural stakeholders. Academic institutions could play a significant role in enhancing the REE linkage in generating national agriculture research systems with the Community Agriculture Extension Service Center (CAESC) in the changing context of federal Nepal.

Keywords: Agriculture academic institution, Community engagement, CAESC, REE linkage

~*~

015 P - Adoption of Recommended Production Practices of Cardinal Variety of Potato in Dadeldhura, Nepal

Sangam Panta, Dipika Parajulee, Udit P. Sigdel

Agriculture and Forestry University, Chitwan, Nepal

Correspondence Email: pantasangam116@gmail.com

A survey study was conducted in the potato zone of Dadeldhura to improve the livelihood of potato growers through better productivity of a cardinal variety of potato. Sixty households were selected by using simple random sampling method, and the study was conducted from May to July 2018. Primary data were collected using semi-structured interview schedules, and the secondary data were collected through published journals, research articles, reports, findings of different non-governmental organizations NGOs and INGOs, and District Agriculture Department Office reports. Descriptive statistical analysis was performed using MS-Excel and SPSS. The results of this study showed that the average landholdings of the respondents were 8.6 ropanis (0.44 ha). All the respondents used improved potato varieties, but about 35% of them were not following the

recommended seed rate and plant spacing in potato cultivation. It was found that only 36.7% respondents had received training on potato cultivation techniques. The majority of the respondents (73.3%) were cultivating the Cardinal variety of potato followed by Desiree (68.3%). It was also noted that 35% of the potato farmers were not using chemical fertilizers in potato production enterprise. Government research sites in Dadeldhura had severe disease and insect pest problems in potatoes, including late blight and red ants, but only 51.7% of farmers were using pesticides for disease and insect management. Only 13.3% of the respondents had irrigation facilities, and 50% of them irrigate through sprinkler irrigation. It was found that 28.3% of farmers use haulm pulling practices. Farmers of zone areas should be given effective training related to the adoption of recommended production practices and extension outreach for integrated cropping systems of potato for production profitability.

Keywords: Cardinal variety, Late blight, Potato cultivation

~*~

017 P - Screening of Local, Improved and Hybrid Rice (*Oryza sativa*) Genotypes against Blast Disease (*Pyricularia oryzae*) in Surkhet District, Nepal

¹Basistha Acharya, ²Sunder M. Shrestha, ²Hira K. Manandhar, ³Bedananda Chaudhary

¹Nepal Agricultural Research Council, Regional Agricultural Research Station, Khajura, Nepal

²Agriculture and Forestry University, Chitwan, Nepal

³Nepal Agricultural Research Council, National Rice Research Programme, Hardinath, Nepal

Correspondence Email: basisthacharya1@gmail.com

Rice (*Oryza sativa*) is the major cereal crop of Nepal, which is being faced with the devastating rice blast disease caused by *Pyricularia oryzae* Cavara teleomorph, *Magnaporthe oryzae* Barr. An experiment was conducted to screen rice genotypes against leaf blast disease under disease conducive upland nurseries in Agriculture Research Station (ARS), Dashrathpur, Surkhet, Nepal, from July to November 2016. A total of 101 rice genotypes (comprising of local, improved, and hybrid), including resistant and susceptible check, were screened in alpha lattice design with two replications. Disease scoring was done beginning from the 20th day of sowing by using the disease rating scale 0-9. Amongst the tested 101 rice genotypes, 27, 17, 16, 12, and 29 genotypes were resistant, moderately resistant, moderately susceptible, susceptible, and highly susceptible to leaf blast, respectively, suggesting that there is potential to reduce the loss caused by leaf blast disease through cultivating resistant to moderately resistant rice genotypes. The information revealed from this study could be helpful for rice leaf blast disease management and utilizing these resistant and moderately resistant genotypes for breeding varieties with higher resistance.

Keywords: Blast disease, Genotype, Resistance, Rice

~*~

018 O - Yield Potential of Bio-Energy Sorghum under Different Water Regimes

^{1,2}Sushil Thapa, ²Qingwu Xue, ²Kirk Jessup, ³Robert Aiken, ⁴Jourdan Bell, ⁵William Rooney

¹University of Central Missouri, Missouri, USA

²Texas A&M AgriLife Research at Amarillo, Texas, USA

³Kansas State University, Kansas, USA

⁴Texas A&M AgriLife Extension Service at Amarillo, Texas, USA

⁵Texas A&M University, College Station, Texas, USA

Correspondence Email: sthapa.ucmo.edu

Exploring alternative crops is important not only for human/animal consumption but also for producing industrial feedstock. The U.S. Department of Energy has identified sorghum as a bioenergy crop to meet potential biomass demands for cellulosic ethanol production. Field studies were conducted at Bushland, Texas and Colby, Kansas, to investigate the yield and water use efficiency (WUE) in bioenergy sorghum. Six hybrids were grown under rainfed (I_0), 50% (I_{50}) and 100% (I_{100}) evapotranspiration (ET) requirements. Bushland received 150 mm of seasonal rainfall, while Colby received 325 mm. In Bushland, final biomass was significantly higher at I_{100} (26.8 Mg ha⁻¹), followed by I_{50} (18.6 Mg ha⁻¹), and I_0 (5.8 Mg ha⁻¹). The hybrid difference was found only for I_0 , where TAM 08001, TAM 17600, and TAM 17800 had more biomass compared to TAM 17500, TAM 17650, and TAM 18000. In Colby, I_{100} (23.5 Mg ha⁻¹) had higher, and I_0 (20.3 Mg ha⁻¹) had lower biomass, while I_{50} (22.3 Mg ha⁻¹) was intermediate. The hybrid difference was not significant. For both locations, WUE was lower for I_0 compared to I_{50} and I_{100} . Results showed a large difference in biomass production among water regimes in Texas than in Kansas. Bioenergy sorghum may be produced under the irrigated condition in Texas, while even without irrigation in Kansas.

Keywords: Alternative crops, Bioenergy crops, Biomass, Evapotranspiration, Water use efficiency

~*~

020 O - Adaptation of Nepali Agriculture to Climate Change

Gehendra B. Gurung

Correspondence Email: gehendra@yahoo.com

Due to anthropogenic causes, the global average surface temperature is increasing rapidly and significantly. It has been reported that by now there is 1°C increase in global average temperature compared to the preindustrial era. Studies also show that Nepal's average maximum temperature is increasing at 0.5°C per decade since 1970s. The rate of temperature increase in Nepal is higher than that of the world average. Precipitation has become more and more erratic. Climate change is already affecting Nepal's agriculture that contributes over one fourth of the GDP and engages nearly two thirds of the population. Studies show that the economic value of the effect of climate extremes over agriculture in Nepal is as high as 2% of GDP. It is anticipated that the average temperature will further increase, and precipitation will become more erratic, which will result in intensive effects on agriculture in the coming decades, exceeding the coping and adaptation capacity of farmers whose agriculture depends on the natural environment. The effects will be further aggravated by a lack of short and long-term response measures, including strengthening coping mechanisms, adaptation, and mitigation. It is a must that Nepal's agriculture should adapt to climate change using a number of strategic and technological interventions. Some of the suggested strategies could be shifting crops from the current agro-ecological zone to another where

the future climate will be favorable, shifting dates or seasons of crop cultivation, developing drought and heat tolerant varieties, developing low chilling varieties of crops that require chilling temperature, promoting irrigation facilities over agricultural land, investing in intensive agricultural practices by using controlled environment, and developing practices and tolerant crop varieties for pests and diseases. These adaptation measures should be backed up by a sound research program based on anticipated climate scenarios over the years and the geographic areas.

Keywords: Adaptation, Climate change, Climate scenario, Coping strategy, Mitigation

~*~

021 O - Toxin Minimization and Disaster Preparedness Food Technologies Complement Nutrition, Health Security, and Hunger and Poverty Alleviation

¹Peetambar Dahal, ²Meghnath Dhimal, ³Krishna Belbase, ⁴Sundar Tiwari, ⁴Ishwari P. Dhakal, ⁵Jwala Bajracharya, ⁵Sunil Aryal, ⁵Tek B. Gurung, ⁶Achyut Sharma, ⁷John D. Groopman, ⁷Keith West, ¹Christine P. Stewart, ⁸Govind Bhandary, ⁹Rosina Poudel, ¹⁰Gokarna Gharti-Chhetri, ¹¹Manish Neupane, ¹²Amod Pokhrel, ¹³John V. Ashbrouck, ¹Elizabeth Mitcham, ¹Kent Bradford

¹University of California, Davis, USA

²Nepal Health Research Council, Kathmandu, Nepal

³Nutrition Evaluation Program (Former), UNICEF, New York, USA

⁴Agricultural and Forestry University, Chitwan, Nepal

⁵Nepal Agricultural Research Council, Lalitpur, Nepal

⁶American Mold Experts, Avon, Indiana, USA

⁷The Johns Hopkins University, Baltimore, USA

⁸Partnership for Sustainable Development, Kathmandu, Nepal

⁹Leonard J. Chabert Medical Center, Louisiana, USA

¹⁰Palm Beach State University, Florida, USA

¹¹Thomas Jefferson University, Pennsylvania, USA

¹²University of California, Berkeley, California, USA

¹³Rhino Research, Bangkok, Thailand

Correspondence Email: peetambardahal@gmail.com

A large portion of the Nepalese population faces a silent health crisis daily due to toxins in both high and low-moisture nutritious foods, impeding efforts to alleviate malnutrition. The Nepal Health Research Council (NHRC) reports increasing prevalence of non-communicable diseases illustrating urgency to minimize toxin exposure. Additionally, natural carcinogenic mold toxins develop in traditionally stored low moisture foods/feeds where insect damage and nutrient loss co-occurs. Such toxins are also transferred to meat and dairy products through feeds, affecting human nutrition and health. Collaborative efforts by national and international institutions are needed on education, dissemination of interventions like integrated pest management (IPM), dry chain (drying and moisture-proof storage) and sensitive toxin testing services in both foods and feeds. Implementing pesticide-free dry chain will furthermore enable disaster preparedness and improve trade ratios and food security even during normal periods. International donor agencies will also benefit from food management practices implemented in Nepal. Sensitive monitoring of food toxins is needed to empower the national toxin debate, progress towards organic food and promote the tourism sector. Combination of these approaches in Nepal can also improve food quality in India that supplies about half of the foods to Nepalese consumers. Thus, implementing toxin

mitigation efforts in food systems will complement UN Sustainable Development Goal (UNSDG1)-3 in both countries.

Keywords: Food toxins, Integrated pest management, Malnutrition, Pesticide-free dry chain

~*~

023 O - Similarities of Tools Used in Evaluating Biological Control Agents of Forest Pests in Eastern Forests versus Cotton Pests in Western Cotton Fields

¹Abdul Hakeem, ¹Megha N. Parajulee, ²Jerome Grant, ²Paris Lambdin, ²Frank Hale, ²Greg Wiggins

¹Texas A&M AgriLife Research and Extension Center, Lubbock, Texas, USA

²The University of Tennessee, Knoxville, Tennessee, USA

Correspondence Email: Abdul.Hakeem@ag.tamu.edu

Tools used to evaluate biological control agents are universal. Evaluating natural enemies in a forest setting is different than cotton fields due to plant size differences; however, the same tools could be used with little modification. In the Great Smoky Mountains National Park, whole-tree enclosures were used to evaluate *Sasajiscymnus tsugae* (Sasaji and McClure) (Coleoptera: Coccinellidae), *Laricobius nigrinus* Fender (Coleoptera: Derodontidae) and *Scymnus sinuanodulus* Yu and Yao (Coleoptera: Coccinellidae) against hemlock woolly adelgid (HWA). To evaluate emergence of *Laricobius* adults from the soil, small triangle-shaped cages were used. However, in west Texas, 1.5 ft × 1.5 ft × 3 ft field cages were used to study the western flower thrips [*Frankliniella occidentalis* (Pergande)] using No-thrips® screen. The cotton fleahopper, *Pseudatomoscelis seriatus* (Reuter) (Hemiptera: Miridae) and *Lygus hesperus* Knight (Heteroptera: Miridae) was evaluated using slightly modified 3 ft x 3 ft cages. For the first time, coexistence of two introduced predators, *L. nigrinus* and *S. tsugae*, and a native predator, *L. rubidus* (Coleoptera: Derodontidae) LeConte, on eastern hemlock was documented. Coexistence of these introduced predators indicates that they are compatible and may enhance biological control efforts against HWA. *Scymnus sinuanodulus* was not recovered and its establishment could not be confirmed, however, *S. tsugae* was recovered from 7 of 33 released sites. In west Texas, thrips, cotton fleahoppers, and Lygus bugs are economic pests of cotton at seedling, pre-flower, and boll development stages, respectively. Single- and multi-plant cages of various types and sizes have been successfully used to examine the biology, feeding behavior, and economic importance of these pests in west Texas cotton. Economic thresholds of these major insect pests have been established using similar research tools across species.

Keywords: Biological control agents, Cotton pests, Forest pests

~*~

024 P - Effect of Oxygation on Crops with Varying Rooting Systems: Crop Growth, Yield, and Quality

¹Jay K. Dhungel, ²Surya P. Bhattarai, ³Megha N. Parajulee

¹Institute for Study and Development, Sydney, New South Wales, Australia

²Central Queensland University, Rockhampton, Queensland, Australia

³Texas A&M AgriLife Research and Extension Center, Lubbock, Texas, USA

Correspondence Email: jkdhungel@yahoo.com

The accelerating cost and scarcity of water resulted in the development of more water use efficient (WUE) irrigation methods in agriculture. Compared to the conventional furrow irrigation, subsurface drip irrigation (SDI) improves WUE as the latter supplies water in the plant root zone. However, the continuous supply of water in the root zone results in the creation of hypoxic (lack of oxygen) conditions. Exposure of plant roots to hypoxic conditions affects plant growth, yield, and WUE. Oxygation, a practice of supplying air through irrigation water in SDI, is reported to be effective in overcoming the problem of hypoxia. A study was undertaken to investigate the effects of oxygation on contrasting crop types with different rooting systems (pineapple, wheat, and cotton), soil types (vertisol and ferrosol), air injectors (Mazzei and Seair), and emitter depths (10, 20, and 30 cm) on crop growth, yield, and WUE. The pineapple field study was undertaken at the Valley Syndicate Pineapple Farm, Yeppoon, Central Queensland, Australia during 2007-2011 (main and ratoon crop) while the study on wheat and cotton was undertaken on 16 concrete tubs (3.1 m × 0.85 m × 0.58 m) in the field laboratory. Aeration of SDI water was demonstrated to be equally effective in increasing seed cotton yield in both soil types, while increases in grain yields were more pronounced in vertisol than in ferrosol for wheat. It is generalized that the aeration treatment is more effective in vertisol than ferrosol for shallow-rooted crops, and equally effective in both soil types for tap-rooted crops. The availability of oxygen decreases with increased soil depth. Because cotton has taproots, the effectiveness of oxygation was more pronounced in both the soil types in cotton. Aeration through oxygation increased pineapple yield by 44% in experimental plots while the commercial production was increased by 11%.

Keywords: Oxygation, Rooting systems, Subsurface drip irrigation

~*~

026 O - Status of Large Cardamom Cultivation in Nepal

Dol P. Dhakal, Megha N. Parajulee

Texas A&M AgriLife Research and Extension Center, Lubbock Texas, USA

Correspondence Email: dol.dhakal@ag.tamu.edu

Nepal is the largest producer of the large cardamom (*Amomum subulatum* Roxb.) with the world share of 68%, followed by India (22%), and Bhutan (9%). A native species of the eastern Himalayas, large cardamom is also called black cardamom or Nepal cardamom. The freshly harvested fruit capsules are deep red color and are 2.3 cm in length and 1.5 cm in diameter. Large Cardamom has a pleasant aromatic odor resulting from a low content (4.5-5%) of the volatile oil 1,8-cineole and is mainly used as a flavoring condiment. It is a cross-pollinated monocotyledonous, perennial herbaceous plant. It prefers shade and may be grown on a range of altitudes from 600 to 2300 masl. Cultivation of large cardamom is confined to the sub-Himalayan range of Nepal, northern India (Sikkim and West Bengal), and Southern Bhutan. Approximately 12,500 metric tons of large cardamom are produced annually in Nepal, India, and Bhutan. The

large cardamom covers 14,875 ha, 30,000 ha, and 200 ha with the production of 6,600 mt, 5,562 mt, and 1,000 mt in Nepal, India, and Bhutan, respectively. The contribution of large cardamom in Nepal is 0.76% of the total export and 0.07% of GDP. In recent years, the plantation has been declining, resulting in production losses. Rhizome rot, Foorkey and Chhirkey (viral diseases), leaf-eating caterpillar (*Eupterote molifera*), stem borer (*Glyphipterix sp.*), and aphid (*Pentalonia nigronervosa*) are reported as the main yield-limiting factors for the cultivation of large cardamom in Nepal. Kala (Palm civets), a vertebrate animal pest, was reported as a threat to mature cardamom capsules in the cardamom growing area; animals such as monkeys and rats were also reported as nuisance pests to cardamom plantations. In addition, unpredictable natural occurrences such as frost and drought were also reported as yield-limiting factors in large cardamom plantations in Nepal.

Keywords: Cultivation Zone, Large cardamom, Nepal cardamom

~*~

027 O - Opportunity and Constraints of Agriculture Development in Nepal

Maha P. Gelal

Atlanta, Georgia, USA

Correspondence Email: gelalmp@yahoo.com

The economy of Nepal is heavily based on agriculture. Almost four decades ago, the Ministry of Agriculture introduced innovative agricultural development programs targeting smallholder farmers. The same program is running till now. Until the early 1990s, Nepal was exporting agricultural products, but now, Nepal faces food insufficiency. Land, labor migration and high cost of production are main constraints of agriculture development. Local governments have responsibilities to provide agriculture, education, forest and health care services to the people. Federal and provincial governments need to request multi-national companies to invest in and facilitate the local entrepreneurs in agricultural production. Federal and provincial governments also have to co-ordinate the supply of input required for agricultural production and international trade (export and import) of agricultural products. Similarly, all levels of the government need to seek help effectively and efficiently from educated and experienced Nepali who are living abroad (brain-gain). All levels of governments have to make efforts to control the quality of food along the entire value chain, i.e., from production to consumption. Local government must identify opportunities, prioritize problems, and focus their resources to overcome those problems. The operational cost can be reduced, and quality of products can be improved if production, collection, processing, and marketing can be done in an integrated and unified manner. The other options of cost reduction are to provide subsidies on interest, insurance premiums, and electricity bills. If the resources can be used in an intensive manner for agricultural production, processing, and marketing, the agricultural production and productivity can be increased. This may also help in availability of quality foods and create jobs. Ultimately, it will reduce agricultural import. This may also help bring producers and employees in social security benefit systems, thus sustainable agriculture development.

Keywords: Agricultural production, Brain gain, Food deficiency, Sustainable agriculture

~*~

028 P - Effectiveness of Nutrition Education Intervention in Reducing Overweight and Obesity in Bullock County, Alabama: A Case Study

Johnpaul Kagulire, Norma L. Dawkin

Department of Food and Nutritional Sciences, Tuskegee University, Tuskegee, Alabama, USA
Correspondence Email: jkagulire8923@tuskegee.edu

Obesity disproportionately affects African Americans compared to their Caucasian counterparts. However, interventions aimed at reducing overweight and obesity among African Americans are limited in rural Alabama. This study assessed the impact of a nutrition education intervention on overweight and obesity in an African American community. The study was conducted in Union Springs, a predominantly rural African American city in Bullock county, Alabama. A series of nutrition education classes were offered to participants for a period of 12 weeks. For each class, a pre- and post-test was completed by the participants to assess their nutrition knowledge. Moderate intensity physical activity was conducted by the participants after each class for 25 minutes. Anthropometric measurements including weight, height, waist and hip circumferences, and blood pressure were taken pre and post study. Findings showed that test scores of the participants significantly ($p < 0.05$) improved post-test in all the classes that were conducted. Although the weight of the participants was reduced, no significant ($p < 0.05$) change in Body Mass Index of the participants occurred after the study. Similarly, height, waist and hip circumference and blood pressure did not significantly change post study. In conclusion, nutrition education presents an opportunity of stimulating behavioral changes that may likely influence food choices and ultimately improve on the quality of food consumed by families in rural Alabama. We recommend that participants engage in daily physical activity to promote weight loss and ultimately contribute toward reducing both overweight and obesity.

Keywords: Anthropometry, Blood pressure, Nutrition education, Obesity

~*~

101 O - Molecular Mapping of Quantitative Trait Loci for Fusarium Head Blight Resistance in the Brazilian Spring Wheat Cultivar 'Surpresa'

¹Bikash Poudel, ¹Krishna D. Puri, ¹Yueqiang Leng, ¹Joseph Mullins, ¹Anil Karmacharya, ²Yuan Liu, ²Justin Hegstad, ²Xuehui Li, ¹Kishore Chittam, ¹Shaobin Zhong

¹Department of Plant Pathology, North Dakota State University, Fargo, North Dakota, USA

²Department of Plant Sciences, North Dakota State University, Fargo, North Dakota, USA

Correspondence Email: shaobin.zhong@ndsu.edu

Fusarium head blight (FHB) is a devastating disease in wheat around the globe, and use of resistant cultivars is significant in minimizing losses associated with the disease. No immunity to FHB has been discovered so far, although sources with partial resistance have been identified through extensive germplasm evaluations. 'Surpresa' is a Brazilian spring wheat cultivar with moderate FHB resistance and with no known sources of resistance in its pedigree. Surpresa may carry a new set of genes for resistance to FHB. To identify quantitative trait loci (QTLs) for resistance to FHB in Surpresa, 187 recombinant inbred lines (RILs) were developed from the cross between Surpresa and a susceptible wheat cultivar 'Wheaton'. The population was evaluated by point-inoculation method in three field and greenhouse experiments. Mean disease severity for Surpresa and Wheaton were 41.2% and 84.9%, while mean FHB severity in the population was 57.0% with an overall range between 7.0-100.0% suggesting transgressive segregation among individuals. The

population was genotyped using two-enzyme genotyping-by-sequencing, and a genetic map was constructed with 5431 single nucleotide polymorphisms (SNPs). Four QTLs for type II resistance were detected on chromosomes 2A (2 loci), 3B, and 4D, respectively, explaining 11.0-15.8% of phenotypic variation. The largest effect QTL was mapped in chromosome 4D, and this QTL also coincided with QTL determining plant height. QTL detected on chromosome 3B is different from FHBL and may be novel. These results indicate that FHB resistance identified in Surpresa can diversify the FHB gene pool and can be used to increase resistance against FHB.

Keywords: Fusarium head blight, Surpresa, Transgressive segregation, Two-enzyme GBS, Wheaton

~*~

104 O - Flux Variance Similarity-based Partitioning of Evapotranspiration over a Rainfed Alfalfa Field Using High Frequency Eddy Covariance Data

¹Pradeep Wagle, ²Todd H. Skaggs, ³Prasanna H. Gowda, ¹Brian K. Northup, ¹James P. S. Neel

¹USDA-ARS, Grazinglands Research Laboratory, El Reno, Oklahoma, USA

²USDA-ARS, U.S. Salinity Laboratory, Riverside, California, USA

³USDA-ARS, Southeast Area, Stoneville, Mississippi, USA

Correspondence Email: pradeep.wagle@usda.gov

Although the eddy covariance (EC) technique provides direct and continuous measurements of evapotranspiration (ET), separate measurement of evaporation (E) and transpiration (T) at the ecosystem level is not possible. For partitioning ET into E and T, high frequency (10 Hz) time series EC observations collected from Apr 2016 to May 2018 over a rainfed alfalfa (*Medicago sativa* L.) field in central Oklahoma, USA were analyzed using the open source software Fluxpart. Fluxpart partitions ET by examining the correlation (R_{qc}) between water vapor (q) and carbon dioxide (c) fluxes as prescribed by the Flux Variance Similarity (FVS) partitioning method. Patterns of R_{qc} and partitioned E and T were consistent with expected trends associated with vegetation dynamics and short-term transient features (i.e., hay harvesting and rainfall events). The R_{qc} grew stronger with increasing alfalfa leaf area and exhibited a strong anti-correlation (R_{qc} close to -1) during peak growth when T and photosynthesis (P) were dominant and co-regulated by the leaf stomata. Consequently, a strong linear relationship ($R^2 = 0.96$) was found between monthly values of R_{qc} and Moderate Resolution Imaging Spectroradiometer (MODIS)-derived leaf area index (LAIMOD). Decorrelation of q and c or dominance of non-photosynthetic (e.g., E and respiration, R) fluxes resulted in less negative or positive R_{qc} values during winter, hay harvest, rainy, and nighttime periods. As a result, R_{qc} showed pronounced diurnal cycles and temporal variations. Growing season (Apr-Oct) average T:ET was approximately 0.82 and 0.78 in 2016 and 2017, respectively. Diurnal cycles and temporal variations of leaf-level water use efficiency (WUE, an input of the FVS method) estimates were consistent with the seasonal dynamics of ecosystem WUE, computed from EC-derived gross primary production (GPP) and EC-measured ET. These results validate the performance of the FVS ET partitioning method using high frequency EC data.

Keywords: Evaporation, Fluxpart, Transpiration, Water use efficiency

~*~

105 O - Payments for Begnas Lake Watershed Services in Kaski District, Nepal

Thaneshwar Bhandari

Department of Agricultural Economics, Tribhuvan University Lamjung Campus, Nepal

Correspondence Email: thaneshwarbhandari@iaas.edu.np

There are concerns shown by early studies in assessment of beneficiaries' perception on the importance of Begnas Lake watershed in terms of service provisioning and payments for ecosystem services (PES). Service mechanism was studied during July to September 2017 to assess such perceptions of beneficiaries on service systems, ranking on changing factors of lake watershed, determining willingness to pay amount, and mechanism of payment system. The study used a contingent valuation survey from 148 respondents who were residing in three different catchments by using simple random sampling. Ranking of direct and indirect ecosystem services provisioned by Begnas Lake revealed that the catchment constantly being a tourist hub because of its amenity service was the first indirect service. Respondents ranked eutrophication, surface runoff and development efforts without doing EIA (Environmental Impact Assessment) as the top-three ecosystem service deterioration factors. Climate change effects further triggered the ecosystem services provisioning system including depletion of water source in winter and summer, and diversity of bird, fauna, fish, and other aquatic animal growth. These were considered costly management issues for future generation payment so that coping with these shortcomings in the short and long run was necessary for keeping the ecosystem as the ornament of their dwelling. The study determined willingness to pay amount per month was NRs. 200 for environmental services, NRs. 50 for 10% increased fish diversity, and NRs. 500 for Master Plan-based investment. Estimated mean maximum and minimum payment for respondents were NRs. 834 and NRs. 235, respectively. Almost all respondents preferred payments in the form of labor work and cash. As downstream residents exploited ecosystem services excessively, at least two-third higher than upstream and one-third higher than midstream, an amount was recommended as compensation payment. Differential in PES amount also depended on types of services people were receiving in the catchment area. Study recommended short and long-run nature-based solutions supporting unmet demand for ecosystem services.

Keywords: Climate change, Contingent valuation, Diversity, Master plan, Nature-based-solution

~*~

106 O - Machine Vision System for Occlusion Free Robotic Harvesting in Apple Orchards

¹*Santosh Bhusal*, ²*Or Hirshfeld*, ¹*Uddhav Bhattarai*, ¹*Manoj Karkee*, ¹*Qin Zhang*, ²*Avi Kahani*

¹Biological Systems Engineering, Washington State University, Prosser, Washington, USA,

²FFRobotics Inc, Haifa, Israel

Correspondence Email: santosh.bhusal@wsu.edu

Harvesting specialty crops such as fruits and vegetables is one of the highly labor-intensive tasks. In the past, automated harvesting of apples and other fruit crops have been investigated widely, but no commercial success has been reported yet. Most of the previous studies considered detecting apples in the canopies and attempted robotic picking without considering the occlusions and fruit orientation. Such studies often reported robot-canopy collisions as well as lower fruit detachment efficiency. Understanding the fruiting environment (such as nearby branches and trellis wire,

clusters, and orientation) can provide better picking strategy to improve robotic harvesting. This study aims to provide additional feedback for the robotic arm to approach the safest picking direction for an apple by understanding its orientation and surrounding environment. For this study, in addition to apples/fruit, fruit calyx, branches and apple clusters are detected in an image using state-of-the-art deep learning methods. This additional information (from branches, clusters and trellis wire) will be studied to identify occlusion-free apples for harvesting. For each apple to be harvested safely, the information from its calyx will be used to identify the safe direction for the robotic arm to attempt picking. The result shows that in 95% of the cases (compared to ground truth) the proposed system identified apples which are safe to harvest and in 91% of the cases the proposed system identified apples occluded with branches, which were not recommended for harvesting. Such a system (which provides additional feedback about fruit orientation) is expected to be suitable for the future of apple harvesting and other robotic operations in orchards.

Keywords: Deep learning, Machine vision, Occlusion handling, Robotic harvesting

~*~

107 P - Effect of Foliar Spray of Boron and Zinc on Performance of Cucumber Under Net House in Kaski, Nepal

Suraj K.C., Kabita Paudel, Sujan Pokharel, Sabuj Adhikari, Arjun K. Shrestha
Department of Horticulture, Agriculture and Forestry University, Chitwan, Nepal
Correspondence Email: surajkc2018@gmail.com

A field study was conducted at a commercial cucumber farm in Majheripatan, Kaski from January to April 2019 to assess the effect of foliar spray of boron and zinc on the performance of cucumber (*Cucumis sativus L.*), var. Bhaktapur Local. The study consisted of ten combination treatments viz., Z0B0: zinc sulphate at 0% and borax at 0%, Z0B1: zinc sulphate at 0% and borax at 0.4%, Z0B2: zinc sulphate at 0% and borax at 0.5%, Z1B0: zinc sulphate at 0.6% and borax at 0%, Z1B1: zinc sulphate at 0.6% and borax at 0.4%, Z1B2: zinc sulphate at 0.6% and borax at 0.5%, Z1B3: zinc sulphate at 0.6% and borax at 0.5%, Z2B0: Zinc sulphate at 0.75% and borax at 0%, Z2B1: zinc sulphate at 0.75% and borax 0.4% and Z2B2: Zinc sulphate at 0.75% and Borax at 0.5%. Randomized Complete Block Design was used in the experiment with three replications for each treatment combination. The results showed significantly better performance measures such as plant height (139.3 cm), plant canopy (52.1 cm), stem girth (7.2 mm), and yield (140.34 t/ha) with a foliar application of combination of zinc sulphate at 0.75% and borax at 0.5% compared to other treatments. These parameters decreased as the dose decreased. Results suggest that use of zinc sulphate dosage of 0.75%, which denotes the use of 7.5 g/l and borax dosage of 0.5% (5 g/l) either solely or in combination would be beneficial for cucumber production.

Keywords: Bhaktapur local, Foliar spray, Zinc sulphate

~*~

108 O - Influence of GA3 and NAA on Tomato Production Under the Glasshouse in Kaski, Nepal

¹Ritesh K. Jha, ¹Arjun K. Shrestha, ²Baikuntha Adhikari, ³Basanta K. Shrestha, ⁴Shyam Kandel

¹Department of Horticulture, Agriculture and Forestry University, Chitwan, Nepal

²Ministry of Land Management, Agricultural and Cooperatives, Province No. 5, Nepal

³Ministry of Agriculture, Government of Nepal, Kathmandu, Nepal

⁴USDA-ARS, Salinas, California, USA

Correspondence Email: ritesh.lord.of.truth@gmail.com

A field experiment was conducted in the naturally ventilated greenhouse to assess the performance of tomato, cv. Srijana as influenced by GA3 and NAA during the summer of 2018-2019 at Kham Ghale Krishi farm, Pokhara, Kaski, Nepal. Treatments comprised of four levels of GA3 (i.e. 0, 25, 50, and 75 ppm) combined with four different levels of NAA (i.e. 0, 25, 50, and 75 ppm). Treatments were replicated three times in a factorial Randomized Complete Block Design (RCBD). Tomato fruit yield was significantly influenced by the use of GA3 and NAA and their combinations. Among four levels of NAA, the highest yield (109.91 mt/ha) of tomato was recorded with NAA @ 25 ppm, which was 10.3%, 17.4% and 24.7% higher than NAA @ 0 ppm, 50 ppm, and 75ppm, respectively. Similarly, a significantly higher yield (103.46 mt/ha) of tomato was attained with GA3 @ 50 ppm and the yield was 13.9%, 10.3%, and 6.7% higher than that with GA3 @ 0 ppm, 25 ppm, and 75 ppm, respectively. Interactions between GA3 and NAA levels were significant for all yield attributes. Regression analysis for the effect of GA3 and NAA on the yield of tomato showed a polynomial relationship with the dose of GA3, 52.65 ppm and NAA, 20.29 ppm, respectively. Tomato production could be improved by the combined application of GA3 @ 50 ppm and NAA @ 25 ppm under the glasshouse condition in Pokhara, Nepal.

Keywords: cv. Srijana, Greenhouse, Tomato yield

~*~

109 O - Farmers' Willingness to Pay for Crop Insurance in Nepal

¹Bibek Sapkota, ¹Maria F. Rola-Rubze, ¹Michael Burton, ²Roy Murray-Prior

¹School of Agriculture and Environment, The University of Western Australia, Perth, Australia

²Agribiz RD&E Services, Yungaburra, Queensland, Australia

Correspondence Email: bibek.sapkota@research.uwa.edu.au

The Government of Nepal has been implementing crop and livestock insurance programs since 2013 employing a public-private partnership model. However, despite a 75% subsidy in the premium, farmers' participation in the crop insurance program has been negligible thus far. The existing insurance products draw mainly on a feasibility study, which only looked at supply side issues. Information on farmers' risk attitudes, preferences, and willingness to pay (WTP) for crop insurance are lacking in the Nepali context. We estimated farmers' WTP for crop insurance conducting a discrete choice experiment (DCE) with 420 randomly selected farmers in a blocked design, which involved two insurance types (loss-based insurance vs rainfall-index insurance), two levels of sum insured (60,000 and 90,000 NPR/ha), three levels of deductible (15%, 20% and 25%) and six levels of premium price (250, 500, 750, 1,000, 1,250 and 1,500 NPR/ha). The study also involved a real monetary lottery-choice experiment to elicit farmers' risk attitudes together with a socio-demographic survey. The results show that premium price and deductible had negative

effects on the utility of crop insurance, while sum insured had positive effect on the same. The utility, however, was unaffected by insurance type, which indicates that farmers are indifferent between loss estimation methods. Similarly, farmers' risk aversion had negative effect on the utility of status-quo, which implies that the more risk averse the farmers are, the more willing they are to buy insurance. Among the attributes considered in the DCE, sum insured had the highest marginal effect on the utility of insurance. Farmers' WTP for the existing crop insurance product was slightly lower than the current premium rate (after subsidy), which partly explains the demand-supply incongruence in the insurance market. The findings suggest that there is potential for diversifying crop insurance products corresponding to farmers' preferences and risk attitudes.

Keywords: Crop insurance, Discrete choice experiment, Risk attitude, Weather-index insurance

~*~

110 P - Factors Explaining Neonatal Mortality in Agriculturally Dominated Areas in Nepal

Tantrika R. Khanal

Tribhuvan University, Mahendra Ratna Campus, Kathmandu, Nepal

Correspondence Email: tantrika12@gmail.com

World Health Organization reported 18 incidences of neonatal deaths per 1000 live births in 2017. Globally 2.5 million children died in the first month of their life in 2017, approximately 7,000 neonatal deaths every day. Among various causes, the lack of antenatal care (ANC), postnatal care (PNC), and delivery health services are the major factors explaining the variations in neonatal mortality. The neonatal mortality rate varies across geography and countries with the highest neonatal mortality rate in Sub-Saharan Africa and South Asia. In Nepal, the neonatal mortality rate is estimated to be 20.7 deaths per 1000 live births in 2017 which was 26.4 deaths per 1000 live births in 2011. Hence, some improvement has been achieved to lower the neonatal mortality rate. The leading cause of neonatal mortality is poverty. The traditional and subsistence agriculture also plays a vital role to increasing the neonatal mortality rate. Hence, we expect the neonatal mortality to be higher in agriculturally dominated rural areas in Nepal. However, the empirical literature has not adequately investigated the factors explaining the neonatal mortality in agriculturally dominated rural areas in Nepal. The primary objective of the study is to determine the factors influencing the neonatal mortality rate in agriculturally dominated rural areas in Nepal. The study employs multivariate regression analysis to identify the relationship between neonatal mortality rate and the factors influencing the neonatal mortality rate. Preliminary findings indicate that the neonatal mortality rate varies significantly across areas, based on their sociodemographic characteristics in rural and agriculturally dominated areas in Nepal.

Keywords: Mortality factors, Neonatal mortality, Rural areas

~*~

111 P - Survey of the Village-Based Indigenous Duck Production Systems in Nawalparasi, Nepal

Anju Sharma Chapagain, Prem L. Mahato, Nirajan Bhattarai
Agriculture and Forestry University, Chitwan, Nepal
Correspondence Email: theanjusharma.as@gmail.com

Surveys using both purposive and random sampling methods were deployed in Nawalparasi, Nepal to study the village-based duck production systems and constraints in order to design future improvement and conservation strategies. This study examined characteristics of the flock, housing system, feeding system, medication, mortality and production and reproduction performance of ducks. The results showed that among the duck breeds surveyed, Muscovy (86.5%) predominated in all households, followed by Chinese (13.5%) breed. A majority of the respondents had fixed type day shed (88%), among which 92.3% were made up of locally available materials. Fifty percent of ducks were found to have sheds shared with the chickens. The majority depicted Ethno-veterinary therapy as the most popular (75.3%) method of treating diseases in indigenous ducks. The majority of respondents (80%) identified predators as the principal cause of mortality in ducks. Relationship of age and incidence of mortality showed that ducklings were the most unprotected group. The number of ducklings dying per clutch was 2.99 and 1.91 for absence and presence of pond in the household ($p < 0.05$), respectively. Age of first laying of Muscovy was 204 days when commercial medicine was used, whereas it was 241 days when homemade medicine was used, and 248 days when commercial and homemade medicines were combined ($p < 0.05$). Production and reproduction performance results showed that Muscovy laid about 11 to 12 clutches of 16 eggs per year while Chinese breed laid about 50 to 60 eggs per breeding season. There were significant opportunities for improved duck production in Nawalparasi as well as throughout Terai region of Nepal.

Keywords: Clutches, Duck production, Duck feed and housing

~*~

112 P - Production Economics and Marketing of Large Cardamom in Sankhuwasabha, Nepal

Santosh K. Bhattarai

Department of AgriEconomics, Institute of Agriculture and Animal Science, Kathmandu, Nepal
Correspondence Email: skbhattarai99@gmail.com

A study on production economics and marketing of large cardamom in Chainpur, Sankhuwasabha was conducted from December 2018 to June 2019. Altogether sixty farmers were selected randomly from the Prime Minister Agriculture Modernization Project (PMAMP) Cardamom command area of Chainpur municipality of Sankhuwasabha. In addition, 12 traders were also selected for the study. A focus group discussion, key informant interview and direct observation were conducted to generate primary data along with household survey with the use of semi-structured pre-tested interview schedule. The secondary data were collected from reports and publications of different institutions, organizations and government bodies like Federation of Large Cardamom Entrepreneurs of Nepal (FLCEN), District Agriculture Development Office (DADO), Ministry of Agriculture and Livestock Development (MoALD), Department of Agriculture (DoA), and Central Bureau of Statistics (CBS). The yield of cardamom in the study

area has fallen by more than 50% from the maximum realized yield of 220 kg/ha. Cardamom was found to be labor intensive in the study area, and farmers were not using manure owing to difficult topography. Coupled with low market price and low productivity, many farmers took the loss. However, economic analysis of the area indicated that the cardamom farming could be profitable. The sensitivity analysis with 20% decrease in price also found the farming to be profitable and viable. The farming is labor intensive, and the average annual production cost was NRs. 50,124 considering hired laborers only and NRs. 74,358 considering both hired and family labor costs. Among many causes of decline in productivity, farmers ranked disease as the most devastating. After harvesting, many farmers faced the problems of price fluctuation. The monopoly of Indian marketers at Birtamod was the topmost reason for price fluctuation followed by political interference as suggested by most traders. The study showed an immediate need of crop management via disease control to increase production and marketing intervention for consistent price of large cardamom.

Keywords: Economics, Large cardamom, Price fluctuation

~*~

116 P - The Livelihood Diversification Strategies: Landscaping of a Typical Fish Farm in Gwagwalada, Nigeria

Michael A. Oke

International Development Department, Michael Adedotun Oke Foundation, Abuja, Nigeria

Correspondence Email: maof2020@gmail.com

The study examined different livelihood diversification strategies, and landscaping of a typical fish farm located in Gwagwalada. In order to realize the objectives of the study, primary data were obtained from farm workers, buyers, and the owners of the fish farm, with the aid of a structured questionnaire. Photographs of the operation and the survey activities were also taken. We monitored the fish consumption patterns of the people as part of their morning and evening meals, fish farm activities of workers such as spreading of fish feeds onto the ponds, fish mortality and floating of dead fish and consumption of dead fish by live fish in the pond. We also observed that banana plantings were used as a shelterbelt around fish farms to shield the ponds from high wind and dust storms. Fishnets were used to protect fish fingers from predators such as birds. The farm enterprise was diversified by having farmsteads for dwelling, planting of grasses along the farm edges and roadsides to protect soil from wind erosion as well as for grazing by goats and other farm animals, shelterbelts for the protection of fish ponds from wind and sand storms, and integration of farm animals and fish farming. Thus, a significant relationship between household livelihood diversification and fish farming enterprise has been established for food security in small-holder fish farmers in Gwagwalada, Nigeria.

Keywords: Diversification, Fish farms, Landscaping, Livelihood

~*~

117 P - Current Situation of Agricultural Business and Technology Development in Nigeria

Michael A. Oke

International Development Department, Abuja, Nigeria

Correspondence Email: maof2020@gmail.com

The problems in agricultural business in Nigeria are numerous, which necessitates the leverage of new technologies. The major objective of this study was to evaluate agricultural businesses and use of technologies and innovations in the rabbit industry, snail production, fish marketing, and orange production. Based on literature review, newspapers, field visits, and photos, it was found that Nigerian farmers could not compete with their international competitors due to poor technologies and innovations, and lack of proper transportation, marketing, management, processing, and storage facilities. Some activities involved in export of some agricultural products, including information on the prices of agricultural produce and the type of crops that are highly demanded are lacking. There is a simple rabbit cage technology, where some farmers keep their rabbit for sales but there is no special market for rabbit meats. The business of rabbit farming is a one-man business. For the fish industry, some farmers have selected places for marketing, or they send to other markets or central places for easy distribution. For the orange business, some farmers transport their oranges through a van for marketing. More processing factories are needed for all these businesses, which will open new job opportunities. Thus, use of new technologies and innovations are needed in the agricultural sector.

Keywords: Agricultural business, Social Development, Technology

~*~

118 O - Energy Use, Greenhouse Gas Emission, and Global Warming Affecting Spring Paddy Production in Jhapa District, Nepal

Padam P. Paudel

Department of Agricultural Engineering, Tribhuvan University, Sunsari, Nepal

Correspondence Email: paudelpadamprasad@gmail.com

Paddy rice plays an important role in Nepal's agriculture-based economy. It is the largest crop in Nepal, which contributes about 25% of gross domestic production (GDP) of the country. The primary objective of this study was to evaluate the energy use pattern and greenhouse gas (GHG) emissions in spring paddy production in Jhapa district, Nepal. From stratified random selection methods, 71 farmers were selected for the study, and the data were collected through direct questionnaires using a face-to-face interview. From the study, it was found that 31,191 MJ of energy is used per hectare of paddy field with an average yield of 5,351 kg/ha corresponding to the output energy of 78,659 MJ/ha. The highest share of input energy was for fertilizers (43.8%) and the least was for chemicals (0.5%). Energy use efficiency, energy productivity and net energy were calculated as 2.52 kg/MJ, 0.17 kg/MJ and 47,468.40 MJ/ha, respectively. The CO₂, N₂O and CH₄ emission from the spring paddy production system were found to be ~713.0 kg/ha, 0.06 Kg/ha and 0.98 Kg/ha, respectively. Total global warming contribution was calculated to be 1,008.09 kg CO₂ eq/ha for a time span of 100 years. The average cost of production of spring paddy was found to be \$874.9/ha or \$0.16/kg paddy production. The study showed that different cropping patterns used by farmers directly affect the net energy input, energy use efficiency and GHG emissions.

Keywords: Energy use efficiency, Energy use pattern, Rice

~*~

119 P - Agricultural Growth and Its Determinants in Nepal

Amrit Dumre, Shiva C. Dhakal, Mohan Acharya, Prabin Poudel

Department of Agricultural Economics and Agribusiness Management, Agriculture and Forestry
University, Chitwan, Nepal

Correspondence Email: amrit8afu@gmail.com

This paper critically analyzed the trajectory of agricultural growth and its determinants in Nepal. Agricultural growth is vital for stimulating overall economic growth. The World Bank research shows strong statistical link between agricultural and overall economic growth in less developed countries. Economic growth and agricultural growth in Nepal also show strong correlation ($r = 0.7501$). Agricultural transformation is characterized by declining share of agriculture in national employment and GDP, and increasing share of secondary sectors like industry, service and manufacturing. However, this structural shift seems unplanned and ungoverned in the case of Nepal. The contribution of agriculture to GDP is continuously declining, but the growth of secondary sectors like industry and manufacturing still appears stagnant. At this incipient stage of agricultural transformation, productivity growth in agriculture is both a necessary as well as sufficient condition for the development of the economy as a whole. Agricultural growth depends on institutional (agricultural credit and land holdings), infrastructural (irrigated area, farm mechanization, electricity, storage, transportation, agricultural market), technological (high yielding varieties or improved seed, fertilizers and pesticides), and socioeconomic factors (population, poverty and literacy). Policies strengthening these determinants can help Nepal achieve targeted economic growth.

Keywords: Agricultural growth, Agricultural transformation, Economic growth

~*~

120 O - Perceptions and Practices of Direct Seeded Rice in Terai Region of Nepal

¹*Samaya Gairhe, ¹Tika B. Karki, ¹Sudeep Subedi, ¹Yogendra Acharya, ²Soni Das*

¹Nepal Agricultural Research Council, Singhdurbar Plaza, Kathmandu, Nepal

²Agronomy Division, Khumaltar, Lalitpur, Nepal

Correspondence Email: samaya43@gmail.com

Rice is the most important staple crop of Nepal and accounts for 20% of agriculture gross domestic product (AGDP). It is generally planted by transplanting seedlings of 20-25 days old in puddled condition. However, due to shortage and high cost of labor, cost of transplanting has become untenable. Therefore, direct seeded rice (DSR) is becoming popular as it is a cheaper alternative to transplanting. Hence, the study was conducted to examine the perceptions and practices of DSR farmers in Terai regions of Nepal. A total of 120 households were surveyed in November 2019 by employing multistage random sampling, representing different (Eastern, Central and Western) Terai regions. Three focus group discussions (FGDs) were conducted to complement the information. Percentage and average of farmers' perceptions and practices of DSR were calculated and ranked. The study revealed that most farmers were directly sowing rice during first and second week of June and drill the seeds on tilled un-puddled soil. The farmers managed weed by both manual as well as herbicides application. Severe weed infestation was the most important problem ranked by farmers followed by water management, and fertilizer application. Similarly, labor

saving was the most important advantage of DSR followed by water saving and profitability. Farmers perceived that comparable yields can be harvested from DSR and transplanted rice (TPR) but with less labor, seed rate, water, fertilizer, and crop duration in addition to improving soil health, thereby making it a remunerative enterprise. Weed management in DSR can be achieved by complete flooding of land for a few days that can destroy weed seeds. Training, subsidies, demonstration as well as timely sowing of seed, irrigation, herbicide application, and leveled land are the prerequisite for the success of DSR in Terai region of Nepal.

Keywords: Direct seeded rice, Herbicides, Irrigation, Weed

~*~

121 O - Road to Commercialization: Lessons Nepalese Dairy Industry Can Learn from Dairy Farms in the United States

Sushil Paudyal

Department of Animal Science, Texas A&M University, College Station, Texas, USA

Correspondence Email: sushilpaudyal@tamu.edu

U.S. dairy production is considered one of the most sophisticated and specialized industries in the world. On the other hand, dairy production in Nepal is crawling from subsistence to commercialization; average livestock per household being 1-5 dairy animals. This study focused on similarities, differences, common challenges, and lessons that the dairy industry in Nepal can learn from the industry in the US. Major yearly trends in U.S. milk production include (1) a steady increase in milk production; and (2) a consistent decline in the number of dairy operations followed by a consistent increase in the number of cows per operation. A similar scenario to the current dairy practices in Nepal can be expected to continue in the Nepalese dairy industry for the foreseeable future due to 1) lack of commercialization of the operations; and 2) adoption of alternative employments by the farming communities including foreign employment. Many of these farmers belong to producer-owned cooperatives in both countries. The cooperatives assemble members' milk and move it to processors and manufacturers. Initially local, many of today's dairy cooperatives in the U.S. are national, with members across the country, which could be another trend that we can expect in the Nepalese dairy industry. Individual animal management practices have long been replaced by the concept of herd management and the use of precision technologies in the US because of reduced time, labor, and resource requirements. Nepalese lifestyle demands higher consumption of milk, which contrasts with the US where per-capita consumption of milk has declined because of competition from other beverages and a declining children population. Some cooperatives operate their own processing and manufacturing plants; however, product diversification is a need in both countries. Product diversification in terms of cheese, butter, and yoghurt has proven to be beneficial in the US, for which Nepalese milk processors should already be prepared.

Keywords: Commercialization, Dairy, Livestock, Milk processing

~*~

122 O - Diversity of Fusarium Fungi Causing Fusarium Head Blight of Wheat in Georgia

¹Bikash Ghimire, ²Mohamed Mergoum, ¹John Youmans, ¹Alfredo D. Martinez, ¹James W. Buck

¹Department of Plant Pathology, University of Georgia, Griffin Campus, Griffin, Georgia, USA

²Department of Crop and Soil Sciences, University of Georgia, Griffin Campus, Griffin, Georgia, USA

Correspondence Email: bikash.ghimire@uga.edu

Fusarium head blight (FHB) is a devastating wheat (*Triticum aestivum* L.) disease of worldwide importance due to grain yield reduction and food safety issues associated with mycotoxin deoxynivalenol (DON) contamination. An increase in corn (*Zea mays* L.) acreage is presumably a key factor responsible for recent FHB epidemics in the southeast United States. *F. graminearum* within the *F. graminearum* species complex (FGSC) with 15ADON chemotype is predominant among three distinct North American populations. However, the emergence of novel virulence chemotypes has recently occurred in North America. To elucidate the pathogen diversity in Georgia (GA), USA, we collected 320 isolates from symptomatic wheat heads and corn debris from 47 counties in 2017/18 and 2018/2019 seasons. PCR-based identification with translocation elongation factor 1 alpha (EF-1 α) primers of nearly 50 isolates indicated that most were *F. graminearum* with a few isolates being *F. poae* that were recovered from southwest GA. TRI-based assay through multiplex PCR of Tri3 and Tri12 locus revealed a high frequency of 15ADON with few identified as nivalenol-type (NIV). The phylogenetic relationship of representative isolates and reference strains of all known FGSC species based on the EF-1 α gene showed that a majority of the isolates were clustered within the *F. graminearum* clade closely related to Gulf coastal population (GCP). To the best of our knowledge, this is the first report describing FGSC and their chemotype along with *F. poae* from Georgia. A further study on the population structure using VNTR markers and virulence testing of the isolates in the greenhouse are ongoing to better understand the pathogen and assist future disease management strategies.

Keywords: *F. graminearum*, Markers, Mycotoxin deoxynivalenol

~*~

123 O - Examining the Factors Influencing Contract Farming Choice Decisions of Ginger Growers in Nepal

¹Aditya R. Khanal, ²Ashok Mishra, ¹Sudip Adhikari, ³Anjani Kumar

¹College of Agriculture, Tennessee State University, Tennessee, USA

²Morrison School of Agribusiness, Arizona State University, Arizona, USA

³International Food Policy Research Institute, South Asia Office, New Delhi, India

Correspondence Email: akkhanal@gmail.com

Ginger is an important high value crop in Nepal with great market potential. However, ginger producers, typically smallholder ginger growers, are often hampered by variable market price, access to credit, inputs, extension services, and marketing. The Government of Nepal has initiated market reforms that have opened doors for private sector intervention in production agriculture. It is interesting to analyze ginger growers' decision towards adoption of these interventions in production agriculture. Contract farming (CF) is one of the important interventions that can facilitate the reduction of transaction costs and market imperfections and has been found to enhance welfare of smallholder farmers in many developing countries. Using farm-level survey

data collected in 2014-2015 by the International Food Policy Research Institute South Asia in the hilly regions of Nepal, we examined ginger growers' participation decisions in CF. The sampled areas have the presence of private contractor(s) with a potential to initiate contract. Information on ginger farming was collected from Pyuthan, Palpa, and Arghakhanchi districts, located in the western and mid-western regions of Nepal. Considering the contract and non-contract growers, we analyzed a sample of 611 ginger growers randomly chosen from 53 Wards of 14 Village Development Committees in the three sample districts. We analyzed participation decisions in three forms of CF contracts that contractors underwrite in the area: CF with input conditions, CF with output conditions, and CF with both input and output conditions. We found that 52% of the sampled farmers participated in CF. Our results suggest that compared to non-contract ginger growers, the factors such as higher price premiums (contract price minus spot price), greater market/transportation distances, and wealth of growers significantly influence the participation in CF, regardless of any CF-form choice. Additionally, we discuss conditions and implications of each CF-form choice and factors influencing these specific choice decisions.

Keywords: Choice decisions, Contract farming, Ginger, High value crop

~*~

124 O - Cannabis as an Economic Crop: Prospect and Possible Use in Nepalese Context

Niranjan Aryal

Lab Director at Certus Analytics, Murrieta, California, USA

Correspondence Email: naryal101@gmail.com

Human consumption of cannabis in various forms for medical and recreational purposes can be traced back to before-the-common era. During this time, human selection of specific cannabis strain has greatly altered the characteristics of the plant. Despite the long history of domestication and selective breeding, the evolutionary aspects and underlying genetics has not been adequately understood. Due to increased legalization of cannabis in western countries including several states in the USA, the plant has attracted researchers and industrialists. Studies on the medicinal values of cannabinoids, terpenoids and other secondary metabolites in the cannabis plant may yield great utility to human society. The review of the history, science, medicinal uses, and socio-economic aspects of cannabis plant provided the insight into its relationship with humans since the beginning of civilization. In Nepal, the plant has a long religious, medicinal and recreational relation with the society. Cannabis was one of the major sources of revenue collection for the government of Nepal before its illegalization in 1983. The plant was a very reliable income source for Nepalese farmers in the hills and plains of Nepal. With the global focus on the cannabis plant, and Nepal's desire for exponential growth in the economy, cannabis plants should be considered for re-legalization. Also, extensive research and assessments must be done before the initiation of the legalization process. Testing laboratories, scientific manpower, regulated market, and public awareness are some of the challenges that need to be addressed. If legalized and regulated, Cannabis farming can boost the Nepalese economy and bring back prosperity to Nepalese people.

Keywords: Cannabis, Cannabis-economy, Legalization

~*~

125 O: Progress in Development of Nanoparticle-based Swine Influenza Vaccines

¹Santosh Dhakal, ¹Shristi Ghimire, ²Renukaradhya Gourapura

¹The Ohio State University, USA (Now at Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland, USA)

²Ohio Agricultural Research and Development Center (OARDC), The Ohio State University, Wooster, Ohio, USA

Correspondence Email: santoshdhakal88@gmail.com

Nanoparticles offer many advantages as a vaccine delivery platform because they can enhance antigen uptake and facilitate antigen processing by antigen presenting cells (APCs), induce maturation of APCs, promote antigen cross-presentation, induce cytokine production, and modulate antibody and cell-mediated immune responses. Swine influenza A virus (SIV) causes severe economic loss to the swine industry globally. Pigs are also regarded as a mixing vessel for influenza A viruses (IAV) of diverse (human, avian and swine) origin, generating novel virus strains that can cause human infections or even pandemics. Vaccination is one of the effective means to prevent influenza in pigs and nanoparticles-based technology can be useful for the development of more efficacious swine influenza vaccines. We have evaluated the potential use of poly (lactic-co-glycolic) acid (PLGA), polyanhydride, chitosan, dendrimer-like-alpha-D-glucan (Nano-11) and liposome-based nanoparticles for the development of swine influenza vaccines. Our vaccine-challenge studies in pigs show that nanoparticles can modulate mucosal antibody or cell-mediated immune responses, or both depending on their physicochemical properties and provide better protection by reducing fever, lowering pneumonic lesions, and clearing virus from the respiratory tract. Thus, the diverse immunogenic properties of various nanoparticles can be used for improving the breadth of protective efficacy of swine influenza vaccines.

Keywords: Influenza A virus, Nanoparticles, Pigs, Swine influenza, Vaccine

~*~

126 P - Effects of Planting Depth and *Bacillus subtilis* Treatment on Saffron (*Crocus Sativa* L.) Production in Green Roof Production System

Pradip Poudel, Hideka Kobayashi, Shawn Lucas, Leigh Whittinghill

College of Agriculture, Communities, and the Environment, Kentucky State University, Frankfort, Kentucky, USA

Correspondence Email: pradip.poudel@kysu.edu

Saffron (*Crocus sativa* L.) is a high-value crop with little information available on cultivation practices. This research is being conducted to evaluate the effect of planting depth and *Bacillus subtilis* treatments on flower growth and saffron production in an intensive green roof system. A completely randomized factorial design was used for this research with two planting depths (10 cm and 15 cm) and three *Bacillus subtilis* treatments (untreated control, 15.6 ml/L, and 31.2 ml/lit) as the independent variables. Corms receiving fungicide treatment were dipped in bio-fungicide concentrate solution for 30 minutes before planting. Completely opened flowers were picked daily and processed on the same day. During processing, fresh flower weight, fresh stigma weight, sepal length, sepal width, and stigma length were measured. Dried stigma weight was determined after drying stigma in the dehydrator at 135⁰F for 30 minutes. Data were analyzed using analysis of variance (ANOVA) with planting depth and bio-fungicide treatments as fixed effects using R (the R Project for Statistical Computing). We expect that *Bacillus subtilis* treatment with the 10-cm

planting depth will have the greatest effect in increasing flower growth (sepal length, sepal width, and stigma length) and saffron yield (fresh flower weight, fresh stigma weight, and dried stigma weight). The information obtained from this research will help in the development of best management practices for high-quality saffron production in Kentucky.

Keywords: Bio-fungicide, Flower growth, Green roof, Saffron, Stigma

~*~

127 P - CRISPR/Cas9 Genome Editing System as a Versatile Tool for Functional Genomics

^{1,2}Anindita Chakraborty, ¹Hua Li, ¹Sadia Iqbal, ¹Michael G. K. Jones, ¹Stephen J. Wylie

¹Western Australia State Agricultural Biotechnology Centre, School of Veterinary and Life Sciences, Murdoch University, Perth, Australia

²Department of Genetic Engineering and Biotechnology, Shahjalal University of Science and Technology, Sylhet, Bangladesh

Correspondence Email: anindita.chakraborty@murdoch.edu.au

The CRISPR/Cas9 system is derived from a bacterial immune system against invading DNA viruses. It has been modified and is widely used in gene editing of many organisms, including plants. The present study was conducted on plants of *Nicotiana tabacum* L. (tobacco) as a model system. A transfer-DNA (T-DNA) cassette containing Cas9 and a selectable marker, bar, was introduced into tobacco cells using an Agrobacterium-mediated transformation method. The successful integration and expression of Cas9 and bar genes in the tobacco genome was confirmed by PCR, RT-PCR, and sequencing. Transgenic tobacco plants expressing Cas9 and bar were chosen for further analysis. Single guide RNAs (sgRNAs) targeting an endogenous gene, pds, and a transgene, bar, were designed. An in vitro Cas9 digestion assay confirmed cleavage efficiency. Different methods of introducing sgRNAs targeting both the pds and bar genes into plant tissue are being investigated. Successful introduction of sgRNAs to Cas9-expressing plants will facilitate functional genomics in this species.

Keywords: CRISPR/Cas9, Gene editing, sgRNA

~*~

128 O - Biratnagar Jute Mill: Situation, Machineries, Recommence Feasibility and Potentiality - An Industrial Case Study

Dikshit Poudel

Department of Agricultural and Applied Economics, The University of Georgia, Athens, Georgia, USA

Correspondence Email: dikshit.pdl@gmail.com

Industries play a substantial role in gross domestic product of countries. The importance and potential of industries have been only minimally realized in Nepal. Biratnagar Jute Mills (BJM), located in Biratnagar, is the first industry of Nepal with registration number 1 established in 1936 (1993 Bikram Sambat). Various industries (especially agro-based) have been marginally successful or closed due to the lack of resources and substantial socio-political instability and uncertainty in the country over the past several decades. However, the current status of these industries, effect of their closure, and condition of machineries have not been examined. In this

presentation, a case study of a closed industry, BJM, conducted in 2018 is discussed. Employment, products, historical, political and economic importance, government action, reason for closure of industry, total machines within the industry, total jute production, farmers, and discouragement issues are included and discussed. Data were collected employing interviews with authorized personnel from the industry and government offices. This presentation provides an inclusive set of potential future opportunities and recommendations for industrial development along with jute production in Nepal. It was found that BJM possesses significant potential to revive and contribute to employment and economy of the country.

Keywords: Agro-based industries, Employment, Impact assessment, Industry closure

~*~

129 P - Goats' Productivity Status under Small Holder Farmers' Management in Bharatpur, Chitwan, Nepal

Bijay Paudel, Gokarna Gautam, Shiva P. Bhusal, Sachin Upadhayaya

Faculty of Animal Science, Veterinary Science and Fisheries, Agriculture and Forestry
University, Chitwan, Nepal

Correspondence Email: bijaypaudel997@gmail.com

Goat plays an important socio-economic role in Nepalese agriculture. However, there is limited information available regarding the productivity of goats under small holder farmers' management condition. This study was conducted to know the productivity of goats under small holder farmers' management condition at Bharatpur-19, Chitwan. Seventy-four households were randomly selected and surveyed on various aspects of their goats' productive and reproductive performance. Data were collected from 109 goats and entered and analyzed using MS-Excel 2016. Of which 60.5%, 35.8% and 3.7% were local, Jamunapari cross and Boer cross breeds, respectively. Reasons for raising goats were income (93%), manure (80%), and meat (46%). Mean (\pm SD) production indices included flock size of 4.42 ± 2.03 , number of kids per birth of 1.98 ± 0.79 , weeks at castration of 9.93 ± 2.47 (range: 6.4 to 21.4 weeks), age at first birth of 12.12 ± 1.63 months, and birthing to conception interval of 4.61 ± 2.14 months. Birthing was highest in spring and lowest in autumn season. Age at first birthing was lower ($p=0.01$) in Jamunapari cross (11.65 ± 2.41 months) than in local breeds (12.47 ± 1.70 months). However, number of kids born (2.17 ± 0.96 , 1.90 ± 0.66) and birthing to conception intervals (4.22 ± 2.39 , 4.75 ± 2.07 months) were not different between Jamunapari cross and local breeds. In conclusion, autumn was the most active breeding season for goats. Although age at first birthing was lower in Jamunapari cross, the birthing to conception intervals and the number of kids born were similar between two breeds. Since there were few goats having very good productivity, there is great potentiality of selective breeding to improve the economic status of goat-rearing farmers.

Keywords: Goat, Productivity, Small holder farmers, Selective breeding

~*~

130 P - NDVI Comparison of Farm Parcels of Owen County, Kentucky

Smriti Kandel, Jeremy Sandifer, Manisha Hamal, Anju Chaudhary, Buddhi Gyawali
College of Agriculture Communities and the Environment, Kentucky State University, Frankfort,
Kentucky, USA

Correspondence Email: buddhi.gyawali@kysu.edu

The population growth has variable impacts on productivity of vegetated landscape in Owen County, Kentucky. Change in productivity can be quantified using satellite observations of Normalized Difference Vegetation Index (NDVI). This research was conducted to compare the productivity of farm parcels (small, medium, and large), and measure the concentration of high or low values of farm area and NDVI of Owen County. The cloud free Landsat 4-5 and Landsat 8 images with 30 m resolution of the same summer months were selected for 2005 and 2018 to calculate NDVI. The mean NDVI among farm parcels between 2005 and 2018 was compared using ANOVA. The result was significant in 2018 where large-sized farms showed higher mean values of NDVI (0.48) followed by medium-sized farm (0.47) and small-sized farm (0.47). Also, there was decrease in NDVI from 2005 to 2018 which might be due to decrease in total crop area. There was low clustering of NDVI in small-sized farms while the same was high in medium-sized farms. The low productivity in small farms could indicate that they are less intensively managed as compared to medium and large-sized farm parcels. Further study is needed on farm productivity and NDVI among geographical areas.

Keywords: Landsat image, Productivity, Spatial clustering

~*~

131 O - Ecology and Epidemiological Modeling of Infectious Diseases in the Framework of Sustainable Development of Nepal

¹Bhim Chaulagain and ²Ram B. Khadka

¹Oregon State University, Botany and Plant Pathology Department, Corvallis, Oregon, USA

²The Ohio State University, Department of Plant Pathology, Wooster, Ohio, USA

Nepal Agricultural Research Council, Banke, Nepal

Correspondence Email: bhimchaulagain1986@gmail.com

Infectious disease epidemic invasions have substantial impacts on both ecosystem functioning and human welfare. The outbreak of infectious diseases is likely to occur more frequently in developing countries like Nepal compared to industrialized nations. Pathogens that demonstrate the fat-tailed dispersal kernel are of significant concern owing to their potentially damaging and fast-spreading nature. Recurrent outbreak of endemic and emerging infectious diseases with potential for long-distance dispersal through air, water, trade, and human migration (for example, dengue, scrub typhus, influenza (H5N1 and H1N1) of humans, rabies, foot and mouth disease of animals, and wheat rusts, late blight, and wheat blast of plants) have been claiming numerous lives and causing severe threats in the country's economy. Understanding the epidemiology of these diseases and modeling the relationship among epidemiological parameters can contribute significantly in identifying appropriate disease control strategies. Discrete-time spatial deterministic and stochastic approaches including spatial network-based modeling could be employed for understanding an epidemic outbreak and its spatial dispersion and for utilizing different management strategies to prevent such epidemics from reaching regional scales. This

would provide important insights regarding the timing, rate, and duration of the epidemics and efficacy of different management strategies to manage an epidemic outbreak. However, the socio-economic and geopolitical situation at local, regional and national levels should also be considered while devising management strategies for any epidemic outbreak.

Keywords: Epidemiology, Infectious diseases, Long distance dispersal, Management strategies, Modeling

~*~

132 O - Combined Effects of Inundative Biocontrol and Anaerobic Soil Disinfestation Using Non-Host Cover Crops as Carbon Sources for Clubroot Management in Mustard Greens

Ram B. Khadka, Sally A. Miller

Department of Plant Pathology, The Ohio State University, Ohio Agricultural Research and Development Center, Wooster, Ohio, USA

Correspondence Email: khadka.13@osu.edu

Clubroot, caused by *Plasmodiophora brassicae*, is a major production threat to cruciferous crops worldwide and is becoming increasingly challenging due to the lack of available management options. Experiments were designed to evaluate the combination of commercially available biocontrol agents and cover crops that could be used as carbon sources in anaerobic soil disinfestation (ASD-carbon source) for clubroot disease management. Experiments were conducted utilizing a factorial randomized complete block design with three replications, in which the first factor was ASD amendment (winter rye, ryegrass, sudangrass or leek cover crop, wheat bran (standard), covered with no amendment (anaerobic), and uncovered with no amendment (aerobic). The second factor was biocontrol treatment [Prestop (*Gliocladium catenulatum*), Actinovate (*Streptomyces lydicus*), Serenade (*Bacillus subtilis*) or no biocontrol product]. Cover crops were grown in 350-ml pots containing muck soil, inoculated with the pathogen (*P. brassicae*) and incubated for 45 days in growth chambers. Then cover crops were uprooted, chopped into small pieces, and mixed with soil in the same pot. Wheat bran was mixed with soil at 10 g kg⁻¹ soil before filling the pots. Each pot was saturated with tap water before inoculation of biocontrol products and sealing in Ziploc™ plastic bags. After three weeks, bags were removed, soil aired for one week, and mustard greens 'Green Wave' seeded. Prestop and Serenade consistently reduced the clubroot index alone and in combination with wheat bran, and sudangrass-amended ASD treatment. Furthermore, ASD with winter rye consistently showed synergy with Serenade and Actinovate, and ASD with sudangrass showed synergy with Actinovate, Prestop and Serenade in reducing clubroot indices. Therefore, cover crops such as ryegrass, sudangrass and winter rye could be utilized as ASD carbon sources and their combination with Serenade, Actinovate or Prestop could enhance the efficacy of ASD for clubroot management in organic and conventional farming systems.

Keywords: Anaerobic soil disinfestation, Biocontrol, Clubroot, Cover crop, Cruciferous crop

~*~

133 O - Red Light Absorbance-Transmittance, Fluorescence and Electron Transport Measures from PS II on the T4 and E1 and Leaves of Eight Maize Hybrids

¹Nav R. Adhikari, ²Susmita Kafle, ³Jiwan Shrestha, ¹Lal P. Amgain, ¹Bishnu B. Adhikari, ¹Subarna Sharma

¹Institute of Agriculture and Animal Science, Tribhuvan University, Kathmandu, Nepal

²Unique Seed Company, Dhangadhi-13, Kailali, Nepal

³Nepal Agriculture Research Council, Khumaltar, Lalitpur, Nepal

Correspondence Email: navraj.adhikari@gmail.com

We examined red light absorbance-transmittance (RAT) and chlorophyll fluorescence (Fo, Fm, Fm-Fo), electron transport from PS II (Fv/Fm, Fv/Fo) for eight maize hybrids. An experiment was conducted using randomized complete block design with three replications of seed planting on Dec 1, 2017 at a farmer's field in Fulbari, Chitwan, Nepal. We took one hundred observations of RAT measures (using SPAD 502 plus, Spectrum, USA) from T4 leaf of each of the six randomly selected plants in a 3-day period starting from 69th day after seeding during early vegetative stage. Fo, Fm, Fv (=Fm-Fo), Fv/Fm and Fv/Fo were also measured from the E1 leaf of the same plants in each of twenty-four experimental plots starting from the 141th day to 148th day during late grain filling (using chlorophyll fluorometer (OS30p+, Opti-Sciences, USA)). After analysis of the frequency distributions of the measures and comparing their means, we found no significant difference among the single reading, and averages of three and 100 readings. Besides, we can conclude that a single reading from sample plants from the T4 and E1 leaves of six plants in each plot is enough to examine the traits, but we must eliminate outliers while taking observations from the equipment if we are just examining averages of maize crop genotypes in the respective T4 and E1 leaf. We could not find special peculiarities in the frequency distribution of the measures for high grain yielding hybrids although we found different types of frequency distribution pattern for different hybrids based on skewness and kurtosis. Three significantly differing, highest grain-yielding hybrids found were Bioseed, Gangakaveri, and Shresta and their corresponding grain yields were 16, 14 and 12 tons per hectare, respectively.

Keywords: Electron transport, Fluorescence, Maize hybrid, Red light absorbance-transmittance

~*~

134 P - Identification of Potential Overwintering Host of Cotton Leafroll Dwarf Virus in Georgia

Nabin P. Sedhain, Sudeep Bag, Jared Whitaker, Ping Chee, Phillip Roberts, Robert Kemerait

University of Georgia, Tifton, Georgia, USA

Correspondence Email: sudeepbag@uga.edu

During 2018-2019, cotton leafroll dwarf virus (CLRDV) was reported from the southern United States in Alabama, Florida, Georgia, Mississippi, South Carolina, and Texas. This phloem-restricted virus is transmitted by aphids in a persistent, circulative and non-propagative manner. Since January 2019, in coordination with UGA-Extension, an extensive survey was initiated in Georgia to investigate the alternate hosts that could potentially act as a green bridge. Different weeds commonly found in Georgia including henbit deadnettle (*Lamium amplexicaule*), mouse-ear chickweed (*Cerastium vulgatum*), purple cudweed (*Gnaphalium purpureum*), curly dock (*Rumex crispus*), Carolina geranium (*Geranium carolinianum*), perennial peanut (*Arachis glabrata*), and wild radish (*Rhaphanus raphanistrum*) were collected from commercial cotton

fields. In addition, cotton stalks and leaf regrowth from the remains of the previous year crop were also sampled. The samples were analyzed using reverse transcription polymerase chain reaction (RT-PCR) to detect the presence of the virus. Among the weeds tested, CLRDV was detected from henbit and perennial peanut collected from a cotton field in Tift County. The virus was detected from the ratoon cotton stalk, suggesting cotton stalks as its potential overwintering habitat. This report suggests that henbit deadnettle, perennial peanut, and ratoon cotton are potential host habitats to serve as the green bridge for the virus and the aphid vectors. In addition, this report warrants further study on the role of those specific weeds and the regrowth from the ratoon cotton stalks on the epidemiology of this emerging viral disease.

Keywords: Cotton leafroll dwarf disease, Disease epidemiology, Green bridge

~*~

135 P - Estimating Biomass of Cover Crop Grown under Different Grazing Management Scenarios Using WorldView-3 Spectral Reflectance and Forage Tower

Sonisa Sharma

Noble Research Institute, Ardmore, Oklahoma, USA

Correspondence Email: ssharma@noble.org

Grasslands and grazing systems are dominant landscape features in the Southern Great Plains (SGP) of the United States and in similar climatic regions around the world. Dynamic grassland vegetation parameters such as biomass are important for management and for research on carbon cycling, soil formation, and preservation. The variable climate of the SGP creates large year-to-year variability in grassland vegetation productivity. Remote sensing using spectral reflectance has shown potential for large scale, non-destructive monitoring of these vegetation dynamics. However, that situation is changing with the emergence of numerous and increasingly advanced satellite imagery. Currently, there is a clear need to improve our ability to use reflectance data to monitor and forecast grassland vegetation parameters for the benefit of ranchers, extension workers, farmers, scientists, and government personnel. The objectives of this study were to: 1) understand the relationship between vegetation biomass and spectral reflectance in grasslands; and 2) determine the accuracy with which a handheld spectral reflectance sensor and forage tower can be used for *in situ* non-destructive vegetation parameter estimations and forecasts.

Keywords: Estimation accuracy, Grass biomass, Vegetation indices

~*~

136 O - Evaluation of Potato Germplasm for Late Blight Disease Resistance in Surkhet, Nepal

¹Prem B. Magar, ²Baidya N. Mahto, ¹Ram B. Yadaw, ³Kalika P. Upadhyay, ¹Keshab R. Pokhrel, ³Suprabha Pandey

¹Nepal Agricultural Research Council, Agriculture Research Station, Dasharathpur, Surkhet, Nepal

²Nepal Agricultural Research Council, Singhadurbar Plaza, Kathmandu, Nepal

³Nepal Agricultural Research Council, National Potato Research Program, Lalitpur, Nepal

Correspondence Email: premmagar12@gmail.com

Late blight disease of potato caused by the fungus *Phytophthora infestans* (Mont.) de Bary is one of the most important diseases of potatoes (*Solanum tuberosum* L.) in all potato-growing areas of Nepal and it is becoming more destructive in a recent years due to the loss of resistance in the available cultivars. During 2016 and 2017, field experiment was conducted to screen out 30 genotypes including resistant and susceptible checks in alpha lattice design with two replications under natural epiphytotic condition. The disease was severe during the trial period, reaching up to 9 score (scale 1-9) in susceptible check variety (100% disease severity). Different genotypes showed different levels of resistance (score value 1 to 9) indicating some good sources of resistance genotypes available in the country. Replication effect was non-significant, whereas the genotype effect was highly significant for disease severity, AUDPC (area under disease progress curve), and score value. In addition, there was a significant difference in tuber yield among the tested genotypes. Six genotypes namely, CIP 384321.15, PRP 146267.6, PRP 286365.6, PRP 286265.22, PRP 136369.1, and LBr-40 were found resistant against the fungus. Most of the genotypes showed moderately resistant reaction. Four genotypes were categorized as moderately susceptible. Two genotypes expressed susceptible response while three genotypes exhibited highly susceptible response to the disease. Maximum tuber yield (29.92 t/ha) was found in moderately resistant genotype PRP 296667.3 and lowest yield (3.96 t/ha) was found in highly susceptible genotype, PRP 136368.3. The identified resistant sources can be used as a donor line for breeding *P. infestans* resistant potato cultivars in future.

Keywords: Disease resistant, Disease susceptible, *Phytophthora infestans*

~*~

137 P - Factors Influencing the Adoption of Conservation Agriculture in the Eastern Gangetic Region of Nepal

¹Surya P. Adhikari, ²Maria F. Rola-Rubzen, ¹Yuga N. Ghimire, ¹Dinesh B. Thapa Magar, ³Renuka Shrestha

¹Socioeconomics & Agricultural Research Policy Division, Nepal Agricultural Research Council, Lalitpur, Nepal

²School of Agriculture & Environment, University of Western Australia, Perth, Australia

³Agronomy Division, Nepal Agricultural Research Council, Lalitpur, Nepal

Correspondence Email: adhikarisurya56@gmail.com

Agricultural labor scarcity, dependence on rain-fed farming, inappropriate use of inputs, high production costs, and declining productivity are the major challenges of Nepalese agriculture. To address the above challenges, conservation agriculture (CA) has been widely promoted in the eastern Gangetic region of Nepal, to reduce production cost and improve yield through mechanization and CA practices. Despite the benefits of technology, there is no rapid spread of CA in Nepal. Very little information is known regarding why a small number of farmers have adopted this technology. Therefore, for scaling out CA technologies, it is important to understand farmers' adoption decisions. The aim of this study was to determine the socioeconomic and institutional factors that influence the adoption of conservation agriculture in Nepal. A socio-economic survey was conducted among adopter and non-adopter farmers during April-August 2018. A total of 337 samples (126 adopters & 211 non-adopters) were collected using structured interviews conducted in Sunsari and Dhanusha districts of Nepal. A probit model was used to identify factors that influenced the adoption of conservation agriculture. The result showed that

households with a greater number of dependent members and larger farm size adopted CA technologies. In addition, households who received CA-related training were more likely to adopt the technology. Similarly, memberships in an agricultural-related organization, and access to conservation agricultural machinery positively contributed to CA adoption. Farmers who used information related to crop production and marketing through TVs, radios, and newspapers adopted CA technologies more often than those who did not use those media. Lastly, farmers who participated in the field days and exposure visit activities were positively inclined to adopt the technology. For widening the adoption of this technology, government extension policy should initially focus on larger farmers and provide them more CA-related training, and focus on improving access to CA machinery, increasing the number of exposure visits and field days, and highlight the benefits of the technologies.

Keywords: Adoption, Conservation agriculture, Mechanization, Probit model

~*~

138 P - Varietal Evaluation of Promising Maize Genotypes in Mid Hills of Nepal

¹Bipin Neupane, ¹Ankur Poudel, ²Pradeep Wagle

¹Department of Agronomy, Plant Breeding & Statistics, Institute of Agriculture and Animal Science, Lamjung Campus, Lamjung, Nepal

²USDA, Agricultural Research Service, Grazingland Research Laboratory, El Reno, Oklahoma, USA

Correspondence Email: neupanebpn63@gmail.com

Varietal evaluation of hybrid maize genotypes with desired performance is one of the main objectives of a maize breeding program. Fourteen hybrid maize genotypes were evaluated for 17 quantitative and nine qualitative traits using randomized complete block design (RCBD) with three replications in Sundarbajar, Lamjung, Nepal. The major objective was to identify superior genotypes based on genotypic and phenotypic variability, heritability, genetic advance, and correlation on grain yield and yield-associated traits. Analysis of variance revealed the existence of significant differences in 17 quantitative traits among the genotypes. Large variation was observed for grain yield among genotypes. Genotype RL-24-0/ RL-111 had the lowest yield (5.53 t/ha) and genotype Pioneer had the highest yield (11.98 t/ha) whereas check variety Rampur Hybrid-10 had the yield of 8.23 t/ha. Grain yield showed highly significant positive correlations with stem circumference ($r=0.67$), and number of ear ($r=0.6$), but significant negative correlation ($r=-0.55$) with anthesis-silking interval. Dendrogram grouped 14 genotypes into four clusters. Cluster I incorporated the highest number (five) of genotypes, which also had highest cluster mean (average yield of 10.01t/ha) for grain yield. Traits namely test weight, ear aspect, anthesis-silking interval, number of ears, and tassel branching can be considered in the selection process of maize crop improvement programs as they had high GCV, PCV, and heritability along with high genetic advances.

Keywords: Cluster, Correlation, Genetic advance, Heritability, Hybrid

~*~

139 O - Analyzing Soil Nutrient Balance in Hills of Nepal: Do Socio-economic Factors Matter for Sustainable Land Use?

Romy Das Karna

Salem College, Winston-Salem, North Carolina, USA

Correspondence Email: romeedasnp@gmail.com

Soil nutrient balance studies have increasingly become influential in policy discussions for soil fertility management and sustainable agriculture in developing countries. However, such studies, particularly in the context of Nepal, have often overlooked socio-economic characteristics of farm households that demonstrate significant influence in balancing soil nutrients. This study estimates the balances of three macro-nutrients - nitrogen, phosphorus, and potassium - and analyzes the impact of socio-economic factors on each of them applying a Seemingly Unrelated Regression (SUR) model. The results indicated that, on average, farm households in the study area had an annual surplus of 31 kg ha⁻¹ nitrogen but an annual deficit of 20 kg ha⁻¹ phosphorus and 45 kg ha⁻¹ potassium. Socio-economic factors, such as distance to the market center, distance to farm plot from the homestead, possession of sloping plots, and receiving training on nutrient management showed a negative impact on nutrient balances. In contrast, male-headed households, family size, and the use of improved composting methods showed a positive impact on nutrient balances. The study suggests that increased supply of organic sources of phosphorus and potassium via improved composting, better accessibility to inorganic phosphorus and potassium fertilizers with improved marketing infrastructure, and site-specific fertilizer recommendations which are more accountable to the changing pattern of cultivation in mid-hills, may contribute to minimizing the trend of nutrient mining. Further, gender-sensitive extension services are needed to provide female-headed households with better knowledge and skills to manage their soil nutrients.

Keywords: Soil fertility, Soil nutrient balance, Sustainable agriculture

~*~

140 O - Multi-year Prediction of Rice and Wheat Yields over Changing Agro-climatic Scenarios in Central Terai of Nepal

¹Lal P. Amgain,²Devi Dhakal, ²Sailesh Adhikari, ³Saurav Suman

¹Faculty of Agriculture, Far-western University, Tikapur, Kailali, Nepal

²Central Department of Hydrology and Meteorology, Tribhuvan University, Kirtipur, Nepal

³Climate Change, Agriculture and Food Security Program, World Food Organization, Lalitpur, Nepal

Correspondence Email: lalamgain@fwuagriculture.com

Central Terai in Nepal is the major production domain of rice and wheat; however, their yields over the last three decades have been affected heavily by anomalies of agro-climatic indices such as fluctuating temperature, solar radiation, and rainfall. NASA POWER data over the last 32 years (1985-2017) in Dumkauli in Nawalparasi district and Taulihawa in Kapilvastu district were purposively selected, downloaded, and validated with recorded data repository of the Department of Hydrology and Meteorology for the study of the multi-year prediction of agro-climatic scenarios on yields of rice and wheat in the Central Terai. The trend analysis of grain yields of rice in Nawalparasi and wheat in Kapilvastu were correlated over the historical records of maximum and minimum temperatures along with rainfall. A positive correlation was found with minimum temperature and rainfall with adequately fit regression equations and coefficient of determination

for both rice and wheat. CSM-CERES-Rice and Wheat embedded in DSSAT ver 4.7 crop models was used to study the multi-year prediction of rice and wheat yield over the recorded and simulated climatic scenarios. Simulation results approximated the observed data of the rice and wheat yields recorded from the Ministry of Agricultural Development in Nepal. The multi-year prediction was also done for the predicted weather following IPCC (2007) scenario using environmental modification section of the DSSAT ver 4.7 models for both rice and wheat. The results showed that both the rice and wheat yields can only be sustained for a few years by using the present crop varieties and urged for the development of climate-smart rice and wheat varieties to feed the increasingly growing population. Two major agro-climatic indices, temperature and rainfall, were the most sensitive for wheat and rice production, respectively, in Central Terai of Nepal.

Keywords: Agro-climatic indices, DSSAT 4.7 crop model, Multi-year prediction, Rice and wheat yields

~*~

141 O - Comparative Assessment of Soil Health Indicators in Response to Woodland and Silvopasture Land Use Systems

Sangita Karki, Raymon Shange, Ramble Ankumah, Wendell McElhenney, Osagie Idehen
Department of Agricultural and Environmental Sciences, Tuskegee University, Tuskegee,
Alabama, USA

Correspondence Email: sngtkarki@gmail.com

The inherent complexity of soil creates difficulty in detecting the shift in the soil quality and ecosystem health. Therefore, indicators that are sensitive to change in land management practices are of utmost importance. Soil chemical properties, enzyme activities, and microbial community composition are often studied as important indicators of the soil health dynamics in the forest, pasture, and cultivated land-use systems. However, limited studies have been documented on the soil health indicators in the silvopasture system (SPS). Therefore, the objective of the study was to determine the impact of SPS on soil health characteristics and compare that with the forest-woodland system (WS). Soil samples were collected from the existing southern-pine SPS and hardwood and southern-pine mixed WS at the Atkins agroforestry research and demonstration site, Tuskegee University. The microplate fluorometric method was used for enzyme assay, while the 16sRNA MiSeq gene sequencing method was used for microbial community composition. SPS had a significant effect on acidic phosphatase (169.5 ± 6.59), alkaline phosphatase (43.6 ± 3.39), phosphodiesterase (10.5 ± 0.71), and α -glucosidase (61.7 ± 3.34) enzyme activity. Proteobacteria, Actinobacteria, and Acidobacteria were the most dominant bacterial phyla. Comparatively, Proteobacteria were higher in SPS while Acidobacteria were higher in WS. Similarly, Ascomycota and Basidiomycota were the most dominant fungal phyla in both systems. The microbial community was also impacted by the SPS at the class and genus taxonomic level. Similarly, microbial diversity was also significantly impacted by the SPS. Significantly higher soil organic carbon ($p < 0.0001$), total nitrogen ($p < 0.0001$), Mehlich phosphorus ($p < 0.001$), pH ($p < 0.01$), and nitrate ($p < 0.05$) were observed in SPS soil. Management practices, plant species, and edaphic properties were the most significant contributors to soil health dynamics.

Keywords: Enzyme, Soil microbial activities, Soil properties, Soil qualities

~*~

142 P - Seed Quality Performance of Eight Rice Varieties Collected from Four Seed Production Centers of Nepal

Krishna P. Sharma, Birendra K. Bhattachan

Department of Agronomy, Agriculture and Forestry University, Chitwan, Nepal

Correspondence Email: bkbkumar56@yahoo.com

Good quality rice seed plays an important role in food production for the ever-increasing population in Nepal. An experiment was conducted to study the seed quality of rice varieties collected from different seed-producing centers of Nepal. Rice seeds collected from different centers were evaluated at the seed laboratory of Hetauda during 2017-2018. The study was a factorial completely randomized design with four seed-centers as the main plot factor, eight rice varieties as subplot factor, and four replications. The result showed that germination of seed from Hardinath, Dhanusa was 93%, which was at par with Improved Seed Company Chitwan (92.5%), and significantly higher than the least germination (88.5%) seeds collected from Cooperative Seed Rautahat. Among the rice varieties, Sambasub-1 had the highest germination capacity (92%), which was similar to Manakamana-1 (92%), whereas Sukhha-3 had the least germination capacity (88.8%). Seeds from Hardinath, Dhanusa had the highest seedling vigor index of 2339, and seeds from Cooperative Seed Rautahat had the least seedling vigor index of 1808. Among the rice varieties, Manakamana-1 had the highest seedling vigor of 2217, which was at par with the seedling vigor index of Ramdhan (2144). Sornasub-1 had the least seedling vigor index of 1712. Rice blast, a seed-borne disease infected by *Pyricularia oryzae*, was highest in Ramdhan seed (1.6) collected from Big Seed Trading, Bara, while the least infection was observed in Sabitri (1.06) collected from Hardinath, Dhanusa. Manakamana-1, from Hardinath, Dhanusa, had the highest quality seeds among all rice seed varieties collected from all seed-producing centers.

Keywords: Germination, Rice seed varieties, Seed health, Seed quality, Vigor

~*~

143 O - Economics of Chhari and Marketable-size Carps in Bara, Nepal

¹Prabin Adhikari, ¹Dilip K. Jha, ¹Mousami Poudel, ¹Suraj Gurung, ²Mahesh C. Acharya

¹Agriculture and Forestry University, Chitwan, Nepal

²Department of Pest Risk assessment, Plant Quarantine and Pesticide Management Center, Lalitpur, Nepal

Correspondence Email: adhikariprabin8@gmail.com

A study was conducted to analyze the economics of production of chhari and marketable-size carps in Bara, Nepal. Small-sized whole fish of mostly mrigal (*Cirrhinus mrigala*) is commonly called chhari fish. A total of 90 farmers; 45 chhari producing and 45 marketable-size carps producing farmers were selected randomly and surveyed through pre-tested semi-structured interview-based schedule in March 2019. Data were analyzed using STATA 12.1 and SPSS 25. The study revealed that the total cost of fish production per hectare of pond area was 971,927NRs/year. Chhari production was more profitable in the study area as compared to marketable-size carps with a benefit-cost ratio of 1.97 and 1.67, respectively. Production function analysis including six explanatory variables, showed significant effect of feed, labor ($p < 0.01$), maintenance, fuel, electricity ($p < 0.05$), lime, and fertilizer and medicine costs ($p < 0.1$), but seed cost was insignificant. The return to scale was found to be 0.906 and at 2nd stage of production. According to estimated allocative efficiency indices, it is suggested to reduce seed and lime, and fertilizer cum medicine

costs by 159% and 72%, respectively, and increase the maintenance, feed, fuel cum electricity, and labor cost by about 95%, 33%, 95%, and 50%, respectively, for chhari producers. Similarly, for marketable-size carp producers, it is suggested to decrease fuel and electricity cost by 176% and increase maintenance seed, feed, lime, fertilizer and medicine, and labor costs by 95%, 86%, 13%, 29%, and 30%, respectively. Thus, fishery enterprise is in the stage of higher potentiality to increase the production in the study area.

Keywords: Benefit cost ratio, Chhari, Fishery, Resource-use efficiency

~*~

144 O - Seed Yield and Profit of Wheat Seed Varieties Collected from Farmers and Government Sector of Nepal

Birendra K. Bhattachan, Amit Timilsina

Department of Agronomy, Agriculture and Forestry University, Chitwan, Nepal

Correspondence Email: siutibhattachan@gmail.com

Farmers in Nepal use wheat seeds produced by farmers as well as the government sector. An experiment was conducted at the farm of Agriculture and Forestry University from December 2017 to April 2018 to study the seed yield and economic profitability of wheat seed varieties collected from four seed-producing centers. The study had a split-plot design in which the main plot factor was location from where seeds were collected (1. National Wheat Research Program (NWRP), Bhairahawa; 2. Farmer's Cooperative Chitwan; 3. Farmers of Bardiya, and 4. Farmers of Chitwan), subplot factor was wheat varieties (i.e., 1. Gautam, 2. Vijay, and 3. NL-297) and four replications were used. The result showed that NWRP, Bhairahawa, produced a significantly highest seed yield of 3.42 t ha⁻¹ followed by Farmer's Cooperative Chitwan (3.1 t ha⁻¹), and farmers of Chitwan (3.06 t ha⁻¹) whereas the least seed yield (3.01 t ha⁻¹) was produced by farmers of Bardiya. Similarly, variety Gautam produced the highest seed yield of 3.4 t ha⁻¹, followed by Vijay (3.1 t ha⁻¹), and the lowest yield of 3.0 t ha⁻¹ was produced by NL-297. NWRP, Bhairahawa produced highest economic profit of US\$707 ha⁻¹, followed by farmers of Chitwan and Bardiya at \$618 ha⁻¹ and 607 ha⁻¹, respectively, and the least profit was for Farmer's Cooperative Chitwan with \$576 ha⁻¹. Gautam produced the highest economic profit of US \$694 ha⁻¹, followed by Vijay (\$607 ha⁻¹), and the least economic profit was produced by NL-297 (\$580 ha⁻¹). Thus, wheat seed variety Gautam collected from the government sector had the highest seed yield and could provide the most economic profit among the seed varieties and the locations studied.

Keywords: Economic profit, Farmer's seed, Government's seed, Wheat seed yield

~*~

145 P - Growth and Profitability of Maize under Different Organic and Inorganic Nutrient Management Scenarios in Chitwan, Nepal

Kailash R. Bhatt

Agronomy Department, Agriculture and Forestry University, Chitwan, Nepal

Correspondence Email: ramankailash63@gmail.com

A field experiment was conducted to evaluate the effect of different organic and inorganic fertilizers on growth and profitability of maize (*Zea mays* L.) in Chitwan, Nepal during the spring season of 2017. The experiment was laid out in Randomized Complete Block Design (RCBD)

using 8 treatments to supply 120 kg N using urea, farmyard manure (FYM), and poultry manure (PM). Those 8 treatments included: T1: 120 kg N ha⁻¹ as Urea; T2: 60 kg N ha⁻¹ as Urea + 60 kg N ha⁻¹ as FYM; T3: 60 kg N ha⁻¹ as Urea + 60 kg N ha⁻¹ as PM; T4: 60 kg N ha⁻¹ as FYM + 60 kg N ha⁻¹ as PM; T5: 60 kg N ha⁻¹ as FYM + 30 kg N ha⁻¹ as Urea + 30 kg N ha⁻¹ as PM; T6: 60 kg N ha⁻¹ as Urea + 30 kg N ha⁻¹ as PM + 30 kg N ha⁻¹ as FYM; T7: 60 kg N ha⁻¹ as PM + 30 kg N ha⁻¹ as FYM + 30 kg N ha⁻¹ as Urea, and T8: Control or no nitrogen with four replications. The results showed that the growth parameters such as plant height, leaf area index, and dry matter accumulation were higher at the plots fertilized with combined application of organic and inorganic fertilizers as compared to control plots. Likewise, days to tasseling (62.5 days), days to silking (68.0 days), and anthesis silking intervals (3.5 days) were also found earlier with the same treatments. Similarly, biological yield (10.12 t ha⁻¹), net return (NRs. 42.57) and B:C ratios (1.58) were also comparatively superior for T3: 60 kg N ha⁻¹ as Urea + 60 kg N ha⁻¹ as PM. Therefore, based on our findings, application of 120 kg nitrogen through T3 can be recommended to the farmers of Chitwan.

Keywords: Farmyard manure, Maize, Poultry manure, Urea, Crop yield

~*~

146 O - Factors Affecting Adoption of Good Agriculture Practices on Mandarin Orange (*Citrus reticulata* Blanco) Production in Arghakhanchi District, Nepal

¹Bishnu P. Panth, ²Bishnu Bhusal, ³Shiva C. Dhakal

¹Department of Agricultural Extension and Rural Sociology, IAAS, Kathmandu, Nepal

²Department of Genetics and Plant Breeding, IAAS, Kathmandu, Nepal

³Department of Agricultural Economics and Agribusiness Management, Kathmandu, Nepal

Correspondence Email: bishnuprsdpanth@gmail.com

This study was conducted to determine the factors affecting adoption of good agriculture practices (GAPs) of mandarin orange (*Citrus reticulata* Blanco) production in Arghakhanchi district. Use of certified plant materials, use of recommended dose of fertilizers, plantation in pit of recommended dimension, harvesting and handling procedure, waste management, documentation and record keeping, planning of the farm, workers' welfare, and training to farmers were used as GAPs standards. The study used randomly selected 120 mandarin growers from mandarin block in April 2018. Descriptive statistical tools including logistic regression, t-test and linear regression were used to analyze data collected from semi-structured interviews. The logistic regression coefficients implied land holding was a highly significant socio-economic variable influencing adoption of GAPs. Family size, caste, farming experience, occupation and education level of household head were significant socio-economic variables influencing adoption of GAPs. The linear regression coefficients of mandarin productivity were found highly significant with use of certified planting materials, recommended dose of chemical fertilizers, plantation of seedling in the recommended size of pit, and waste management. Mandarin productivity was found significant with training to farmers and with farm planning and workers' welfare. From independent t-test, use of recommended dose of chemical fertilizers, good harvesting and handling procedure, waste management, and farm planning were found highly significant with mandarin productivity. Similarly, farmer's training and use of certified planting materials and documentation and record keeping were found significant with productivity of mandarin. The major problematic disease was found to be powdery mildew whereas green stink bug was found to be the major problematic

insect. Lack of insurance was the major production problem while lower price of the produced commodity was the major marketing problem in the study area.

Keywords: Good agricultural practices, Mandarin, Productivity

~*~

147 O - Biotic and Abiotic Stress Conditions and Rice Production Efficiency: Evidence from Nepal

¹*Sudip Adhikari*, ¹*Aditya R. Khanal*, ²*Gokul Poudel*

¹College of Agriculture, Tennessee State University, Nashville, Tennessee, USA

²CIMMYT, South Asia office, Kathmandu, Nepal

Correspondence Email: sadhika2@my.tnstate.edu

Production agriculture contributes around 29% to Nepalese gross domestic product (GDP) and involves around 65% of population. Rice (*Oryza sativa* L.) is a staple crop and one of the important commodities in Nepalese agriculture. However, Nepal lacks self-sufficiency in rice and relies on import to fully meet the domestic demand of rice. Rice production in Nepal faces various biotic and abiotic stresses, which contribute to trigger many adverse effects on production and productivity. The major abiotic stresses discussed in the literature include drought, flood, very high and low temperatures, salinity, and so on. Studies have found that rice producers in many developing countries currently operate on technically inefficient production systems. This study integrated remote sensing and survey data to rigorously estimate the production and efficiency in Nepalese rice production. Specifically, we used ‘normalized difference vegetative index’ (NDVI) extracted from Landsat Satellite images and survey data of 1052 households from six districts (Kanchanpur, Kailali, Bardiya, Banke, Kapilvastu, and Rupandehi). The NDVI values capture the variability in standing green biomass (a proxy for yield). From normally distributed NDVI values of each district, samples were randomly selected from each quadrant of normal curve to collect proportionate data. We found significant impacts of abiotic stresses on the production and technical efficiency in Nepalese rice production.

Keywords: Landsat satellite images, NDVI value, Rice, Plant stress, Technical efficiency

~*~

148 P - Chyangra and Chyangra Fiber: Current Status and Future Prospects

^{1,2}*Saroj Sapkota*, ²*Neena Amatya Gorkhali*, ³*Deepak Adhikari*, ¹*Nirajan Bhattarai*

¹Department of Animal Breeding and Biotechnology, Agriculture and Forestry University, Chitwan, Nepal

²Animal Breeding Division, Nepal Agricultural Research Council, Khumaltar, Lalitpur, Nepal

³Swine and Avian Research Program, Nepal Agricultural Research Council, Khumaltar, Lalitpur, Nepal

Correspondence Email: sarose.sapkota@gmail.com

Chyangra (*Capra hircus*) is the mountain goat originating from Tibet and usually raised in an altitude of 2400 m and above across the northern borders of Nepal. Chyangra is mainly raised under migratory system (74.5%) followed by sedentary (24.5%) system. They are smaller in size, not prolific (usually single kid per year), and hardy with long hair coat. Chyangra are grown for meat as well as for draught purpose and are popular for high value as well as fine quality wool

called Chyangra fiber. Chyangra fibers have high market potentials, as they have unique blend and qualities (13-18 microns of diameter) and are popular within and outside the country. The methodology of this study was designed to have maximum interaction with stakeholders at various levels including producers, middlemen, processors, suppliers, service providers, government officials, policymakers and consumers. Based on the information, four sites namely Muktinath, Chhoser, Kagbeni, and Chhumsang were selected for the study on Chyangra and its fiber production and marketing. Simple descriptive statistics (mean, range) and quantitative data collected were analyzed using Excel. Qualitative data were obtained from household survey, focus group discussion, and transect walk. Current national supply and demand study on Chyangra fiber showed that there is a considerable gap (about 96.36% deficiency) in production. Total national earning from Chyangra fiber product export is about NRs. 3 billion per year. Immediate interventions for improving productivity of Chyangra goats through checking indiscriminate breeding/inbreeding and enforcing selection practices and crossbreeding, providing promotional investment support (e.g. soft loans, insurance, community goat rearing) along with appropriate techniques for harvesting and value addition of Chyangra fiber are urgently needed.

Keywords: Chyangra, Fiber, Goat

~*~

149 P - Analyzing Determinants of Adaptation to Flood in Eastern Nepal Using Parametric and Semiparametric Approach

Santosh Pathak

Department of Agricultural Economics and Agribusiness, Louisiana State University, Baton Rouge, Louisiana, USA

Correspondence Email: spath11@lsu.edu

Flood remains the most catastrophic disaster in Nepal historically. Flood is a common issue during monsoon season, especially in the valleys and the Terai plains. The damage from flood extends beyond assets and infrastructures to economic ripple effects. This study was conducted with the objective of identifying the existing adaptation practices and assessing the determinants of adaptation to flood. Both parametric and semiparametric estimators were used to identify the factors influencing the adaptation process. The results are based on a questionnaire survey of randomly selected 217 households in the Saptari district of eastern Nepal. Most of the adaptation practices were conventional types. Access to a relief program, provision of irrigation, and membership of social groups significantly affected the farmers' adaptation to flood hazards. This study cautions the use of parametric estimator with distributional assumptions like logit and probit model to identify the determinants of adaptation and make inferences. Inferences from semiparametric estimation approach provide a more reliable estimate. Existing adaptation measures need strengthening with scientific measures to mitigate the effects from flood.

Keywords: Adaptation, Flood, Semiparametric approach

~*~

150 O - Agricultural Productivity Growth in Nepal: Potentials, Trend and Determinants

¹Ganesh R. Joshi, ²Narayan B. Joshi, ³Lila B. Karki

¹Central Department of Environmental Sciences, Tribhuvan University, Kathmandu, Nepal.

²Sustainable Research & Development Center, Kathmandu, Nepal

³Cooperative Extension, Tuskegee University, Alabama, USA

Correspondence Email: grjoshi20@gmail.com

Agriculture is considered a main sector for economic growth, poverty reduction, and food security in Nepal. Recognizing its importance, various policies and programs were implemented in the past. This paper aims to review the growth of the agricultural sector and economy in different periods, analyze the growth in area, production, and productivity of agricultural sub-sectors between 1974 and 2014, and identify the determinants of agricultural growth. Compared with her neighbors, the productivity of major crops and the use of fertilizer is at low level in Nepal. During the first half of this period, the production growth in most of the crops and commodities came mostly from area expansion rather than yield growth. The public resource allocation to the agricultural sector in general and agricultural research in particular remained at a very minimum level compared with other sectors. Moreover, the AGDP growth was higher for the Agriculture Perspective Plan (APP) period compared to the pre-APP period. The determinants of AGDP growth showed that the variables such as real public investment in the agricultural sector, development of roads, and normal weather years were significant and positive variables while literacy among the economically active population engaged in agriculture was a negative and significant variable. Despite the low level of growth, there are still opportunities for agricultural development in Nepal. The productivity of most of the crops and commodities can be increased by bridging yield gap between the farm and research centers. To harness this potential, public resource allocation to the agricultural sector should be increased and the emphasis should be given for the development of rural infrastructures such as roads, irrigation, and market centers. The policies and programs should also be focused on the retention of educated youths and governance needs to be improved by adopting transparent and accountable mechanisms.

Keywords: Agriculture, Determinants, Economic growth, Nepal, Productivity

~*~

151 O - Production and Marketing of Ginger: A Case Study in Salyan District, Nepal

¹Shristi Upadhyaya, ²O. P. Singh, ³Lila B. Karki, ⁴Raj K. Adhikari

¹Agriculture and Forestry University, Chitwan, Nepal

²Department of Extension and Rural Sociology, Agriculture and Forestry University, Chitwan, Nepal

³Tuskegee University, Cooperative Extension, Tuskegee, Alabama, USA

⁴Himalayan College of Agricultural Science and Technology, Kathmandu, Nepal

Correspondence Email: shristiup624@gmail.com

Ginger is an important spice crop traditionally grown in the mid-hills of Nepal for cash income. Major challenges for ginger cultivation are the limited availability of information on the production process and lack of farmers' direct access to market. This study was conducted to assess the production and marketing status of ginger in the Salyan district. A total of 60 ginger producers from Sharada and Bagchaur Municipalities and Siddhakumakh Rural Municipality were sampled

using simple random sampling technique. Primary data were collected using semi-structured questionnaire for household survey as well as using focus group discussion (FGD), key informant interview (KII), and rapid market appraisal (RMA) survey. The collected data was analyzed using MS Excel and SPSS. Average area under ginger cultivation was found to be 0.13 ha. Average cost of production per hectare was NRs. 4,20,000. The productivity of ginger in the study area was 14.4 mt/ha. The average selling price of fresh ginger was NRs. 29.34 per kg whereas average price of dried ginger was NRs. 201.42 per kg. Local traders were major market actors for influencing the price of ginger. Despite many problems, the ginger production in the study area was a profitable business (B:C ratio 1.53). When alternative pathways of post-harvest practices were followed, the B:C ratio would be 1.68, 1.46, and 2.02 for case I (only fresh ginger sold), case II (only Sutho or dry ginger sold) and case III (only seed rhizome sold), respectively, under the same production system. Low market price and lack of proper storage and processing facilities were major problems in ginger marketing. Rhizome rot and lack of technical backup were found as the main hindrances in ginger production. The establishment of collection, cleaning, and processing centers in strategic locations can address some of the major problems related to ginger marketing in the study area.

Keywords: Economics, Ginger, Marketing, Production

~*~

152 P - Sprouting and Canopy Development Pattern of Browse Species Suitable for Grazing Small Ruminants

¹Bidur Paneru, ²Shailes Bhattarai, ¹Nevershi Ellis, ¹Uma Karki

¹Department of Agricultural and Environmental Sciences, Tuskegee University, Tuskegee, Alabama, USA

²University of Georgia, Athens, Georgia, USA

Correspondence Email: spaneru9661@tuskegee.edu

Browse species play an important role in feeding small ruminants in Alabama and many other states of the USA. Previous studies have highlighted the leaf shedding time of these species. However, the sprouting and canopy development pattern of common browse species has not been documented well. The study objective was to determine the sprouting and canopy development pattern of browse species commonly available in the grazing lands used for raising small ruminants. Major browse species present in the Agroforestry and Browse Research and Demonstration sites were identified and 10 samples of each species were tagged. Each species was closely monitored and the date when the very first sprout was developed by each species was recorded. Canopy data were taken beginning two weeks after the very first sprout and repeated every 14 days using a vertical photoplot until full canopy development was completed. Data were analyzed using the GLM procedure in SAS 9.4. First sprout was seen in early February in nine species, followed by six species in late February, five species in early March, seven species in late March, and three species in early April. Sixteen species attained full canopies by April 21 (early growers) and five species by May 21 (late growers). Five species, American beautyberry, bush indigo, Chinaberry, grapevine, and rivercane developed their sprout late in the season, but attained the full canopy in a shorter period compared to the rest of the species included in the study. Findings of the current study indicate that grazing lands dominated with the early-growing browse species can be stocked with grazing animals about one month in advance (late April) versus those dominated with the late-growing species (late May). Further study on the carrying capacity of

grazing lands dominated with browse species will be useful for appropriate utilization of such resources.

Keywords: American beautyberry, Bush indigo, Chinaberry, Grapevine, Photoplot

~*~

153 O - Effect of River Engineering, Excessive Nitrogen, and Climate Change on Hydroecology of Upper Mississippi River

Deepak Parajuli

Geography Department, Southern Illinois University, Carbondale, Illinois, USA

Correspondence Email: parajulideepak@gmail.com

The Upper Mississippi River (UMR) is a significant ecological and navigational system of the United States. Human-induced modifications such as river engineering, land-use change, and the extensive use of chemical fertilizers in agriculture have altered the hydrology and geochemistry of UMR, which has adversely impacted its globally important ecosystem. These adverse impacts have also likely been exacerbated by anthropogenic climate change. This review provides a synthesis of the effects of river engineering, excess nitrogen, and climate change on the hydro-ecology of UMR. Peer-reviewed journal articles, government-funded reports, published books, unpublished theses/dissertations, and various review papers were used in this synthesis. Floodplain disconnection from the UMR main channel appeared to have the most significant impact on UMR hydro-ecology. Levees along UMR have reduced the extent of floodplains subject to inundation, thereby reducing floodplain ecosystem's access to nutrients, such as nitrogen from floodwaters, resulting, in part, in increased nitrogen loads in the river. The dams have primarily disrupted longitudinal connectivity, and the levees have obstructed lateral connectivity. Similarly, an increase in temperature due to climate change will compel mussel and fish species to move farther upstream to reach a different and more habitable temperature regime. Large floods induced by climate change will likely disrupt both hydrology and ecology of the UMR. Floodplain reconnection with the river main channel appears to be a more propitious strategy for the restoration and rehabilitation of the degraded hydro-ecology of UMR. Similarly, enhancing the connectivity of the river with its floodplain, increasing the diversity of plants and animals, and minimizing the controlling variables such as sediment load, nutrients, total suspended solids, and limiting invasive species will contribute to achieving the adaptive capacity and resiliency of the UMR.

Keywords: Climate change, Hydro-ecology, Resiliency, River engineering

~*~

154 P - Effects of Cover Crop and Fertility Management on Soil Biological Properties in Dryland Soybean Systems

Sapana Pokhrel

Plant and Soil Sciences, Mississippi State University, Starkville, Mississippi, USA

Correspondence Email: sp2189@msstate.edu

Farming practices such as cover crops, tillage, and fertilizer application are key determinants of microbial community structure and function in soil. Among the critical functions of soil microbiomes to dryland crop production is that of contributing to improved soil structure via

aggregation. Soil structure is critical to both drainage and storage of soil moisture in the rooting zone. A study was conducted at the Pontotoc Branch Experiment Station for the past two years to determine the effects of soil aggregation due to cover crop species, cover crop growth period, and fertility management in no-till, dryland soybean production on microbial activity and biological indicators. Five fall cover crops (cereal rye, wheat, vetch, native vegetation, and a mustard-cereal rye mixture) in combination with three fertility practices (mineral fertilizer based on soil test recommendations, poultry litter at a rate based on nutrient analysis and crop requirements, and a no-fertilizer control) were studied. The duration of cover crop growth was controlled by soybean planting during May or June of each year. Soil samples, collected at the termination of cover crops, i.e., at soybean planting, included pH, total carbon and nitrogen, available phosphorus, micronutrients, glomalin-like proteins, and percent water-stable aggregates. Additionally, cover crop percentage, cover crop biomass, and soybean yield were also measured. The results provide a better understanding of the rates of change to soil characteristics that are critical in dryland soybean systems.

Keywords: Cover crops, Dryland, Microbiome

~*~

155 O - Decline of Agropastoralism in the Upper Gandaki River Basin: Food Security and Livelihood Diversification Implications

Milan Shrestha

School of Sustainability, Arizona State University, Tempe, Arizona, USA

Correspondence Email: milan@milanshrestha.com

Agropastoralism has been the main livelihood source for mountain communities in Nepal. However, it is fast disappearing, and it is also a poorly understood socio-ecological system that historically enabled these mountain societies to adapt to harsh climatic conditions, rugged terrains, inaccessibility, and shorter crop growing periods. This presentation highlights some of the preliminary results of an interdisciplinary study conducted in the higher altitude villages located in the foothills of Mt. Annapurna in Lamjung and Kaski districts. Our ethnography involving *bhedi gothala* (shepherds) and livestock owners, and household social survey results provide in-depth insights on the conditions under which food security in the region historically relied on subsistence farming. Subsistence farming in these communities are supplemented with transhumance--seasonal migration of sheep flocks and cattle herds--that provides much needed stability in their food systems and overall livelihood diversification strategies. This system, however, faces unsettled futures, as agropastoralism is already in decline in much of the region and the growing attraction of youth toward non-farm income sources has only intensified the declining trend, raising concerns for long-term food security. Interestingly, agropastoralism is increasingly recognized as an important adaptation measure against climate change risks because it can prevent overgrazing, create ecological corridors, and maintain both plant and animal genetic diversity. Some mountain communities where this system had disappeared are now attempting to restore and/or revitalize it as their cultural renewal process. The results are somewhat mixed. Nevertheless, there are also many important lessons, which exemplifies a dilemma faced by mountain communities around the world. Should agropastoralism be retreated in favor of other livelihoods or be revitalized as part of cultural renewal process? Lessons from this study are significant for future research focusing on food security and livelihood diversification in mountain

communities facing similar uncertainties (e.g., depopulation, food shortage, climate change and variability, unreliable remittances).

Keywords: Agrobiodiversity, Agropastoralism, Food security, Mountain agriculture, Sustainability

~*~

156 O - Biological Control of *Sclerotium rolfsii* and Growth Promotion of Sweet Pepper by Selected *Bacillus* Species

Bandana Bhusal, Margaret T. Mmbaga

Department of Agricultural and Environmental Science, Tennessee State University, Nashville, Tennessee, USA

Correspondence Email: bandana.bhusal6@gmail.com

Diseases constrain vegetable production and their control rely heavily on pesticides that cause toxicity hazards to growers, consumers, non-target organisms, and the environment. Southern blight (*Sclerotium rolfsii*) is an economically important disease of vegetable crops, and the development of pesticide resistance is problematic. The objective of this project was to evaluate five isolates of *Bacillus* spp. (PS, PsL, Prt, IMC8 and YNP5) as biological control agents (BCAs) for *S. rolfsii* disease management. In-vitro assays identified three bacterial isolates (Ps, PsL and Prt) that significantly reduced *S. rolfsii* mycelial growth in dual cultures. The bacterial isolates were also used for volatile experiment where significant growth of sweet pepper was seen. *Bacillus* spp. produce volatile compounds, which are important for promoting growth and protecting plants against pathogens by the help of induced systemic resistance (ISR) in plants. *Bacillus* spp. produce resistant endospores that can survive in adverse environmental conditions and antibiotics to manage a wide range of phytopathogens. *Bacillus* spp. are found to be effective against a wide range of plant pathogens. There is a rapid increase in the use of I species for controlling phytopathogens as compared to other species of biocontrol agents. The bacterial isolates displayed potential as alternative products for disease management and plant growth promotion in organic farming and reducing pesticide usage in conventional pepper production.

Keywords: *Bacillus* spp., Biological Control, Disease management, Growth promotion

~*~

157 P - Weed Control in Cutting Propagation of Nursery Crops

Isha Poudel, Anthony Witcher

Department of Agricultural and Environment Science, Tennessee State University, Nashville, Tennessee, USA

Correspondence Email: ipoudel76@gmail.com

Weeds are a major problem in the cutting propagation environment, competing for resources and reducing crop growth and quality. Hand weeding is the most common method for controlling weeds in nursery crop propagation, but it is time-consuming and costly due to high labor cost. A study was conducted to determine the effect of pre-emergence herbicides (Gallery SC, Broadstar, Marengo G, Regal O-O, Ronstar G) and mulch (perlite, vermiculite, paper pellets, pine pellets) on stem cutting root development and weed control. Stem cuttings of *Viburnum plicatum* f.

tomentosum 'Mariesii' were placed in 2.5-inch containers and arranged under intermittent mist, and rooting percentage and root dry weight were recorded. Seeds of two weed species (crabgrass and bittercress) were surface-sown, and shoot fresh weight was recorded after 6 weeks. Rooting percentage was 100% for all treatments, except for pine pellets (95%) and vermiculite (95%). *Viburnum* root dry weight was similar to the control for all treatments. The growth of bittercress was suppressed by all treatments compared to the control, with Gallery SC and paper pellets being the most effective. Broadstar, Marengo G, Regal O-O, and paper pellets were most effective in controlling crabgrass, as all other treatments were similar to control. We demonstrated that several pre-emergence herbicides and mulches were safe to apply during cutting propagation and that weed control varied by weed species and product. As a result, nursery crop propagators could reduce labor costs by utilizing preventative weed control methods.

Keywords: Bittercress, Crabgrass, Mulches, Pre-emergence herbicides, *Viburnum*

~*~

158 P - Exploring Hidden Root Traits for Improving Spring Wheat in the Pacific Northwest

¹Bikash Ghimire, ²Scott H. Hulbert, ³Camille M. Steber, ³Kim Garland-Campbell, ⁴Karen A. Sanguinet

¹Department of Plant Pathology, University of Georgia, Griffin Campus, Griffin, Georgia, USA

²Department of Plant Pathology, Washington State University, Pullman, Washington, USA

³USDA Agricultural Research Services, Pullman, Washington, USA

⁴Department of Crop and Soil Sciences, Washington State University, Pullman, Washington, USA

Correspondence Email: bikash.ghimire@uga.edu

Understanding the genetic basis of root traits and overall root physiology provides essential information on a largely untapped resource for crop improvement as roots are instrumental for the uptake of water and nutrients. However, breeding for improved root traits is challenging due to laborious and time-consuming root phenotyping in soil. Our studies sought to uncover spatiotemporal root growth dynamics of mature plant root systems in five spring wheat (*Triticum aestivum* L.) cultivars, Louise, Alpowa, Hollis, Drysdale, and Dharwar Dry, and a facultative spring landrace, AUS28451, using the *in situ* minirhizotron technique. A two-year greenhouse study revealed that the root system grows rapidly after early node elongation to gain maximum size during anthesis, after which root growth slows and transitions to senescence. We were able to detect quantifiable differences among wheat cultivars in root traits in both 5-day-old seedlings and root systems at anthesis. Furthermore, the positive correlation of the observed root traits with grain yield and the consistency in root traits observed using minirhizotrons and through the extraction of young and mature root systems has reinforced the experimental results. A negative correlation was found between root number, area, and length, and root diameter. We found that the spring wheat cultivars-AUS28451, Dharwar Dry, and Alpowa had increased root density, area, and length, but also increased time to heading. The results from this study can be further leveraged to screen breeding lines for root traits of interest as well as assess the heritability of root traits for dryland farming in the inland Pacific Northwest.

Keywords: Dryland farming, Minirhizotron, Root phenotyping, Root system architecture, Wheat

159 O - Need for Financial Education in High School Curricula: A Case of Rural Nepal

Lila B. Karki, Uma Karki
Tuskegee University, Alabama, USA
Correspondence Email: lkarki@tuskegee.edu

Financial literacy is becoming increasingly critical to students at an early age because high school students (with 10+2) must take on more financial responsibilities and strive for financial independence more than ever before. Teaching financial education at high school in Nepal is not a common practice. Consequently, students seem to have little knowledge about personal finance management. The objective of the study was to identify the need for financial education and students' willingness to pursue it. A survey was administered among 83 high school students. Of the respondents, 47% reported that they had some informal perception and ideas about financial literacy and education from the family and day-to-day chores. Thirty percent confirmed that they did not have any theoretical knowledge nor skill, and 19% reported that they were not sure whether they knew any or not. The findings revealed that 94% of the respondents highlighted that financial education was an essential subject for them at school, college, and in their professional lives. The respondents expressed their willingness to learn in the following areas, but not limited to, i) budgeting (67%) that consisted of saving and spending plans, ii) reinforcing ways and means of saving to pay for school and college education and emergencies (16%), iii) strengthening their earning power (10%), iv) borrowing and managing loan/credit (4%) while investing in education, and v) tips and actions for better money management (3%). Nearly 99% of the respondents recommended introducing financial education to high school curricula. The students recognized a considerable gap between desire and demand for the curricula and the actual supply of financial education opportunities in high school at present.

Keywords: Budgeting, Financial literacy and education, Social learning opportunities

~*~

160 P - Functional Relationship Study of Symbiotic Component DOESN'T MAKE INFECTIONS with the Endoparasitic Nematode Infection

Rishi Khatri, Mandeep Adhikari, Vincent Klink
Biological Sciences, Mississippi State University, Starkville, Mississippi, USA
Correspondence Email: rishi.gulmeli@gmail.com

Pathogenic activities by endoparasitic nematodes in soybeans inhibit nodulation and biomass accumulation resulting in a billion-dollar worth of worldwide loss. They induce the formation of a well-defined nurse cell that coincides with reduced host reproductive fitness. Experiments in *Glycine max* have shown DOESN'T MAKE INFECTIONS 3 (DMI3) homolog being expressed in syncytia undergoing a compatible interaction. The developmental processes are known to have similarities to the genesis of symbiosis, but very little information exists on the regulation process of nurse cell formation. The functional relationship, if identified, will be important in creating nematode resistant lines of soybeans. The effects of overexpression and RNAi interference of *Glycine max* calcium-calmodulin dependent protein kinase (CaCMK) homologous to the *Medicago truncatula* symbiosis-regulating DOESN'T MAKE INFECTIONS 3 (DMI3) is being studied on this project. PCR primer pairs for the gene were designed. Amplicons were ligated into the directional pENTR/D-TOPO vector and transformed into chemically competent *E. coli* strain. Amplicon confirming original Genbank accession were shuttled into pRAP15 or pRAP17

destination vector by a LR-Clonase reaction. Genetic transformation of engineered vectors was carried out into a chemically competent *Agrobacterium rhizogenes* strain with the enhanced green fluorescence protein (eGFP). The non-axenic chimeras were planted in the greenhouse. Plants with untransformed roots were discarded and only the transformed ones were used for infection by the soybean cyst nematode *Heterodera glycines* [NL1-Rhg/HG-type 7/race 3]. Cyst population from the transformed plants thirty days after the infection will be counted and female indices calculated will be used to check the susceptibility or resistance of the soybeans. The gene expression level will also be quantified through qPCR assay using RNA taken from the root samples.

Keywords: Female index, Nematode, Resistance, Susceptibility, Transformation

~*~

161 O - Varietal Screening of Okra Against Okra Yellow Vein Mosaic Virus (OYVMV) Under Different Management Practices in Rupandehi District, Nepal

¹A. Chaudhary, ¹K. Poudel, ¹N. Ghimire, ¹S. Ghimire, ²R. Poudel, ³A. Pandey

¹Kentucky State University, Kentucky, USA

²Tribhuvan University, Kathmandu, Nepal

³Tennessee State University, Tennessee, USA

Correspondence Email: chaudharyanju62@gmail.com

Okra (*Abelmoschus esculentus* L. Moench) is an important vegetable crop of Malvaceae family found in the tropical and sub-tropical regions of the world. Okra production is constrained by several abiotic and biotic factors. Yellow vein mosaic virus (YVMV), a member of the Geminiviridae family is the most serious disease of Okra, which is characterized by a homogeneous interwoven network of yellow veins enclosing the green tissue and mostly transmitted by an insect vector known as whitefly. Systematic research on this virus is very limited in Nepal. A field study was conducted at the Horticulture farm of IAAS, Paklihawa Campus from March to June 2017 to screen the varietal resistance against Okra YVMV under different management practices. The experiment was laid out in two-factor split-plot design with three replications. The average chlorophyll content of the leaves was found to be higher in Julie variety followed by Arka Anamika. The whitefly count was significantly lower after the application of treatment in the subsequent date in almost all varieties. The application of management practices in the respective varieties was significant with Super Green and Julie varieties with the least Percentage Disease Index (PDI). Similarly, the highest yield was obtained in Julie variety in combination with imidacloprid insecticide, but due to the maximum waiting period of this chemical, Julie under azadirachtin appears to be a more promising combination.

Keywords: Chlorophyll, Percentage disease index, Whitefly

~*~

162 O - Effects of Biochar on Physicochemical Properties of Soil, Yield, and Water Use Efficiency of Soybean Under Different Irrigation Regimes

Anand Mishra

Agricultural Engineering Division, Nepal Agricultural Research Council, Nepal

Correspondence Email: anandhansy@yahoo.com

Biochar is a C-rich product, produced from plant or animal residues through pyrolysis in an anoxic or low oxygen environment. The properties of biochar depend on the production temperature and feedstock. It is used for improving soil physicochemical properties, plant growth, and to mitigate climate change by C sequestration. It is also used for increasing the water-holding capacity of the soil. The application of biochar increases both water holding capacity and crop yield and decreases the amount of irrigation required to grow the crop. A laboratory experiment was conducted to investigate the effects of biochar on soil physicochemical properties, seed yield (SY), aboveground biomass yield (AGBY), and water use efficiency (WUE) of soybean under different irrigation regimes. Bamboo biochar (BB) was applied at the rate of 1 and 3% (w:w). Three irrigation treatments were applied to recover the water level to 100%, 80%, and 60% of field capacity (FC) on alternate days. Results showed that a 3% BB application significantly increased the plant available water content. Bulk density was significantly reduced by 91.4% with the application of 3% BB. I1B2 (100% FC with 3% BB) increased AGBY by 114.0% compared to I1B0 (100% FC without biochar). I3B2 (60% FC with 3% BB) increased AGBY only by 108.2% compared to I3B0 (60% FC without biochar). The Phosphorous (P) and Potassium (K) uptake of I1B2 were significantly increased compared to I1B0. The K uptake was increased by 132.0% at I1B2 compared to I1B0. We concluded that biochar application enhanced the physicochemical properties of soil, and a 3% BB application significantly increased the AGBY and WUE for AGBY.

Keywords: Biochar, Irrigation, Soil properties, Soybean, Water use efficiency

~*~

163 P - Post-anthesis Leaf Health as a Potential Determinant of Yield in Early Evaluation Trial of Wheat Genotypes

Deependra Dhakal

Department of Genetics and Plant Breeding, Agriculture and Forestry University, Chitwan,
Nepal

Correspondence Email: ddhakal.rookie@gmail.com

Recent advances in plant phenotyping and statistical techniques have enabled exploration of a variety of economically important crop traits in a greater depth. This study evaluated field plot design and a mixed model approach to uncover the association of wheat yield and post-anthesis leaf health. Randomization-based experimental design constrained for replicated checks balanced within blocks was generated and employed for estimation of augmented genotype effects - also known as augmented row-column design for a small number of checks. Model variants with and without random block and augmented genotype effects, and fixed effects for check varieties and post-anthesis leaf health traits were formulated and tested. Selection of the best model for yield estimation was accompanied by likelihood-ratio test (LRT), while stepwise variable selection and backward elimination procedure was used to retain traits with significant effects. Proportion of heritable variation was significant in both test and check genotypes for yield and yield component traits. However, a significant amount of phenotypic variation in thousand kernel weight, plant height, flag leaf area, canopy temperature depression, days to heading and days to anthesis was associated with blocking factors. Leaf greenness and relative chlorophyll content (SPAD reading) were used as major leaf health traits that influenced yield. The effects of post-anthesis leaf health traits solely accounted for 39% variation in yield estimates. Best Linear Unbiased Prediction

(BLUP) estimation and adjustment for fixed effects revealed that 68.9% of the genotypic variation of entry genotypes in yield was explained by the extended model, one which incorporated post-anthesis leaf health attributes. Contrasts were defined for yield comparison of check genotypes, which included varieties Bhrikuti, Gautam, Tilottama, and Aditya. Test genotypes were appraised based on yield BLUP, and suggestions were made for the inclusion of top performing test genotypes in further stages of plant breeding program.

Keywords: Anthesis, BLUP, Constrained randomization, Leaf health attributes, Stepwise variable selection

~*~

164 P - Study on Zoonotic Helminths in the Gastrointestinal Tract of Dogs in Kathmandu Valley of Nepal

¹Bibek Bhattachan, ¹Birendra K. Bhattachan, ²A. Jha

¹Agriculture and Forestry University, Chitwan, Nepal

²Central Veterinary Hospital, Tripureshwor, Kathmandu, Nepal

Correspondence Email: bibekbhattachan2017@gmail.com

Gastrointestinal (GI) helminth parasitic problem is common in dogs of all ages in Nepal. A laboratory experiment was carried out in the Central Veterinary Hospital, Tripureshwor, Kathmandu from October 2016 to March 2017 to study the prevalence of zoonotic helminths on dogs of three districts (Kathmandu, Lalitpur, and Bhaktapur) in Kathmandu valley and to assess the risk factors associated with it. The health condition of 219 dogs from three municipalities of Kathmandu valley were evaluated and fecal samples were collected. Fecal samples were examined by zinc sulfate floatation method. Results showed that 118 (54%) dogs out of 219 were infected by helminths. GI helminth prevalence was highest with *Ancylostoma* spp. (48%) followed by *Toxocara canis* (33%), *Trichuris vulpis* (11%) and least was with *Dipylidium caninum* (8%). Among the three age groups of dogs (under one year; 1-5 year; and above 5 years old), puppies under one-year-old (42%) were infected higher than other age groups (30% in 1-5 years and 28% in above 5 years). Free roaming dogs (45%) were infected significantly higher, followed by the dogs kept in kennel with group (34%) and dogs kept in kennel individually (21%). Female dogs were infected more (51%) than male (49%) dogs. Likewise, non-dewormed dogs were infected more (84%) than the dewormed dogs (16%). Among the female dogs, nursing dogs (75%) were infected more than the non-nourishing ones (25%). Based on this study, it was concluded that dogs should be examined and treated against helminths in timely fashion to protect the health of the dogs in three districts of Kathmandu valley.

Keywords: Deworming, Dogs, Gastrointestinal helminths

~*~

165 O - Seed Yield Performance of Rainfed Upland Rice Varieties under Organic and Inorganic Fertilizers in Chitwan District, Nepal

Birendra K. Bhattachan

Department of Agronomy, Agriculture and Forestry University, Chitwan, Nepal

Correspondence Email: siutibhattachan@gmail.com

Use of both organic and inorganic fertilizers is a common practice of farmers in Nepalese rice farming system of rainfed upland field condition. A long-term field experiment was conducted to

study the performance of three rainfed upland rice varieties under organic and inorganic fertilizers in the farm of Agriculture and Forestry University, Rampur, Chitwan, Nepal for five years. The design used was split plot; main plot factor included organic and inorganic fertilizers (120:60:40 kg NPK ha⁻¹, Farm Yard Manure (FYM) = 120 kg N ha⁻¹, combination of 60:30:20 kg NPK ha⁻¹ and 60 kg N FYM ha⁻¹, and Control or no fertilizer) and sub plot factor included three rice varieties (Apo, IR-78877-208-B-1-2, and CT 65110-24-B-1-2) with four replications. The result showed that use of 120:60:40 kg NPK ha⁻¹ produced the highest rice yield of 2.45 t ha⁻¹, which was at par with combination of 60:30:20 kg NPK ha⁻¹ and 60 kg N FYM ha⁻¹ (2.40 t ha⁻¹). Control produced the lowest yield (1.51 t ha⁻¹). Among the rice varieties, Apo produced the highest rice grain yield of 2.56 t ha⁻¹ and the least (2.32 t ha⁻¹) was produced by CT-65110-24-B-1-2. However, grain yield of rainfed upland rice increased in the subsequent years with the use of both combinations of NPK+FYM and FYM alone than in previous years. The highest production of rainfed upland rice yield was associated with the number of tiller production, number of grains per panicle, and thousand grain weight. Thus, it was concluded that the grain yield of rainfed upland rice can be increased using inorganic fertilizer in the short term; however, continuous use of FYM can increase grain yield of rainfed upland rice in the long-run in Chitwan, Nepal.

Keywords: Fertilizer benefits, FYM, Grain yield, Inorganic fertilizer

~*~

166 O - Grain Yield Performance of Ramdhan Rice Under Different Date of Transplanting and Age of Seedlings in Rampur, Chitwan, Nepal

Birendra K. Bhattachan

Department of Agronomy, Agriculture and Forestry University, Chitwan, Nepal

Correspondence Email: siutibhattachan@gmail.com

Rice farming in Nepal is highly dependent on rainfall pattern of the monsoon season, resulting in varying date of transplanting and age of seedlings. A field experiment was conducted at Agriculture and Forestry University, Rampur, Chitwan, Nepal to test the grain yield production of Ramdhan rice affected by different seedling age and transplanting date from March to December in 2014. Split plot design was used for the experiment; five dates of transplanting (July 15th, 30th July, 1st August, 15th August, and 30th August) as a main plot factor and age of seedlings (15 days old, 30 days old, 45 days old, 60 days old) as a sub plot factor with four replications. Result showed that highest grain yield was obtained for August 1st transplanting date and the lowest yield was obtained for August 15th transplanting date. However, 30 days old seedling produced the highest grain yield in Ramdhan and the lowest yield was obtained from 60 days old seedlings. Higher grain yield was associated with number of tillers per meter square, grains per panicle, thousand grain weight and days to maturity. Similarly, in late transplanting season, it was found better to transplant 45 days old or 60 days old seedlings to obtain grain yield with some penalty, and 15 days old seedling was not suggested for in late transplanting condition. Based on this study, it can be concluded that farmers can use younger seedlings for transplantation in earlier date of transplanting and older seedlings in later date of transplanting in Chitwan and likely in other regions of Nepal with similar agroclimatic conditions.

Keywords: Date of transplanting, Grain yield, Rice seedlings

~*~

167 P - Efficacy of Organic and Inorganic Sources of Nitrogen on Growth, Yield, and Quality of Beetroot Varieties in Chitwan, Nepal

Arati Sapkota

Horticulture Department, Agriculture and Forestry University, Chitwan, Nepal

Correspondence Email: aratisapkota@gmail.com

Economical use of organic and inorganic fertilizers based on their availability is necessary for the sustainability of livestock-based farming systems in Nepal, yet scientifically tested information on such integration is limited. A study was conducted in the Horticulture farm of AFU, Rampur, Chitwan, Nepal from November 2018 to February 2019 to evaluate the effect of organic and inorganic nitrogen sources on growth, yield, and quality of beetroot. The experiment was laid out in two factorial randomized complete block design with four replications consisting of two beetroot varieties (Madhur and Ruby Red) and five nutrient sources combinations viz. T1: 100% poultry manure (PM), T2: 50% PM+50% RDF, T3: 100% farmyard manure (FYM), T4: 50% FYM+50% RDF and T5: 100% RDF (120:80:40 Kg NPK ha⁻¹). Results indicated that 50% PM+50% RDF was better for the growth and yield parameters, while the use of FYM alone was inferior in almost all cases. At harvest, significantly higher plant height (39.25 cm), number of leaves per plant (14.68), leaf length (34.56 cm), leaf width (11.38 cm), beetroot diameter (7.33 cm), and edible beetroot length (10.21 cm) was recorded in 50% PM+50% RDF. Likewise, root yield (47.42 t ha⁻¹) and shoot yield (27.51 t ha⁻¹) were also found higher in the same treatment. However, non-significant differences were observed in the quality parameters such as TSS and pH. Between two varieties, Madhur was found superior in most of the growth and yield parameters such as plant height, root diameter, root length, and root yield. Moreover, on analyzing the soil parameters, significantly higher organic matter content, potassium, phosphorous, and pH were observed in 100% PM although, % N was found significantly higher in 50% PM+50% RDF after harvest.

Keywords: Beetroot varieties, FYM, Poultry manure, Yield

~*~

168 P - Vegetable Grafting: Uses, Outlook and Opportunities for Nepal

Sudarshan Kharal, Arjun K. Shrestha

Department of Horticulture, Agriculture and Forestry University, Chitwan, Nepal

Correspondence Email: kharalsudarshan392@gmail.com

Grafted vegetable seedlings have been used from the early 20th century. This technique has been utilized extensively in East Asia and the European countries where it has developed as a multi-million-dollar industry. The increase in land area under protected cultivation, intensive use of land, scarcity of production resources, and changing climate leading to unpredictable weather have caused a rapid increase in the use of grafted vegetables. However, in Nepal, where the productivity of vegetable crops is quite low, and breeding activities are inadequate, use of grafted vegetables is still untapped. Therefore, this technique can be an important intervention to improve the overall production system of Solanaceous and Cucurbitaceous vegetables. Methods of vegetable grafting, their uses, research conducted on this topic in Nepal and the possible opportunities are discussed in this review paper. Cleft, splice, tongue approach, hole insertion and pin grafting are the methods currently in use. Grafting can be used to overcome the problems caused by various soil-borne disease and nematodes, and abiotic stresses such as low and high temperature stress, drought stress,

salinity, and metal and organic pollutants while increasing the yield and extending crop duration in vegetable production. In Nepal, only two research studies on vegetable grafting have been conducted to assess the tolerance to soil-borne diseases. In both studies, rootstock of wild brinjal (*S. sisymbriifolium*) in tomato scion were used. Utilization of this technique in Nepalese conditions provides ample opportunities for researchers and academicians to conduct research and for breeding companies to develop resistant rootstocks. By implementing this method, the vegetable industry can improve the overall yield, its quality and reduce management hindrances in production.

Keywords: Grafting, Nepal, Production, Vegetables

~*~

169 P - Soil and Plant Health Management for Sustainable Vegetable Production in Nepal

¹Rajan Ghimire, ²Rajendra Regmi, ³Jhalendra Rijal, ⁴Nirajan Bhattarai

¹New Mexico State University Agricultural Science Center, Clovis, New Mexico, USA

²Agriculture and Forestry University, Chitwan, Nepal

³University of California Cooperative Extension, Modesto, California, USA

⁴Agriculture and Forestry University, Chitwan, Nepal

Correspondence Email: rghimire@nmsu.edu

Chitwan district has been a major vegetable production region in central Nepal. The rapid adoption of vegetable production technologies and an increase in awareness of product quality among consumers have urged the need for improved crop and soil management practices. We evaluated farmers' knowledge on pesticide safety through a questionnaire survey and conducted a season-long soil and crop health school in five farmer groups of Chitwan to support sustainable vegetable production. The survey results indicated that chemical pesticides were the primary choice of over 80% growers for pest management. Over 84% of growers used at least one form of personal protection equipment (PPE) during pesticide spray or handling, although the quality and appropriateness of the PPE warrant further investigation. Nearly 17% of growers received at least one short-term training on integrated pest management (IPM). However, they did not know the harmful effects of pesticide residues and did not practice proper pesticide disposal methods. More than 200 vegetable farmers from five farmer groups from western Chitwan were trained on improved vegetable production practices and integrated soil and plant health management strategies. Farmers learned improved soil nutrient management, soil organic matter testing and management, scouting for seasonal pests and their control, and integrated strategy to identify nutrient deficiency, pest problems, and their management practices.

Keywords: Farmer survey, Pesticides, Soil testing, Training and education

~*~

170 O - Database of Women in Agricultural and Allied Professions and Future Direction

¹Prakriti Bista, ²Ambika Tiwari, ³Shristi Ghimire, ⁴Ranjana Rawal

¹Clovis, New Mexico, USA

²Mississippi State University, Stoneville, Mississippi, USA

³The Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland, USA

⁴Ohio State University, Department of Horticulture and Crop Science, Columbus, Ohio, USA

Correspondence Email: pbistaghimire@gmail.com

Women have been contributing to Nepalese agriculture as a major labor force for a long time. However, their journey as agricultural scientists begun only after the 1980s. After four decades of formal education, the contributions of professional women have now spread across the globe. Documenting the achievement of these women agriculturists in the diverse arena within Nepal and abroad is needed. Women in Agricultural and Allied Professions (WAAP) was established in 2016 as a women empowerment entity of the Association of Nepalese Agricultural Professionals of Americas (NAPA). The WAAP has a vision of becoming a common platform to support and strengthen women agriculturists in their careers and to rejoice in their professional achievements. Since its establishment, WAAP has been working to promote active collaboration and networking among members. As a first step, we developed the database of Nepalese women in agricultural and allied sciences. The database shows that there is a steady rise in the number of women professionals in the agriculture sector, the number of advance degree (postgraduate) receivers, and their diverse role in Nepal and abroad. Early career professionals can learn from senior members and receive mentorship on the opportunities and challenges of women in the agriculture profession. The database could also help in developing more collaboration and networking opportunities. In the coming days, WAAP will continue to highlight the accomplishments of women professionals and promote their participation in different activities of NAPA, including scientific publications and leadership.

Keywords: Agricultural professionals, NAPA, Networking, Women education

~*~

172 P - Whitefly Population and Incidence of Cassava Mosaic Disease on Selected Cassava Genotypes in Seedling Nursery in Southeastern Nigeria

Oghenetega Ogbe

Biological Science Department, Michael Okpara University of Agriculture, Umudike, Nigeria

Correspondence Email: ogbeclement123@gmail.com

Cassava mosaic disease (CMD) is one of the most widespread and severe diseases of cassava in Nigeria, limiting the production of the crop. Cassava affected by CMD depending on the age and severity produces few or no tubers during the time of infection. This study evaluated whitefly population, virus incidence (CMD) and severity on one-week-old plantlets of 12 selected genotypes (NR070363, S2109-17, TMS950379, NR100388, NR070282, UMUCASS37, S2109-9, NR1S1061, S2109-50, S2109-57, NR100139 and UMUCASS38) of cassava for a three-month period. A total of 360 (30 plants per genotypes) plantlets were used for the study. A direct visual count of whitefly on leaves, disease incidence ratio, and index of severity of symptom (ISS) were used to achieve the objective. The severity scores on leaves were on a scale of 1-5, where 1= no symptoms 2= mild chlorotic pattern over the entire leaf while the latter remained green and healthy, 3= a mild moderate mosaic pattern throughout the leaf, narrowing and distortion in the lower one third of the leaflet, 4 = severe mosaic, distortion and reduction in the entire leaflets and general reduction in the leaf sizes, and 5= severe mosaic, distortion and reduction in the entire leaf. The whitefly population ranged from 2.4 to 8.5 with genotype UMUCASS37 having the lowest and NR070363 with the highest whitefly population. The virus incidence ranged from 13.3% to 46.6% across the genotypes. TMS950379 had the highest CMD (46.6%) while NR070282 had the lowest (13.3%). The severity score ranged from 2 to 3 across genotypes with NR100388 having severity score of 2 and NR070363 had 3, while S2109-57 and UMUCASS38 had 2.1. The study

concludes that NR100388, S2109-50, S2109-57 and UMUCASS38 are the best genotypes to manage CMD spread.

Keywords: Cassava, CMD, Severity, Virus incidence

~*~

173 O - Efficacy of Botanicals for Management of Green Mold Disease (*Trichoderma* spp.) in Oyster Mushroom (*Pleurotus sajor-caju*)

Gaurav Adhikari, Ashutosh Poudel, Anish Bhattarai, Kriti Poudel, Dikshya Sapkota, Ritesh K. Yadav

Department of Plant Pathology, Agriculture and Forestry University, Chitwan, Nepal

Correspondence Email: gauravadhikari1997es@gmail.com

Mushroom cultivation is often plagued with the green mold disease incited by *Trichoderma* species. In the wake of high risk of health hazards posed by continual deployment of chemical fungicides such as carbendazim and the lack of appropriate alternatives for the management of green mold disease in mushroom cultivation, this study was conducted in an attempt to investigate possible alternatives to chemicals. Different plant products have shown excellent fungicidal properties in the laboratory and the aim of this research was to exploit this property and search for the best alternative. Eight botanicals, including *Artemisia* (T1), turmeric (T2), *Ocimum* spp (T3), Aloe-vera (T4), garlic (T5), *Azadirachta* (T6), onion (T7), and *Urtica* (T8) along with carbendazim (T9) and untreated control (T10) were assayed in the greenhouse cultivation of *Pleurotus sajor-caju* in a completely randomized block design with four replicates. Rice straw used as substrate was dipped in 2% solution of each treatment followed by steam pasteurization during the experiment. Artificial inoculation of *Trichoderma* species was done after the spawn run in each of the treatment units. Most treatments were succumbed to the infection, but the infection rate varied with treatments that greatly affected the yield. The highest yield (458.75 g) with least disease incidence was found in onion-augmented substrate with the lowest yield in untreated control (130 g). All botanicals evaluated were beneficial compared to the control treatment, which substantiates possible opportunities for eco-friendly and safer management alternatives for green mold disease through the use of promising botanicals.

Keywords: Artemisia, Botanicals, Trichoderma

174 O - Effect of Irrigation Water and pH on the Performance of Healthy and Huanglongbing-Affected Citrus: A Transcriptomic Analysis

Lushan Ghimire

Plant Molecular and Cellular Biology, University of Florida, Gainesville, Florida, USA

Correspondence Email: lushanghimire@ufl.edu

Huanglongbing (HLB) is one of the most devastating diseases in citrus (*Citrus* spp.), with roots being the first site of pathogen colonization. It has been established that soil pH of the root zone directly affects nutrient availability and influences root health. Therefore, there is a need to address whether HLB interacts with soil pH. The objectives of this research were to evaluate molecular and physiological responses of healthy and HLB-affected sweet orange to different irrigation water-pH. Physiological traits were assessed in plants (n=8) irrigated with pH 5.8, 7.0, and 8.0 buffers, respectively, for 60 days. Regardless of disease occurrence, the performance of plants decreased with the increase in pH. HLB-affected plants at pH 8.0 had the highest death rate (40%),

least increase in height (<1%), lowest leaf biomass (0.1 g), and greatest leaf drop rate (87%). In contrast, healthy plants at pH 5.8 had the lowest death rate (0%), the highest increase in height (6.6%), highest leaf biomass (6.3 g), and low leaf drop rate (29%). Physiological observations indicated that HLB symptoms were more prominently expressed at pH 8.0 than at pH 5.8. Transcriptomic analysis of root tissue further suggested that HLB-affected plants treated with pH 5.8 were actively detoxifying stress-induced radicals and had increased growth and developmental processes with downregulation of jasmonic acid biosynthesis, implying that HLB-affected plants were under less stress compared to healthy plants under pH 5.8. On the other hand, treatment with pH 8.0 induced defense responses and cell death on HLB-affected plants compared to healthy plants, suggesting increased CLas proliferation and magnified HLB-effects at higher pH. All these observations suggest an interaction between HLB and pH, where HLB symptoms are exacerbated in response to high pH conditions.

Keywords: Citrus, CLas, Huanglongbing, Irrigation water pH, Drought stress

~*~

175 P - Impact of Climate Change on Livestock Production: A Case Study

Prakash Gurung

Agronomy Department, Agriculture and Forestry University, Chitwan, Nepal

Correspondence Email: gurungagri5@gmail.com

A survey study was conducted in two wards of Bharatpur Sub-metropolitan city in January 2016 to assess the perceived impact of climate change on livestock production. Sixty randomly selected respondents were interviewed, and data were analyzed using SPSS and STATA. It was found that 91.7% of the respondents were aware of climate change, and they adapted different strategies, including a change in breeding strategies and structure of shed, use of exotic and improved breeds and forage crops, capacity build up, and management of production system scientifically. Respondents have experienced the effect of climate change within the last 10 years as evidenced by the altered onset and ending times of summer (85.0%) and winter (53.3%) and rainfall dynamics (75.0%). Furthermore, the crop growing seasons were pushed ahead by one month, with a resulting decrease in colder days and increase in hotter days. The vulnerability index in Bharatpur region was 5.49, which indicated a high level of vulnerability to climate change. Drought, disease outbreak and occurrence of new weeds were also increased. Most of the households (91.7%) were impacted from climate change at varying extents due to: i) unavailability of feed and grass (53.3%); ii) the incidence of disease and external parasites (55%); iii) decrease in milk production (63.3%); iv) loss of appetite in animals (91.7%); and v) heat stress (61.7%). We suggest that the Nepal government should develop a clear mitigation plan to aid farmers in developing agricultural infrastructure and training for adaption and management of climate change impact in Nepal.

Keywords: Adaptation strategies, Climate change, Livestock production, Vulnerability

~*~

176 P - Agriculture Degree Aspirants in Nepal: Geography and Gender Dimensions

¹Dikshit Poudel, ¹Saurav R. Kunwar, ²Shweta Ghimire, ²Keshab Subedi

¹University of Georgia, Athens, Georgia, USA

²University of Delaware, USA

Correspondence Email: dikshit.pdl@gmail.com

Gender dynamics of agriculture in Nepal have been historically characterized by low land ownership and less farm decision power of women compared to men despite women contributing a majority of farm labor. The gender difference is not only limited to farmers but extends to agricultural students and professionals. Agriculture and Forestry University (AFU) is the only agricultural university in Nepal, although there are a large number of agricultural institutions and colleges throughout the country. The students who appear for the undergraduate admission test in AFU could serve as the population in which to examine the gender attributes of the interest in agriculture degrees. We believe that the gender dynamics of agriculture degree aspirants in Nepal are further confounded by geographical dimensions. In this research, we attempt to describe the population of agriculture degree aspirants and their success in securing admission and assess the gender dimensions in interaction with geography. Among 3,529 students who appeared for the undergraduate (agriculture program) entrance examination at AFU in 2018, half of them were female. However, females' admission success rate was slightly lower than of males (female: 48% vs male: 52%). Females constituted 30%, 33% and 36% of the aspirants from the province number seven, six, and two, respectively. In contrast, females contributed most of the test attendees from province 3 (64%) and 4 (53%). Similarly, the difference in the success rate was higher in province seven followed by six, and two with male vs. female pass rate of 28% vs 72%, 29% vs 71%, and 36% vs 64%, respectively. Also, after adjusting for geographical location and performance in high school (School Leaving Certificate) examination and Associate degree (Intermediate in Science), females are less likely to pass the entrance compared to males (Adjusted OR: 0.51, CI: 0.43-0.61). However, these inferential statistics need to be interpreted cautiously as the study population was subject to self-selection bias.

Keywords: Agricultural university, Gender, Geography, Merit entrance, Schooling, Test scores

~*~

177 O - Assessment of Major Feed Resources and Its Utilization in Manaslu Conservation Area, Nepal

¹Sabita Subedi, ²Bhojan Dhakal, ²Shankar R. Pant, ³Naba R. Devkota

¹Improved Seed for Farmer Program (ISFP), Butwal, Rupandehi, Nepal

²Pasture Forage and Agroforestry, Nepal Agricultural Research Council, Kathmandu, Nepal

³Directorate of Research and Extension, Agriculture and Forestry University, Chitwan, Nepal

Correspondence Email: sabitasubedi22@gmail.com

An assessment was made on the available feed resources, its utilization pattern (specifically, roughage and concentrate) produced from the Manaslu Conservation Area (MCA) of Nepal to formulate the appropriate strategies in satisfying the annual dietary requirements of livestock covering its present production and management scenarios. A comparative study was done by employing a purposively conducted survey to deduct distribution of forage sources in the area. Findings revealed that natural vegetation, seasonally available crop residues, and dried grasses were major feed resources, whereas their contribution to the total supply varied significantly

($p < 0.01$). The amount of feed obtained from various sources was calculated by standard conversion and using primary household data. Findings revealed that farmers practice significantly higher ($p < 0.01$) number of grazing days and hours per day for large ruminants such as yak and chauri compared to small ruminants such as goat and sheep. The findings also indicated seasonal variations of feed supply where January to March is the period of short supply. There was a good supply during June to September, although average roughage and crude protein supplements were far below the optimum requirements. These scenarios suggest the need for immediate attention to improve the range productivity in MCA as the deteriorating situations of the rangelands may raise questions on sustainability of livestock herders.

Keywords: Altitude, Carrying capacity, Dietary requirement, Feed resources, Rangeland

~*~

178 O - Time-course Analysis of Physiological and Molecular Traits Associated with Efficient Nitrogen Uptake and Transport in Wheat

Suman Lamichhane

Department of Crop and Environmental Sciences, Blacksburg, Virginia, USA

Correspondence Email: sumanlmc123@gmail.com

The application of nitrogen fertilizer is pivotal for high grain yield and appropriate grain protein content in wheat. However, only 30-50% of the applied N is absorbed by the plants, and the remaining N is lost to water bodies and atmosphere, leading to water and air pollution. A comprehensive understanding of physiological and molecular mechanisms that underpin efficient nitrogen uptake and transport is a crucial step for the development of new wheat accessions with increased nitrogen use efficiency (NUE) while maintaining grain yield. In this study, a comparative analysis was conducted between two soft red winter wheat genotypes, VA08MAS-369 and VA07W-415, to characterize the agronomic, physiological, and molecular traits related to efficient nitrogen uptake and transport in wheat. Under ample N supply, both genotypes displayed similar yield, yield parameters, and NUE indices. At low N supply, however, line 369 maintained yield and yield-related parameters and exhibited higher NUE indices. Our study also revealed that high NUE in line 369 was attributed to high nitrogen uptake efficiency (NUpE) under limited N. Plant ability to absorb nitrogen is largely influenced by root morphology and functions. We demonstrated that line 369 maintained root growth parameters such as maximum root length, total root volume, and total surface area under low N, whereas these parameters were significantly lower in line 415. Additionally, genes encoding high-affinity nitrate transporters such as TaNRT2.1 and TaNRT2.2 were expressed more abundantly in roots of line 369 than line 415 at limited N. Results suggested that line 369 is more adapted to limited N conditions due to maintained root development and increased function of nitrogen uptake. Improvement of these traits could be incorporated into a wheat breeding program to develop cultivars with more efficient N uptake.

Keywords: Nitrogen transporters, Nitrogen use efficiency, Root architecture, Wheat

~*~

179 O - Effect of Plant Growth Regulators on Growth, Flowering, and Yield Attributes of Marigold

Susmita Sigdel, Kritika Adhikari, Gaurav Adhikari, Susil Khanal, Bishal Shrestha
Horticulture Department, Agriculture and Forestry University, Chitwan, Nepal
Correspondence Email: susmitasigdel16@gmail.com

Marigold (*Tagetes sp.*) is the most popular commercial flower in a Nepalese floriculture industry, which is valued for its loose flowers of large sizes with bright shades, ranging from yellow to orange. With the discovery and synthesis of plant growth regulators, we have recognized their role in vegetative growth and flowering of marigold. A study was conducted to explore the role of different plant growth regulators on the flowering and yield of African marigold cv. Calcuttia Local at the horticulture farm of Agriculture and Forestry University (AFU) during the rainy season. A randomized block design was used with ten treatments of three concentrations each of gibberellin (100, 200 and 300 ppm), ethrel (100, 200 and 300 ppm), and naphthyl acetic acid (100, 200 and 300 ppm) with four replications. Results showed significant effect of treatments on plant growth, flowering, and yield. The observed vegetative traits were significantly higher at 300 ppm concentration of gibberellin with the highest yield (17 t/ha) and the lowest yield (11.2 t/ha) recorded in control. Results showed that the production of marigold can be significantly improved with the application of standardized concentration of plant growth regulators.

Keywords: Ethrel, Gibberellin, Plant growth regulators

~*~

180 P - Comparative Study of Stall-Feeding and Pasture Grazing Systems of Goats in Smallholder Farms of the Eastern Mid-Hills of Nepal

¹*Sabita Subedi*, ²*Bhojan Dhakal*, ²*Shankar R. Pant*, ³*Naba R. Devkota*
¹Improved Seed for Farmer Program, Rupandehi, Nepal
²Nepal Agriculture Research Council, Kathmandu, Nepal
³Agriculture and Forestry University, Chitwan, Nepal
Correspondence Email: sabitasubedi22@gmail.com

A study was conducted to identify the appropriate feeding, health, and management system for goat production in Kalika Municipality, Shaktikhor, Chitwan, Nepal. Altogether, 120 households were surveyed by purposive random sampling to collect primary information focused on availability of pastureland, feed resources and prevailing management conditions of goats, within farmer management condition. Moreover, seasonal effect (dry and wet season) on production along with feeding system were assessed within those households considering season as a main factor and the feeding system (stall fed and full grazed) as a sub-factor in a split-plot design. Fecal samples of 650 goats in Winter, 635 in Autumn and 580 in Summer seasons were collected and tested for internal parasites. Data analysis was done using SPSS version 16 and Microsoft Excel 2007. The fecal analysis revealed that goats adopting the grazing system had significantly higher positivity ($p < 0.01$) of endoparasites and ectoparasites than that of stall-fed goats in all seasons. While comparing between the treatments, summer season seemed to be more prone ($p < 0.01$) to internal parasites than the other two seasons and the problem was underpinned by higher numbers of kid's mortality during the same season ($p < 0.05$). This result suggested that the stall-fed system was better than the grazing system in terms of parasitic infestation, but the situation would be

highly dependent upon the local environment. Therefore, there is a need for improvement in the grazing system especially during winter, and regular use of anti-helminthic drugs throughout the year, especially after the cessation of monsoon, would be valuable.

Keywords: Feeding system, Goats, Parasitic infestation

~*~

181 O - Effects of Gender on Adoption of Climate-smart Agricultural Practices among Smallholders in Nigeria

¹Mojisola Kehinde, ²Adebayo Shittu, ¹Maria Ogunnaike

¹Agricultural Economics & Farm Management Department, Federal University of Agriculture, Abeokuta, Nigeria

²Agricultural Extension and Economics, Landmark University, Kwara, Nigeria

Correspondence Email: mojisolaolanike@gmail.com

Low performance of agriculture in developing countries like Nigeria results from high dependence on rain-fed agriculture and natural resources as well as the fact that women lack resources and opportunities. They need to be able to make the most productive use of their time. There exists a significant gender gap between male and female smallholder farmers. This study assesses the role of gender on the adoption of climate-smart agricultural practices on male/female-controlled rice and/or maize farms among smallholder farmers in Nigeria. The data were collected by personal interviews of respondents drawn in a multi-stage random technique, covering 1,237 households sampled across 16 states. Data were analyzed using descriptive statistics and econometric method within the framework of Multivariate Probit (MVP) regression. Gender was measured in terms of the Abbreviated Women's Empowerment in Agriculture Index (A-WEAI); the A-WEAI measures women's empowerment across five agricultural domains viz; i) decisions about agricultural production; ii) access to and decision-making power about productive resources; iii) control of the use of income; iv) leadership in the community; and v) time allocation. An individual is empowered if he/she achieves adequacy in 80% or more of the weighted indicators. The result showed that 27.13% of women were empowered compared to 54.94% of men. The MVP results revealed that the older farmers had a lower adoption probability of crop rotation, minimum tillage, and agroforestry. Similarly, formal education of male-controlled household was positively related to the adoption of crop rotation. The likelihood of adopting crop rotation increased with increase in female empowerment in the household while that of adopting farmyard manure and residue retention declined with a reduction in male and female empowerment. This study recommends that policies targeted at improving women's access to resources be made to accelerate the adoption of these climate-smart agriculture compliant practices in Nigeria.

Keywords: Climate-smart practices, Gender, Nigeria, Smallholders

~*~

182 P - Morphological and Biometric Characterization on Indigenous Lampuchhre Sheep in Terai Region of Nepal

¹Bhojan Dhakal, ¹R. B. Rana, ¹N. R. Poudel, ¹M. R. Tiwari, ¹D. KC, ²S. Subedi, ³T. B. Gurung

¹National Animal Science Research Institute, Khumaltar, Lalitpur, Nepal

²Improved Seed for Farmer Program, Rupandehi, Nepal

³Nepal Agricultural Research Council, Lalitpur, Nepal

Correspondence Email: nickbhojan@gmail.com

A comprehensive study was conducted to examine the prevailing production system of Lampuchhre sheep in Western and Eastern Terai regions of Nepal. Different morphological and biometric information were measured in farmers' fields including household surveys, mostly focused on sheep production in the current scenario. Some parameters including parity, number of kids, and feeding regimes were taken following household surveys and focus group discussions. The major morphological parameters, including head length, ear length, tail length, body length, neck length, fore feet, and rear feet of the male sheep were greater as compared to female sheep of similar age. Strong variation between the weight of female sheep within and among the herd signifies that there are huge chances of inbreeding, which may have caused a decrease in size of some female doe and large variation among the population. Additionally, body weight and body length had positive and linear relationship. A model equation for estimating body weight was established based on morphological traits as $\text{Body weight} = -62.731 + 0.449 (\text{Body length}) + 0.857 (\text{Heart Girth}) - 0.1 (\text{Barrel height}) + 0.911$. The barrel height and age at puberty had non-significant effect ($p > 0.05$) in the overall modelling while body length and heart girth showed a highly significant ($p < 0.01$) relationship. Most of the morphological traits were found to be highly correlated. The large variation on body weight of female as compared to male presents a vast opportunity for future genetic improvement programs and with considerable importance of morphological traits in Nepalese indigenous species of sheep.

Keywords: Biometric characterization, Indigenous breed, Lampuchhre sheep

~*~

184 O - Characterization of Hypervirulent Mutants of Soft Rot Pathogen, *Pectobacterium carotovorum*

Bimala Acharya, Korsi Dumenyó

Department of Agricultural and Environmental Sciences, Tennessee State University, Nashville, Tennessee, USA

Correspondence Email: acharyabimla25@gmail.com

The production of plant cell wall-degrading enzymes (PCWDEs) is an important determinant of virulence in soft rot pathogens. Comparison of enzyme levels in the parent and mutants indicates whether the mutant is hypervirulent, hypovirulent or not affected in virulence. The main objective of this research was to isolate and characterize hypervirulent mutants of *Pectobacterium carotovorum* (soft rot pathogen). We constructed a saturated GFP-tagged transposon Tn5 insertion mutant library by the process of transposon mutagenesis, where the transposon randomly is inserted in the target DNA by a "cut and paste" through the action of transposase enzyme. We selected and isolated extracellular protease (Prt) over-producing mutants. The mutants also had increased levels of other PCWDEs, including extra-cellular enzymes - cellulase, polygalacturonase, and pectate-lyase production as measured by qualitative, quantitative, and

semi-quantitative enzyme assays. The mutants and parental strains were inoculated on celery petioles, potato tubers and carrot root discs for pathogenicity test. With increased PCWDEs, the mutants were also hypervirulent as they macerated more host tissues than the parental strains. We are currently using multiple approaches to determine the mutant gene in each mutant and characterize them and their roles on controlling the soft rot disease. An understanding of the role of these genes can be used in designing effective management strategies for the soft rot disease.

Keywords: Pathogenicity test, Plant cell wall-degrading enzymes, Virulence

~*~

185 P - Economics of Rubber Production in Jhapa District, Nepal

¹Mousami Poudel, ¹Surya M. Dhungana, ¹Prabin Adhikari, ²Angila Bidari, ¹Shankar Paudel

¹Agriculture and Forestry University, Chitwan, Nepal

²Institute of Agriculture and Animal Sciences, Illam, Nepal

Correspondence Email: mousami.pdl@gmail.com

A study was conducted to examine the cost structure and economic feasibility of rubber production in Jhapa district, Nepal. It also aimed to assess determinants of increment in acreage of rubber cultivation in the study area. A total of sixty-two rubber growers were selected through random sampling and interviewed with pre-tested semi-structured questionnaire in March 2019. Study revealed that the total cost of natural rubber production per hectare of rubber orchard was NRs. 499,774.80 per year. It was found to be economically viable and cost effective as indicated by satisfactory values of benefit cost ratio (1.5), net present value of NRs. 686,547 at a discount rate of 12% and internal rate of return of 18%. Probit model revealed that the trainings received, experience of rubber farming, ethnicity, and membership in community organizations were significant factors that positively affected a farmer's decision in expanding the rubber cultivation area. Received trainings solely could increase probability of acreage increment by 36.9%. Thus, it is recommended that extension services like training, farmers' field school, and farm visits should be intensified for increasing profitability from rubber farming.

Keywords: Benefit cost ratio, Internal rate of return, Net present value, Probit model, Natural rubber

~*~

186 O - Technical Efficiency and Rice Productivity in South East Nigeria: A Metafrontier Approach

¹Agatha Ogbe, ¹Adewale Dipeolu, ¹Abiodun Obayelu, ²Justyna Porbeni

¹Department of Agricultural Economics and Farm Management, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria

²Department of Plant Breeding and Seed Technology, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria

Correspondence Email: ag05ogbe@gmail.com

Rice is a major staple food for millions of people accounting for over 20% of global calorie intake. It has become the fastest growing commodity by assuming a strategic position in the food basket of rural and urban households. The demand for rice in Nigeria has been increasing at a faster rate than production and the domestic production is not adequate. The study examined technical

efficiency and rice productivity in South East Nigeria. A total of 217 rice farmers were randomly selected for the study. Descriptive statistics, stochastic frontier and metafrontier were used to analyze the data collected from rice farmers. Analysis revealed that the average farm size was 1.0 hectare; the mean technical efficiencies of the farmers in deep water and upland were 0.812 and 0.878, respectively, and that the rice production was male dominated. It further showed that majority of rice producers were with the economic productive years, and those farmers were operating in stage one of the production frontier, which was characterized by increasing return to scale. Resource inputs such as rice seed, fertilizer, agrochemicals, and land significantly affected rice production, with land having the highest effect on rice production. A substantial gap in technology was found between the metafrontier and upland ecology (0.8687). The study concludes that the scope of rice production could be increased by expanding land area cultivated to rice to increase domestic rice production and that rice farmers in upland could benefit from better production conditions by adopting technology such as adopting improved rice seed variety adapted for production environment and creation of bounds on the land.

Keywords: Ecology, Lowland, Technical efficiency, Technology gap, Upland

~*~

187 O - Effect of Intercropping and Varying Irrigation Levels on Yield and Water Use Efficiency of Winter Forage Species in Mid-Hills of Nepal

¹Bhojan Dhakal, ²Sabita Subedi, ¹Shankar R. Pant, ³Naba R. Devkota

¹Nepal Agricultural Research Council, Khumaltar, Lalitpur, Nepal

²Improved Seed for Farmer Program, Butwal, Rupandehi, Nepal

³Directorate of Research and Extension, Agriculture and Forestry University, Chitwan, Nepal

Correspondence Email: nickbhojan@gmail.com

A study was conducted at Bandipur, Tanahun District, Nepal, to evaluate the impacts of different irrigation levels on water use efficiency and yield of intercropping fodder oats (*Avena sativa*) and berseem (*Trifolium alexandrinum*) in a split-plot design with three replications. Four surface irrigation treatments, including I0 = no irrigation (control), I1 = irrigation at 15-day interval, I2 = irrigation at 30-day interval, and I3 = irrigation at 45-day interval at 100% ETO and three intercropping systems (sole fodder oats, berseem, and berseem-oats intercropping with 55:45 of recommended seed rate) were deployed in early winter. Destructive harvest techniques were applied to measure plant biomass. Results showed that chlorophyll content, relative leaf water content, number of tillers, and plant height were significantly higher in I1, whereas total yield of intercropped berseem-oats was significantly higher ($p < 0.01$) than yields in sole cropping. Meanwhile, the highest Land Equivalent Ratio (LER) was obtained in intercropping with I1 (1.44 ± 0.11) while the lowest LER was observed in monocropping (T0). The total dry matter yield of forage was significantly higher in intercropping with I1 level of irrigation, but no difference between I2 and I3 was found. The optimum irrigation management and intercropping could have a complementary relationship among selected forage species, ultimately increasing yield with reduced anthropogenic inputs.

Keywords: Berseem, Forage, Intercropping, Irrigation, Oat

~*~

188 P - Holding of Cut Gladiolus Spike in Different Preservative Solutions for Enhancing Postharvest Quality and Vase Life

¹Binayak P. Mishra, ²Kalyani Mishra

¹Department of Agricultural Extension and Rural Sociology, Agriculture and Forestry University, Chitwan, Nepal

²Department of Horticulture, Agriculture and Forestry University, Chitwan, Nepal
Correspondence Email: binayakprakash.mishra@gmail.com

Rapid deterioration of physical appearance and short vase life are the major problems users are facing in holding of cut gladiolus (*Gladiolus grandiflorus*). An experiment was conducted to evaluate the effect of different floral preservatives on postharvest quality and vase life of gladiolus. Freshly harvested gladiolus spike (cv. Interpret) was kept in three concentrations (300 ppm, 600 ppm, and 900 ppm) of germicides (citric acid, aluminium sulphate, sodium hypochlorite, cobalt chloride, 8-hydroxyquinoline citrate, silver nitrate, and salicylic acid) without and with sucrose solution (4%). Longer duration to opening of basal floret, higher diameter of first five florets, and longer vase life were recorded with sucrose (4%) + 8-hydroxyquinoline citrate (600 ppm). Among the germicides and concentrations of germicide, superior results in all above parameters were recorded with 8-hydroxyquinoline citrate and 600 ppm concentration. Floral preservative containing both germicide and sucrose recorded superior results in all above-mentioned parameters. Longer duration between fully opening to wilting of first five florets was recorded with floral preservative containing only germicide. Control (distilled water) had inferior results with respect to all parameters.

Keywords: 8-hydroxyquinoline citrate, Germicides, *Gladiolus grandiflorus*, Sucrose, Vase life

~*~

189 P - Incorporation of Diverse Fusarium Head Blight Resistance QTL in Hard Red Winter Wheat Breeding Germplasm

Sagar Adhikari

Plant Science Department, North Dakota State University, Fargo, North Dakota, USA
Correspondence Email: sagar.adhikari@ndus.edu

Hard red winter wheat is a commonly grown wheat in the United States, accounts for 40% of total wheat production and dominates US wheat exports. Despite large acreage, winter wheat faces both biotic and abiotic stresses, including winter kill, Fusarium head blight (FHB), wheat rust diseases (leaf, stripe, and stem rusts), bacterial leaf spot, and tan spot. According to the United States Department of Agriculture, crop losses by fusarium head blight alone have exceeded 3 billion dollars since 1990. The devastating pathogen also contains mycotoxins that are detrimental to human and animal health. The development of lines with high yielding characteristics and disease resistance traits is a major concern. Cross combinations carrying different resistance genes for diseases (Fusarium head blight, leaf rust, yellow rust, stem rust) were studied in a greenhouse. The aim of this study was to produce diverse and multiple resistance that would also be highly productive. This study included development of semi-dwarf inbred lines that combined FHB, leaf, stem, and stripe rust resistance from the cross combinations. Greenhouse based single seed descent inbreeding with phenotypic and marker selection steps was used to accelerate line development. The expected result will be focused on the development of winter wheat cultivars that are disease

resistant with higher production and are suitable in northern prairies and similar environments in other regions of the world.

Keywords: Disease resistance, Fusarium head blight, Stripe rust, Winter wheat

~*~

190 O - Effect of Trade Liberalization on Agricultural Household Welfare in Nigeria

¹Kingsley Edewor, ²Sarah Edewor

¹Supply Chain Department, Hedmee Agro and Daily Foods Limited, Ikeja, Lagos, Nigeria

²Research and Development Department, Saradore Trust Nigeria Ltd, Ikeja, Lagos, Nigeria

Correspondence Email: kingsleyedew@gmail.com

Trade liberalization affects both goods and factor prices which in turn influence export performance and the welfare of households in the long run. We examined the effect of trade liberalization on welfare of agricultural households in Nigeria. The study made use of annual time series and monthly panel data from 1980 to 2016 and 2007 to 2016, respectively. The time series and panel data were tested for stationarity using the Augmented Dickey Fuller (ADF) and the Im, Pesaran and Shin (IPS) tests. The data were subjected to a Quadratic Almost Ideal Demand Systems (QUAIDS) and compensating variation. The policy variables used were Tariff (TRF), Exchange rate (EXR), Monetary Policy Rates (MPR), Terms of Trade (ToT), Narrow Money Supply (NM), Openness Index (OPENTRD), Commodity World Prices (WPs) and Pump price of Premium Motor Spirit (PPP). The welfare analysis revealed that WPs (6.8%) were the highest contributor to household welfare gain as households gained N35,572.01 annually while EXR (24.3%) and PPP (2.8%) were the highest contributors to welfare losses with households requiring annual compensations of N101,384.01 and N14,653.59, respectively. Across the geopolitical zones, welfare losses were also more prevalent in North East (N2,736.63, N265,453.50), and in rural areas (N2,207.07, N193,339.22) as compared to urban areas, and among male headed households (N3,778.99, N228,899.12) as compared to female headed households for all policy variables. The study concluded that all policy variables accounted for welfare losses and gains but WPs, EXR, PPP were key drivers of changes in domestic food prices and household welfare in Nigeria.

Keywords: Agriculture, Compensating variation, Households, Trade liberalization, Welfare

~*~

191 P - Trade Liberalization Effect on Agricultural Export Performance in Nigeria

¹Sarah Edewor, ²Kingsly Edewor, ³Adewale Dipeolu, ³Olumuyiwa Ashaolu, ⁴Sakiru Akinbode

¹Research and Development, Saradore Trust Nig. Ltd, Ikeja, Lagos, Nigeria

²Supply Chain Department, Hedmee Agro and Daily Foods Ltd, Ikeja, Lagos, Nigeria

³Department of Agricultural Economics and Farm Management, Federal University of Agriculture Abeokuta, Abeokuta, Nigeria

⁴Department of Economics, Federal University of Agriculture Abeokuta, Abeokuta, Nigeria

Correspondence Email: saradowe@yahoo.co.uk

The association between trade liberalization and growth has been an important area of study in recent years, especially for developing countries. Previous studies appeared to give conflicting results, as some studies reported that countries that imbibed trade liberalization programs have improved their export performance. This study examined the linkage between trade liberalization

and agricultural export performance during the period 1980 to 2016 using Johansen cointegration and Vector Error Correction Model. The trend of agricultural imports and exports revealed that agricultural import is increasing at a disproportionately alarming rate compared to agricultural exports. The Johansen cointegration revealed the existence of long run relationship between the time series variables. Our results suggest that the terms of trade and the period of intense trade liberalization had positive impact on agricultural export performance in Nigeria while gross domestic products and trade openness negatively influenced export performance. We concluded that sustained period of openness negatively impacted export performance in the long run. For exports to grow, policies embarked upon during the period of trade liberalization should be geared towards improving infrastructure, reducing the exports of primary products without value addition, and reducing import.

Keywords: Agriculture, Export performance, Trade, Vector error correction model

~*~

192 O - Enhanced Precipitation Stimulated Soil Respiratory Loss and Extracellular Hydrolases in a Switchgrass Experiment

Madhav Parajuli, Jianwei Li

Department of Agricultural and Environmental Science, Tennessee State University, Nashville, Tennessee, USA

Correspondence Email: parajulimadhav2015@gmail.com

Precipitation regimes exert important controls on soil respiration but the underlying microbial mechanisms that likely mediate the effects remain rarely studied, particularly in a bioenergy cropland such as switchgrass (*Panicum virgatum* L.). Based on a three-year switchgrass mesocosm experiment, five precipitation regimes were included representing mean annual precipitation amount (P0), two drought conditions (P-33 and P-50: 33% and 50% reduction relative to P0), and two wet conditions (P+33 and P+50: 33% and 50% enhancement relative to P0). Soil samples (0-15 cm) were collected and soil organic carbon (SOC), total soil nitrogen (TN), SOC/TN (C: N), microbial biomass carbon (MBC), soil CO₂ respiration rate (Rs), and extracellular enzymes activities (EEAs) were quantified. The specific soil respiration rate (Rss), derived as the Rs per unit microbial biomass, was used to index microbial growth efficiency (i.e., 1/Rss). Results showed insignificant differences in SOC and TN between treatments. Relative to P0, P+33 significantly increased Rs by 121~312% and little changed MBC, leading to significantly higher Rss ($P < 0.05$). P+33 also significantly increased the activities of carbon acquisition enzymes by 102% but did not change with decreased precipitation. Relative to P0, drought treatments (P-33 and P-50) slightly decreased Rs and MBC, resulting in insignificant changes in Rss. Activities of nitrogen acquisition enzyme is less sensitive to either increased or decreased precipitation. These results suggested that the enhanced quantity of precipitation stimulated soil respiratory C loss likely associated with both elevated hydrolases and reduced microbial growth efficiency. However, microbial community responses to drought conditions are less pronounced in either hydrolases or microbial physiology, likely caused by the soil moisture threshold in the switchgrass mesocosm experiment.

Keywords: Extracellular enzyme, Mesocosm experiment, Microbial growth efficiency, Soil respiration, Switchgrass, precipitation regime change

~*~

193 O - Potential of Beneficial Trichoderma Isolates in Alleviating Drought Stress in Tomato

¹Ranjana Rawal, ¹Joseph Scheerens, ²Maria S. B. Ponce

¹Department of Horticulture and Crop Science, The Ohio State University, Wooster, Ohio, USA

²Department of Plant Pathology, The Ohio State University, Wooster, Ohio, USA

Correspondence Email: rawal.27@osu.edu

Drought stress (DS) is the most destructive abiotic stress responsible for limiting global food production. The use of rhizosphere-symbiotic fungi of the genus *Trichoderma* has been established as a sustainable tool for inducing stress tolerance in crops. However, the beneficial effects of growth promoting *Trichoderma* on DS are poorly understood and may be isolate-specific. The overall goal of this study was to evaluate the ability of novel *Trichoderma* isolates, primarily native to Nepal, to improve growth in tomato genotypes that are exposed to DS. Forty-five *Trichoderma* isolates were collected (from Nepal; N=21, Ohio; N=24), and 24 isolates were selected based on their growth performance under osmotic stress in plate assays. These 24 isolates were evaluated in the greenhouse and we found that the plants treated with *T. viride* (T3), *T. asperellum* (T16), and *T. asperellum* (T33) had higher shoot biomass compared to the non-inoculated control (T0). Similarly, tomato plants inoculated with these isolates showed reduced wilting symptoms and faster recovery upon irrigation. A second greenhouse experiment was conducted to identify the response of different tomato genotypes inoculated with these three *Trichoderma* isolates under DS conditions. The result showed that all the genotypes of tomato tested (Jaune Flamme, Roma, Punta Banda) inoculated with T33 had a significantly higher shoot and root biomass, chlorophyll content, and lower wilting symptoms compared to the plants treated with other isolates. Additionally, these isolates changed the root architecture of tomato seedlings in plate assays, which could result in an increased root surface as a potential adaptation strategy. Collectively, results showed a positive impact of T33, an isolate collected from the arid region of Nepal, on the morphology and physiology of tomato plants under DS.

Keywords: Abiotic stress, Drought, Fungi

~*~

194 O - Nitrogen Optimization in Cotton Production with the Bayesian Hierarchical Approach

¹Chandra K. Dhakal, ¹Sarah Edewor, and ²Megha N. Parajulee

¹University of Georgia, Athens, Georgia, USA

²Texas A&M AgriLife Research, Lubbock, Texas, USA

Correspondence Email: chandrakantdhakal@gmail.com

Limited productivity, volatile lint price, and increasing input costs have been major constraints on cotton production. Nitrogen fertility accounts for 15-20% of cotton production costs. Fitting of crop yield response functions to yield data has become an increasingly common method to derive the optimal input decisions. However, selection of an inaccurate function can affect the accuracy and reliability of optimal nitrogen recommendations. The stochastic plateau function (SPF) includes two independent random effects: the year random effect as an intercept and the plateau random effect which allows year to year variation of expected yield potential. We used hierarchical Bayesian methods to estimate the parameters of SPF to account for non-normal distribution of

random effects on expected lint yield. The estimates from SPF with Bayesian methods were used in dynamic programming model. The dynamic optimization program considered an intertemporal nitrate nitrogen residual function and maximized net present values over a 10-year planning horizon. To our knowledge, no prior studies using SPF with Bayesian approach while also considering carryover effects in fertilizer management decisions exist. In this study, a hierarchical Bayesian approach is used to estimate stochastic plateau response functions under alternative distributions for plateau; a normal and beta density function. The estimation results are also compared with their deterministic plateau counterparts. The non-stochastic plateau function was rejected in favor of stochastic plateau form because it fit the data best. Optimal levels of total nitrogen and net present values of returns were all greatly influenced by the choice of the response functions and nitrogen-to-cotton price ratios. Nitrogen recommendation based on SPFs using soil test information is more prudent for farmer decision-making in nitrogen optimization. Findings of this study are particularly important considering the escalating price of nitrogen and facing a serious environmental challenge including nitrate contamination in water bodies due to over-application of nitrogenous fertilizers.

Keywords: Cotton production profitability, Farmer decision-making, Nitrogen fertilizer optimization, Stochastic plateau function

~*~

195 P - Computational Method to Predict Drought Resistance Gene in Rice

Mandeep Adhikari

Molecular Bioscience and Bioengineering, University of Hawaii at Manoa, Hawaii, USA

Correspondence Email: mandy.deep123@gmail.com

Computational methods for predicting gene of interest and recognizing protein coding regions in genomic DNA have evolved significantly in recent years. This novel technique has provided research breakthrough in the field of genomics and disease resistance. Some advanced gene prediction tools have been extensively used in cancer research and genetic diseases however their use is limited to some model organisms in plant science and are yet to be explored in agriculture to identify superior agronomic traits. In this study, we used *Oryza sativa* gene expression data to predict the key genes involved in water stress tolerance. We applied an SVM-RFE (Support Vector Machine-Recursive Feature Elimination) feature selection method for the prediction. We also expanded our study to predict genes involved in drought susceptibility. We analyzed the top 12 genes predicted to be involved in drought tolerance. Ten of them were known to govern drought resistance. Our study showed that the SVM-RFE method is a very useful and efficient method in analyzing crop data and studying genotype-phenotype relationships in rice.

Keywords: Drought, Resistance, Rice

~*~

196 O - Screening and Evaluation of Multi-Parental Rice Genotypes for Seedling Stage Salinity Tolerance

Sandeep Chapagain, Prasanta K. Subudhi

School of Plant, Environmental and Soil Sciences, Louisiana State University, Baton Rouge, Louisiana, USA

Correspondence Email: psubudhi@agcenter.lsu.edu

Rice (*Oryza sativa* L) is a staple cereal crop that feeds more than half of the population worldwide. Soil salinity is one of the widespread problems in rice growing countries that limit production globally. Rice is sensitive to salinity at seedling and reproductive stage. Therefore, development of salinity tolerant varieties is the most feasible approach to increase rice productivity in saline prone areas. Multi-parental advanced intercross (MAGIC) population development approach is recently developed and has been employed to develop stress tolerance crops by accumulating desirable genes/attributes from multiple parents. In this study, we developed 893 multi-parental introgression lines (ILs) from 8 different combinations in the background of US rice cultivars using multiple donors and evaluated seedling stage salinity tolerance. We screened BC3F3 ILs population under salinity stress at EC 12 dS/m and EC 18 dS/m in sand culture and scored salt injury level when susceptible parents showed characteristic symptoms. Many lines were found to be salinity tolerant from different cross combinations, such as Jup/FL478//Jup/Hasawi (4% highly tolerant, 43% tolerant), Jup/TCCP//Jup/FL478 (5% highly tolerant, 57% tolerant), Cyp/FL478//Jup/Hasawi (11% tolerant), Mer/Geu//Mer/Hasawi (34% tolerant), Chen/FL478//Chen/Dular (15% tolerant), and Cyp/Has//Cyp/FL478 (30% tolerant). Furthermore, we observed salinity related morphological traits, root length, shoot length, dry weight, root-shoot ratio, and chlorophyll content of the selected tolerant lines. We will measure Na⁺ and K⁺ to validate tolerant lines and to understand tolerance mechanisms. Genetic diversity will be studied. In the future, these selected breeding lines will be used to identify superior salt tolerant alleles and provide an opportunity for functional genomics studies which can be used for developing salinity tolerant rice varieties.

Keywords: Multiparental population, Rice, Salinity, Susceptible, Tolerant

~*~

197 O - Evaluation of Row Covers in Yield Performance of the Leafy Green Vegetables in Organic Management System

Kripa Dhakal

Department of Agricultural and Environmental Sciences, Tennessee State University, Nashville, Tennessee, USA

Correspondence Email: kdhakal@my.tnstate.edu

Row covers are commonly used in organic agriculture to extend the production season, protect crops from insect pests and frost, increase water use efficiency, and increase crop yield. Insect pest management is a major challenge for organic growers. The objective of this study was to evaluate the impact of row covers on the yield performance of leafy green vegetables in an organic production system. Four leafy green vegetable crops, including kale, collard, Swiss chard, and lettuce, were evaluated in two research trials in spring 2018 and 2019 at the Tennessee State University organic farm in Nashville. Plants were grown in three different types of row cover, including insect net, agribon cloth, plastic, and a control without row cover. In 2018, the fresh weight of harvest was significantly higher (>50% increase) on agribon cloth for kale, Swiss chard and collard compared to open rows while lettuce performed better under insect net compared to that in open rows. Most of the plants did not survive under plastic as temperature increased in late spring 2018. In 2019 spring, Swiss chard and collard fresh weights per plant were significantly higher in plastic while lettuce under agribon cloth and kale under insect net yielded higher than the same with other treatments. This result showed that the early spring weather favored plastic cover that helped increase the temperature under cover. Results also showed that yield was higher

in all leafy greens in spring 2019 compared with that in 2018. Overall, row covers appeared to contribute positively in sustainable production of leafy greens for organic vegetable growers.

Keywords: Crop protection, Fresh weight, Organic production, Row cover

~*~

198 O - Students' Preference for and Perception of Agricultural Education: A Case of Rural Nepal

¹Lila B. Karki, ¹Uma Karki, ²Ganesh Joshi, ³Jacob Yabi

¹Tuskegee University, Alabama, USA

²Commission for Investigation of Abuse of Authority, Nepal

³University of Parakou, Benin

Correspondence Email: lkarki@tuskegee.edu

Agriculture is the backbone of the Nepalese economy. However, it has not received the expected priority in terms of resource allocation. The objective of this study was to assess the preference, perception, and willingness of high school students towards agricultural education. The study introduced surveys to 83 agricultural track students. Frequency distribution, correlation, and a cross table analyses were done to analyze the data using SPSS. The findings revealed that nearly 98% of the respondents were fascinated with undergoing an agricultural track at school. Likewise, 90% preferred agriculture as their major subject in college education, followed by pure science (5%), and law (1%). Within agriculture, 72%, 15%, 5%, 4%, and 4% respectively intended to study agronomy, veterinary medicine and animal sciences, plant protection, horticulture, and agri-engineering for specialization. Regarding the professional career, 37% preferred agricultural research, 32% indicated to be an agricultural technician, 17% agri-instructor, 5% public office, 4% entrepreneur, 4% farming, and 1% administration. Of the major reasons for choosing an agricultural track, 100% of respondents believed that agriculture is an important subject, 99% underlined that agriculture eradicates poverty, and 98% confirmed that agriculture is the main engine for economic growth. Additionally, 99% recognized that improved agriculture is required to feed the growing population, 96% emphasized mechanization as a pre-requisite to achieve desired progress in agriculture, and 96% believed that girls' involvement is important in agricultural education. Correlation coefficients revealed positively significant relationship ($p < 0.01$) between agriculture, as the main engine of economic growth, women's agricultural careers, agriculture needed to feed the growing population, and mechanization to trigger progress in agriculture. The results explicated that >90% of respondents showed a positive attitude and willingness for agricultural education both at school and college. However, frequent turnover of agricultural instructors was found as a major constraint in promoting agricultural education at the rural schools.

Keywords: Agricultural education, Economic growth, Agricultural track career, Students' willingness

~*~

199 O - Biodiversity-based Value Chain Development of Traditional Crops for Nutrition Sensitive Agriculture in Nepal

Devendra Gauchan

Bioversity International, Kathmandu, Nepal

Correspondence Email: d.gauchan@cgiar.org

Traditional crops of Nepal such as barley, buckwheat, beans, minor millets, grain legumes, fruits and vegetables have great potential to promote nutrition sensitive agriculture due to their nutrient dense value and globally important gene pools. However, the biodiversity of these traditional crops is not adequately exploited by developing markets and value chains. Thus, this paper aims to present experiences and potentials of promoting biodiversity-based value chain development by exploiting traditional crop biodiversity from the mountain agroecosystems in Nepal. This study applied methods combining value chains of biodiversity and nutrition sensitive agriculture of traditional crops from four representative high-altitude locations of Humla, Jumla, Lamjung and Dolakha districts. The research employed field surveys of 328 households, including participatory rural appraisals and market, value chain assessment for the mapping of the value chains' components, key actors, and constraints. The finding showed that the major value chains for the traditional crops included seed, production, processing, marketing and consumption, which are presently weak, fragmented and not properly connected among the biodiversity-based sub-components of production, processing, marketing and consumption. Considering these constraints, value chain upgrading is initiated by mobilizing local communities and linking them with entrepreneurs, hotels, homestays, and consumers. This includes product diversification, processing, value additions and interventions in nutrition analysis, food recipe formulation and consumer awareness. Traditional crops with organic production, value addition and marketing have shown great market and value chain potentials as their demand and product price are increasing recently with consumer awareness of their health value as well as the rich available biodiversity of these crops. Promotion of biodiversity-based value chain development is suggested to promote nutrition sensitive agriculture with focus on organic-ecofriendly production, marketing and certification system linking with geographic indication.

Keywords: Biodiversity and nutrition-based value chains; Crops biodiversity, Organic market

~*~

200 P - Health Parameters of Hair Sheep Raised in Silvopasture and Woodland Systems

¹Nevershi Ellis, ¹Uma Karki, ¹Bidur Paneru, ²Shailes Bhattra

¹Department of Agricultural and Environmental Sciences, Tuskegee University, Tuskegee, Alabama, USA

²Department of Poultry Science, University of Georgia, Athens, Georgia, USA

Correspondence Email: nellis7194@tuskegee.edu

Use of silvopastures and woodlands for raising small ruminants in the Southeast is getting more attention at present than in the past because of multiple benefits these systems offer. However, how the animal health is impacted while stocked in these systems is not documented well, especially for hair sheep in the Southeast. The objective of this study was to evaluate different health indicators of hair sheep raised in silvopasture and woodland systems. Katahdin-St. Croix-cross ewe lambs (n=20; 59.2±2.14 lb live weight; 5-6 months old) were rotationally stocked in silvopasture and woodland plots (10 animals/system; study plots – 1 acre each, 3 plots/system) from May to October 2019. Blood samples were collected on the very first day before allocating

animals to the experimental plots, then in the middle and at the end of the study. Fecal samples were collected on the very first day, then repeated every 14 days until the end of the study and analyzed for the type and severity of the gastrointestinal-parasite infestation. Towards the end of the study, fecal samples were collected and analyzed for fecal nutrients (N, P, crude protein (CP), and digestible organic matter (DOM)). Blood samples were analyzed for 42 different parameters. Data were analyzed in SAS 9.4 using GLM procedure. Silvopasture ewes showed greater levels of calcium, albumin, alkaline phosphate, and sodium, and less creatinine and neutrophils vs. the woodland ewes ($p < 0.05$). Nutrient components present in feces indicated adequate P in animals' diet and desirable rumen efficiency in both groups. However, fecal DOM and P levels were less in silvopasture ewes vs. the woodland ewes ($p < 0.05$). Results indicated that both systems were comparable in terms of numerous indicators, except a few that showed the difference between the systems.

Keywords: Complete blood count, Fecal samples, Grazing

~*~

201 O - Comparison of Evapotranspiration of Differently Managed Pastures in the US Southern Plains

¹Rajen Bajgain, ¹Xiangming Xiao, ²Jefferey Basara, ³Pradeep Wagle

¹Center for Spatial Analysis, University of Oklahoma, Norman, Oklahoma, USA

²School of Meteorology, University of Oklahoma, Norman, Oklahoma, USA

³Grazingland Research Laboratory, USDA-ARS, El Reno, Oklahoma, USA

Correspondence Email: rajen@ou.edu

Grassland, which covers about 67% of land cover in North America, plays an important role in the regional carbon and water cycles. With increasing beef demands, the grasslands in water limited areas are already sustaining pressure for higher demands in productivity. The Southern Plains of the United States have seen conversion of native pastures into introduced pastures for enhancing the production potential. Since the carbon and water exchanges are tightly coupled, the management activities in grassland would impact the water exchange process, measured as evapotranspiration (ET). Two paired sites located at the United States Department of Agriculture, Grazingland Research Laboratory, El Reno, OK, were selected for the detailed quantification of ET of the native (NP) and introduced (IP) pastures at hourly, daily, seasonal, and annual scales. Two years (2015-2016) of ET data measured by eddy covariance system were analyzed to understand the effects of managements on water budget of the grassland ecosystems. Preliminary results showed that higher ET was measured at the NP in both years compared to the IP. The ET rates at half hourly scale at NP in 2015 (pluvial) were about 50% higher than ET rates of IP during the peak growing season. However, in a normal rainfall year (2016), both pastures showed similar magnitudes of ET at half hourly, daily, and annual scales. Overall, the IP was more water use efficient (i.e., higher amount of carbon fixed per amount of water lost) than the NP.

Keywords: Evapotranspiration, Managed pasture, Native prairie, Ecosystem water use efficiency

~*~

204 O - Colonization of Soybean Stems and Toxin Production by the Stem Canker Pathogen, *Diaporthe aspalathi*

¹Bhawana Ghimire, ¹Saurabh Gautam, ¹Rajagopalbabu Srinivasan, ²Ethan Menke, ²Zenglu Li,
¹James W. Buck

¹University of Georgia, Griffin, Georgia, USA

²University of Georgia, Athens, Georgia, USA

Correspondence Email: bhawanigriffin@gmail.com

Southern stem canker disease caused by *Diaporthe aspalathi* has caused major production losses in soybean in the Southeast U.S. Disease symptoms include stem lesions, internal stem discoloration, interveinal chlorosis, and death in susceptible genotypes. Stem colonization defined by quantitative polymerase chain reaction (PCR) assay and direct planting of stem segments on agar, internal discoloration, and lesion lengths were assessed for three *D. aspalathi* isolates, differing in virulence, on susceptible and resistant soybean genotypes. Disease symptoms were compared between an in vitro toxin bioassay and the toothpick inoculation assay. The most virulent isolate of *D. aspalathi* produced longest internal discoloration on the susceptible genotypes G810-2057. *D. aspalathi* colonized resistant and susceptible soybean genotypes and the three isolates differed in toxin production. The toxin bioassay conducted at two dilutions produced disease symptoms significantly different from the toothpick assay on most soybean genotypes, indicating the two assays cannot act as substitutes in phenotype screening.

Keywords: *Diaporthe aspalathi*, Southern soybean stem canker, Virulence, Phenotype screening

~*~

205 O - Interseeding Alfalfa into Native Grasslands for Minimal Trade-offs in Soil Water Consumption

¹Madhav Dhakal, ²Charles P. West, ²Sanjit K. Deb, ³Carlos Villalobos, ⁴Geeta Kharel

¹Sustainable Water Management Research Unit, Leland, Mississippi, USA

²Plant and Soil Science Department, Texas Tech University, Lubbock, Texas, USA

³Department of Natural Resources Management, Texas Tech University, Lubbock, Texas, USA

⁴Department of Crop, Soil and Environmental Sciences, Auburn University, Auburn, Alabama, USA

Correspondence Email: madhav.dhakal@usda.gov

Livestock productivity of semiarid, native grassland is potentially enhanced by interseeding alfalfa (*Medicago sativa* L.), but little is known of the impact on forage yield, quality, and water use. Two hay-type cultivars, 'WL 440HQ' (WL), 'NuMex Bill Melton' (NuMex), and grazing-type 'Falcata'-'Rhizoma' blend (FR) were interseeded into mixtures of four native-grass species in fall of 2015, at 36- and 71-cm row spacing as high- and low-density plantings, respectively. Plots were harvested periodically over 3 years. Evapotranspiration (ET) was estimated based on rainfall and changes in soil water volume and used to calculate water use efficiency (WUE, kg of forage mass m⁻³ of ET) and water footprint (WF, m³ of ET per kg of product) for crude protein (CP) and digestible organic matter (DOM) yield. Alfalfa-grass mixtures produced 35% more forage mass and 96% greater nitrogen (N) yield than the grass-only. Narrow-row alfalfa produced greater total forage mass than wide-row for the first 2 years (P < .05), but no difference between row spacings occurred by year 3. Wide rows had 23% and 26% less marginal cost of revenue increment than the same with narrow rows, relative to grass-only in years 2 and 3, respectively (P < .01). Cultivars NuMex and WL produced greater forage mass, CP, and DOM than the short-statured FR,

especially at high density ($P < .05$). Alfalfa-grass mixtures increased WUE by a mean of 25% and reduced the WF ($P < .001$) with respect to CP and DOM production from 20.17 and 3.07 m³ kg⁻¹ to 10.14 and 2.22 m³ kg⁻¹ over the grass-only stands, respectively. There was no difference between row spacings for WUE, WF, weed biomass, and weed N mass ($P > .05$). Interseeding alfalfa at wide-row spacing can enhance forage productivity and WUE and reduce WF relative to grass-only with narrow-row spacing.

Keywords: Alfalfa, Row spacing, Water use efficiency, Yield

~*~

206 P - Cattle Milk Production and Marketing Chain in Bharatpur-16, Chitwan, Nepal

¹Iebu Devkota, ²Hom B. Basnet, ³Uma Karki

¹Animal Science, Veterinary Science and Fisheries, Agriculture and Forestry University, Chitwan, Nepal

²Department of Microbiology and Parasitology, Agriculture and Forestry University, Chitwan, Nepal

³Tuskegee University, Alabama, USA

Correspondence Email: ebudevkota@gmail.com

Dairy has appeared as a prestigious occupation among other agriculture sub-sectors, contributing 2/3rd to agriculture gross domestic product and has contributed to draw urban capital to rural areas. Recent development of milk processing centers and chilling centers have created a significant ripple effect in booming of the commercial dairy farming system. The major objective of this study was to examine the economics of production and marketing status of milk produced in a traditional cattle rearing system in Bharatpur-16, Chitwan district. VijayaNagar and Gadhi are the two areas chosen for this study due to the overwhelming population of small-scale farmers raising cattle traditionally. A total of 30 farmers were selected from the list of the two Milk Producers' Cooperative (MPC). Two collection centers or processing units that received milk from MPC were selected for the interview. Primary (household survey, interview of key informant and field observation) and secondary (milk producer records) sources were used for data collection. Collected data were coded, tabulated and analyzed using MS-Excel and SPSS. Descriptive and inferential statistics were used for the analysis data. This study is expected to calculate the marketing margin of the milk produced in traditional rearing practices. The relation between factors affecting milk quantity and quality, if present, will be discussed. The present economics involved in milk production in traditional practice will be highlighted.

Keywords: Cattle, Economic analysis, Traditional cattle rearing

~*~

207 O - Economic Potential of Specialty Vegetable - Bitter Melon - in the Southeast USA

¹Lila B. Karki, ²Uma Karki, ³Srinivasa R. Mentreddy

¹Cooperative Extension, Tuskegee University, Alabama, USA

²Department of Agriculture and Animal Sciences, Tuskegee University, Alabama, USA

³Department of Biological and Environmental Sciences, Alabama A&M University, Alabama, USA

Correspondence Email: lkarki@tuskegee.edu

Regardless of food habits, cultural diversity, religious beliefs, and social taboos, an increasing number of people eat bitter melon (specialty melon/gourd). It is one of the most grown vegetables in Asia and has also been grown in tropical and subtropical regions in the USA. Despite its increasing demand mostly by ethnic populations, its production and marketing continue to be a challenge for small-scale growers. Therefore, the study conceptualized a production possibility frontier model to measure the economic benefits of its alley cropping. It was hypothesized that introducing specialty vegetables – bitter melon with tree nuts and timber - maintains annual cash flows for farm operations while trees remain growing, optimizes cost-benefit, minimizes risks, and surges total return for the growers. Consequently, alley cropping with pecans and loblolly pine was established in a research site, and market surveys of bitter melon were conducted in the southeast USA. The surveys collected prices of bitter melons (Chinese, Indian, Japanese, and Honduran) from various retail, specialty grocery, and ethnic stores, and farmers' markets. In total, 64 price observations of bitter melons were collected from 11 cities of Georgia, Alabama, and Florida. The most price information was collected for Indian (48%) and Chinese (25%) types. The price ranged from \$0.75/lb in Gainesville, Florida, to \$3.00/lb in Mobile, Alabama. However, the mean price of the Chinese and Indian types was respectively $\$1.83 \pm 0.45$ /lb and $\$1.86 \pm 0.43$ /lb. The price varied among cities, stores within a city, and the types of bitter melons. Furthermore, seasonal variation of the prices is yet to be estimated. The analyzed market price of specialty melon/gourd in all surveyed cities opens a considerable production possibility for its growers. Assessments of economic benefits using the surveyed market price information, production data from the research site, and secondary sources are yet to be performed.

Keywords: Consumer preference, Market opportunity, Specialty vegetable, Supply potentials

~*~

209 O - Efficacy of Sulfur and Copper as Fungicides to Control Pawpaw Leaf and Fruit Spot

¹Manisha Hamal, ²Sijan Pandit, ¹Jeremy Lowe, ¹Sheri Crabtree, ¹Kirk W. Pomper

¹Horticulture Department, Kentucky State University, Frankfort, Kentucky, USA

²Department of Pathology, University of Lethbridge, Lethbridge, Alberta, Canada

Correspondence Email: manisha.hamal@kysu.edu

The North American pawpaw (*Asimina triloba*) is a native tree fruit of the Eastern United States. It has a smooth custard-like texture and has a flavor which is a combination of mango, banana, and pineapple. Pawpaw leaf and fruit spot caused by *Asperisporium caricae* is the major disease, among the few diseases, that can result in crop losses in pawpaw. Most of the pawpaw growers prefer organic and sustainable control methods to synthetic chemical controls. The purpose of this research is to study the efficacy of sulfur and organic-certified, copper-based fungicide for the management of pawpaw leaf and fruit spot disease, and to investigate if any of the sulfur and copper fungicide treatments has a negative effect on the fruit weight and fruit retention of Sunflower and Susquehanna cultivars of pawpaw. The research was conducted at Kentucky State University Harold R. Benson Research and Demonstration Farm in Franklin County, Kentucky in 2018. Fruit clusters were treated with two levels of each fungicide (sulfur at 25 or 50 ml/800 ml of water or copper at 3.12 or 12.5 ml/800 ml of water) and water without any fungicides was used as control. Insecticidal soap was used as an adjuvant in all treatments, including control, at 155 μ l per 800 ml of water. Cultivar had a significant effect on fruit weight, disease prevalence on fruits,

and disease prevalence on leaves. On leaves, all treatments had significantly less disease prevalence compared to control and alternative control in Sunflower cultivar and the same was the case in Susquehanna, except for high copper. However, on fruits, only the alternative control, but not the water control, had significantly higher levels of fungal prevalence in comparison to other treatments. Single-year data is not enough to draw a conclusion about the effectiveness of these fungicides; therefore, this study would be replicated for further validation of the results.

Keywords: Cultivar, Dark patches, Fungicide, High-value crop, Management practice

~*~

210 P - Ethnoveterinary Practices Among Small-scale Goat Farmers of Nawalpur, Nepal

¹Sachin Regmi, ¹Mohan Sharma, ²Santosh Dhakal, ¹Bal K. Pandey

¹Agriculture and Forestry University, Chitwan, Nepal

²Johns Hopkins University, Maryland, USA

Correspondence Email: thesachinregmi@gmail.com

This survey intended to document different ethnoveterinary practices used by small-scale goat farmers of Nawalpur district of Nepal. Altogether 45 small-scale goat farmers, 71.11% female and 28.89% male, were enrolled in this study. The average age of the respondents was 44.67 ± 2.41 years. The average flock size of goat was 13.93 ± 2.91 heads. Information was gathered through in-person interviews using a pre-structured questionnaire. Among the respondents, 91.11% of the farmers used ethnoveterinary practices. Informant Consensus Factor (Fic), Fidelity Level (FL), and Direct Matrix Ranking (DMR) were used as statistical tools for the study. Altogether 9 different plants, 1 acid, 1 chemical compound, and 1 food by-product were noted to be used as ethnoveterinary medication. Among these plant species, 22.22% were herbs, 33.33% were shrubs, and 44.44% were trees. Fic revealed that ethnoveterinary practices are used mostly for gastrointestinal disorders (75.56%, 34 of 45) such as helminths 47.05% (16 of 34), bloat 23.52% (8 of 34) and diarrhea 29.41% (10 of 34) followed by respiratory disorder (40.00%, 18 of 45) including cough 44.44% (8 of 18) and pneumonia 33.33% (6 of 18), trauma 22.22% (10 of 45), and stomatitis 11.11% (5 of 45). The category that had the highest FL value was *Cannabis sativa* (80%) followed by *Alium sativum* (45%) and *Pisidium guajava* (25%). Additionally, parts used were leaves, buds, whole seed, flowers, and root, either in water solvent or oil adjuvant. DMR showed the highest value for *Cannabis sativa* which has multiple uses. Leaves, buds, flowers, and roots of *Cannabis sativa* were used by different farmers for different purposes. This study shows that ethnoveterinary practice is common among small-scale goat farmers of Nawalpur district. Considering the historical use of such practices in other parts of the country as well, exploring pros and cons of ethnoveterinary medicine would benefit in their rational uses.

Keywords: *Cannabis sativa*, Ethnoveterinary medicine, Goats, Small-scale farmers

~*~

211 O – Agri-trade Relationship between North America and Nepal

¹Purna Kandel, ²Tulsi Dharel

¹Liam International Corporation, Toronto, Canada,

²Centennial College, Toronto, Canada

Correspondence Email: purna.kandel@liambiochem.com

Canada and USA, collectively North America, and Nepal enjoy mutual business among these countries. Major imports of Nepalese AgriFood products are tea, dog chew, spices, noodles, botanical herbs, and essential oils. The total volume of Nepalese AgriFood product export is around US\$40 million per year. Similarly, large amounts of AgriFood products are exported from North America to Nepal. Major products are soybean, canola, lentil, peas, walnut, and almonds. Some final processed food products are also exported from these countries to Nepal. The approximate volume of North American business is \$600 million per year. Similarly, there are added volume of AgriFood trades originated from North America but re-exported from India, UAE, and Singapore. There are few systemic efforts to manage business between Nepal and North America. The food safety regulation, required volume, and no direct access to local market are hindering factors for Nepalese exporters. Additionally, shipping cost, logistics, and banking facilities are hindering export of AgriFood commodities to Nepal. From North American perspectives, their perceived feeling of small market and long shipping duration makes Nepal a less attractive export destination. Similarly, no credit rating of Nepalese companies and lack of bilateral business organizations are also limiting factors. North American companies also have potential to establish food processing industries as well as high-tech companies to cater to domestic and international markets. Going forward, bilateral trade organizations and a growing Nepalese diaspora have great potential to bridge the link to expand both export and import between North America and Nepal.

Keywords: Agricultural trade, Nepal, North America

~*~

212 O - Genetic Associations for Flower Traits of Miscanthus Grown in the Southeast United States

Yongli Zhao

College of Agriculture, Environment and Nutrition Sciences, Tuskegee University, Tuskegee, Alabama, USA

Correspondence Email: yzhao4651@tuskegee.edu

Flowering is one of the key phenological stages for plants. Early and late flowering affects the yield and quality of perennial grasses grown for biomass. Early flowering of *Miscanthus* results in low yield because they do not experience the full use of the entire growing season. Late flowering *Miscanthus* renders higher ash content when the biomass is burnt because nitrogen and other nutrients from leaves and tillers are not channeled to rhizome due to the short available growing time. The lower latitude of the southeast USA (Alabama) causes *Miscanthus* to flower earlier with respect to Midwestern states because of the shorter days in summer season. The common commercial clone of *M. × giganteus* performs poorly in the southeast USA due to early flowering. Therefore, it will be very important to select the *Miscanthus* suitable for the specific environment with appropriate flowering phenology. Obtaining useful molecular markers associated with specific traits and applying marker-assisted selection will facilitate the process of selection of suitable plants, which accelerates the development of hybrids and high-performance varieties of *Miscanthus*. In this study, genome-wide association studies (GWAS) were performed for 169 *Miscanthus* accessions grown in Tuskegee, AL with 46,177 imputed and non-imputed SNPs through 2 single-locus methods and 7 multiple-locus methods. A total of 1,675 SNPs associated with flowering time were detected, of which 72 SNPs' nearby homologous genes were predicted

or identified to regulate the flowering traits. These associated SNPs markers will foster molecular breeding in improving the yield of Miscanthus.

Keywords: Flowering time, GWAS, Miscanthus

~*~

213 O - Effect of Different Chemicals on the Management of Bacterial Stalk Rot (*Erwinia carotovora*) of Maize in Field Conditions

¹Sagar Karki, ²Basistha Acharya ³Darbin Joshi

¹Department of Plant pathology, Tribhuvan University, Lamahi, Dang, Nepal

²Department of Plant Pathology, NARC, Khajura, Banke, Nepal

³Department of Plant Breeding and Genetics, International Maize and Wheat Improvement Center (CIMMYT), Lalitpur, Nepal

Correspondence Email: karkisagar150@gmail.com

Bacterial stalk rot of maize, caused by the pathogen *Erwinia carotovora*, is one of the important maize diseases resulting in reduced yield and poor grain quality. A field experiment was conducted to evaluate the efficacy of different chemicals against bacterial stalk rot of maize in Rampur Composite maize cultivar in summer 2017 at the research field of Prithu Technical College, Institute of Agriculture and Animal Science, Lamahi, Dang, Nepal. The RCBD design was used with seven treatments in three replications. Treatments comprised of Allstin® (Carbendazim 50% W.P. @ 1.5 g/L water), Agricin® (Streptomycin Sulphate 9% + Tetracycline Hydrochloride 1% @ 2g/L water), Surya® (Cypermethrin 5% + Chlorpyrifos 20% @ 2ml/L water), Piyus® (Chlorinated Water @ 1.5 ml/L water), Agricin® + Surya® (Streptomycin Sulphate 9% + Tetracycline Hydrochloride 1% @ 2g/L water + Cypermethrin 5% + Chlorpyrifos 20% @ 2 ml/L water), Blitox-50® (Copper Oxychloride 50% @ 2g/L water), and a control plot. Among various treatments, Agricin® + Surya® showed significantly lower area under disease progress curve (AUDPC) (77.76) followed by Agricin® (120.54), while the highest AUDPC value was observed in control plot (221.98) followed by Allstin® (198.30). Similarly, the highest maize yield was obtained with Agricin® + Surya® (2.20 t/ha) followed by Agricin® (2.08 t/ha) and the lowest in control (1.77 t/ha) followed by Allstin® (1.91 t/ha). The AUDPC value showed a negative relationship with grain yield, i.e., as the AUDPC value increased as crop yield decreased. It was concluded that among different treatments, Agricin® + Surya® was the best combination to control bacterial stalk rot. Farmers can use these chemicals in a right dose to reduce disease severity and increase maize yield.

Key words: Bacterial stalk rot, Grain yield, Maize disease, Rampur composite maize

~*~

214 P - Variability and Path Coefficient Analysis for Yield Attributing Traits of Mungbean (*Vigna radiata* L.)

¹Sunil Ghimire, ¹Arun Khanal, ¹Ganga R. Kohar, ¹Bimala Acharya, ¹Anu Basnet, ¹Pragya Kandel, ¹Binita Subedi, ²Jiban Shrestha, ³Kshitiz Dhakal

¹Department of Plant Breeding and Genetics, Tribhuvan University, Rupandehi, Nepal

²Department of Plant Breeding, Nepal Agriculture Research Council, Lalitpur, Nepal

³Department of Plant Breeding and Biotechnology, West Virginia State University, Virginia, USA

Correspondence Email: ghimiresunil7726@gmail.com

Seven mungbean genotypes were studied to estimate the genetic variability and path coefficient analysis for yield attributing traits at Agronomy farm of the Institute of Agriculture and Animal Science (IAAS), Paklihawa Campus, Rupandehi, Nepal during summer season of 2017. The experiment was conducted with four replications in a randomized complete block design. Pant-5 and Maya were found high yielding genotypes. High genotypic coefficient of variation was exhibited by secondary branches and seed yield per plant. The low genotypic coefficient of variation was given by pod length, number of grains per pod, and days to 50% flowering. High heritability was shown by test weight, secondary branches, and seed yield per plant. Yield was correlated positively with days to flowering, pod length, primary branches per plant, test weight, seed yield per plant, and number of pods per plant. Biological yield, pod length, days to 50% flowering, and number of grains per pod contributed maximum positive and direct effect on yield, indicating that these three traits should be given emphasis while selecting high yielding mungbean cultivars under irrigated conditions.

Keywords: Genotype, Heritability, Mungbean, Path coefficient, Variance

~*~

215 P - Screening of Local, Improved, and Hybrid Rice Genotypes against Blast Disease (*Pyricularia oryzae*)

¹Surakshya Bohora, ²Basistha Acharya, ³Darbin Joshi

¹Department of Plant Pathology, Tribhuvan University, Lamahi, Dang, Nepal

²Department of Plant Pathology, NARC, Khjaura, Banke, Nepal

³Department of Plant Breeding and Genetics, CIMMYT, Lalitpur, Nepal

Correspondence Email: surakshyabohora@gmail.com

Numerous studies have already established blast as a continuous and devastating threat to rice production in Nepal. Rice blast disease can be prevented by spraying chemicals, reduction in the use of nitrogenous fertilizers, and the use of biocontrol agents. Use of resistance varieties to *P. oryzae* is a reasonable, economical, and environment friendly method to control rice blast disease. Locally available, improved, and hybrid rice genotypes were screened at seedling stage against rice blast disease at Bangaun, Lamahi, Dang, Nepal in summer 2017. The experiment was conducted in RCBD design with 4 replications including 52 accessions of rice for screening. Summer sown rice accessions were scored for disease on various levels of growth based on a standard scale of 0-9 developed by the International Rice Research Institute (IRRI) at 5 days interval starting 20 days after transplanting. Rice genotypes showed resistance to highly susceptible reactions. Mean area under disease progress curve (AUDPC) values varied from 36.46 to 262.13. Significantly lower AUDPC value was obtained in Sabitri (36.46) followed by Hardinath-1 (39.93), Loknath-505 (48.61), and Makwanpur-1 (52.08). The highest AUDPC value was recorded in Sankharika (262.13) followed by Jumlimarshi (236.09) and Taichung (197.90). Disease severity was also lowest in Sabitri (19.44%) followed by Makwanpur-1 (22.22%). In earlier stage of crop development, Jumlimarsi and Ghaiya-1 showed higher disease infestation. Results showed that genotypes Sabitri and Hardinath-1 could be utilized as a source of blast disease resistance in rice breeding programs.

Keywords: Bio-control agents, Disease resistance, Rice breeding, Rice varieties

~*~

216 O - Development of Community-Based Eco-Farming as a Center of Excellence

¹*Sadhuram Singh Basnyat*, ²*Tilak Bhandari*

¹Kanjirowa Agro Consultant Pvt Ltd (KACPL), Kathmandu, Nepal

²Institute of Rubber and Jatropha Research-Nepal (IRJR-N), USA

Correspondence Email: retesh705@gmail.com

The current global scenario with contraction in farmlands and fewer farmers engaging in agriculture partly contribute to increased hunger and food insecurity. Nepal has the rich tradition of family farming that farm families can pursue and contribute to food production. These families, however, need some support from the government and other agencies for forward linkage and scale-up efforts. Appropriate policy intervention to small farms and agro-ecological farming could double food production and enable small farmers to continue farming and utilize rich biodiversity, and sustain ecosystems and local economies, while strengthening employment opportunities and social cohesion in rural areas. In Nepal, about 30 million people belonging to different ethnicities live in the geographically and climatically diverse settings. Besides applying innovative approaches and tools for improving agricultural system in the west Rukum and Bardibash in Nepal, KACPL is providing advisory services and assisting the local communities with research and development. Ongoing efforts continue to create a more conducive environment (sourcing fund, building knowledge-based management system, backward and forward linkage, etc.) for sustainable development, including (i) Community-Based Eco-farming in west Rukum in 402 hectares: Working with the local government and 754 household farmers are united and mobilized for a common goal but with different responsibilities -- farming, agro-tourism, agro-forestry, etc. (ii) Development of Center of Excellence for Horticulture (CoEH) in Bardibash in 60 hectares: Based on a public-private partnership (PPP) model, KACPL is facilitating to establish a complete agricultural system, from nursery to end users. Small farmers get direct services from this center. The collaboration between Bardibash municipality and KACPL for the CoEGH is expected to develop a national reference platform for research and innovation which could be an ideal avenue to showcase new technologies and help in knowledge sharing and technology transfer.

Keywords: Small farm, Eco-farming, Public Private Partnership, Center of Excellence

~*~

218 P - Status of Veterinary Vaccine Production in Nepal

¹*Uddab Poudel*, ²*Umesh Dahal*, ²*Saroj Chaudhari*, ³*Santosh Dhakal*

¹Institute of Agriculture and Animal Sciences, Tribhuvan University, Rupandehi, Nepal

²National Vaccine Production Laboratory, Department of Livestock Services, Kathmandu, Nepal

³Johns Hopkins Bloomberg School of Public Health, Maryland, USA

Corresponding Author: poudeluddab15@gmail.com

Livestock sector is an integral part of Nepalese economy with about 11% contribution in national gross domestic product (GDP). Livestock population has continuously increased in the last decade in Nepal and is likely to follow that trend as the interest in animal farming is growing. Infectious diseases such as foot-and-mouth disease (FMD), Peste des Petits Ruminants (PPR), hemorrhagic septicemia (HS), black quarter (BQ), classical swine fever (CSF), rabies, avian influenza, and Newcastle disease (ND) constitute one of the major health challenges to the Nepalese livestock and poultry industry. Vaccination is an efficient means of preventing animals and birds from contracting various economically important diseases. Considering this fact, the government of

Nepal has started production of veterinary vaccines since the 1960s. At present, the National Vaccine Production Laboratory produces at least 14 different types of vaccines to be used in animals and birds. Despite these efforts, the demand for vaccine is not met as Nepal spends billions of rupees in import of poultry and non-poultry vaccines each year. There is a need of strengthening laboratory facility for isolation and characterization of field strains of pathogens and capacity building for production of vaccines using updated modern technologies to be self-reliant in veterinary vaccine production in Nepal.

Keywords: Infectious diseases, Livestock, Nepal, Vaccines

~*~

219 O – Integrating Woodlands and Animal Production: Whole System Approach to Promote Sustainable Agriculture

¹Uma Karki, ¹Bidur Paneru, ²Shailes Bhattra, ³Rishi Khatri, ¹Nevershi Ellis, ⁴Lila B. Karki, ⁵Sanjok Poudel

¹Department of Agricultural and Environmental Sciences and Cooperative Extension, Tuskegee University, Tuskegee, Alabama, USA

²Department of Poultry Science, University of Georgia, Athens, Georgia, USA

³Department of Biological Sciences, Mississippi State University, Starkville, Mississippi, USA

⁴Cooperative Extension, Tuskegee University, Tuskegee, Alabama, USA

⁵Department of Crop, Soil and Environmental Sciences, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA

Corresponding author: ukarki@tuskegee.edu

Woodlands occupy the major land cover in the southeast USA and offer a great opportunity for animal grazing when managed sustainably. However, information on managing woodlands integrated with grazing animals to benefit all components of the system is rare. The objective of this study was to develop strategies to promote the sustainable use of woodlands integrated with small ruminants through the whole-system approach. Studies were conducted from 2015 to 2019 using meat goats and hair sheep in woodland plots (6, 1-acre each) with grazing facilities. Plant species present in the system were identified and quality was evaluated. In 2017, each plot was virtually demarcated into 4 equal strips and non-pine plants in each strip were either cut to one of the heights (0, 0.91, or 1.52 m from the ground surface; treatment) or left uncut (control). Animals were rotationally stocked targeting 50% defoliation of the available vegetation. Influx of photosynthetically active radiation (PAR) and the understory-vegetation biomass were quantified. Animal performance and health status, diurnal behavior and distribution, vegetation preference, and browsing height were assessed. Using these measures, economics of woodland grazing was assessed. Cutting non-pine plants increased PAR influx (4-19 times) and understory-vegetation biomass (35-141%) significantly. Animals consumed 70% of the plant species present in the system available up to 1.4 m. The distribution and feeding activity of animals were less in the control versus the cut areas. The growth of young animals was limited because of inadequate energy intake. Animals did not damage the well-grown pine trees. Feeding cost was 44-156% lower in woodland grazing compared to conventional feeding systems. Results suggest that woodlands can be well integrated with small ruminants when the whole system is managed properly with rotational stocking, supplementing young animals to meet their energy requirement, and enhancing the understory vegetation growth and utilization by animals.

Keywords: Economics, Energy, Small ruminants, Vegetation preference

221 O - Effect of Different Types of Mulch and Variety on Growth and Yield of Cauliflower at Parewadin, Dhankuta, Nepal

Kiran Roka, Birendra K. Bhattachan

Agriculture and Forestry University, Chitwan, Nepal

Correspondence Email: keranmagar50@gmail.com

Growth and yield of cauliflower depend on varieties and mulching materials. An experiment was conducted to study the growth and yield performance of three cauliflower varieties using different mulching materials at Parewadin, Dhankuta from January to May 2019. A factorial RCBD design comprising of 12 treatments, T1 (Anna cup + black plastic), T2 (Anna cup + straw), T3 (Anna cup + transparent plastic), T4 (Anna cup + no mulch), T5 (Snow grace + black plastic), T6 (Snow grace + straw), T7 (Snow grace + transparent plastic), T8 (Snow grace + no mulch), T9 (Yumiko + black plastic), T10 (Yumiko + straw), T11 (Yumiko + transparent plastic), and T12 (Yumiko + no mulch) were used. Growth and yield of cauliflower, soil moisture, and weed dynamics were significantly affected by mulching materials. The result revealed that plant height, leaf number, leaf length, stalk length, plant canopy, and curd length were higher for variety Yumiko followed by Snow grace and Anna cup. Leaf width, total plant fresh weight, marketable curd weight, net curd weight, and curd yield were higher for variety Snow grace followed by Yumiko and Anna cup. Growth and yield parameters were found higher for black plastic mulch followed by transparent plastic mulch, straw mulch, and no mulch. However, there was no significant interaction effect of mulching material and cauliflower variety on any parameters. Weed count and weed biomass were ranked as, no mulch > transparent plastic mulch > straw mulch > black plastic mulch. Therefore, use of variety Snow grace mulched with black plastic material is recommended to achieve high yield of cauliflower.

Keywords: Anna cup, Black and transparent plastic, Snow grace, Straw mulch, Yumiko

~*~

222 O - Elucidating the Effects of Organic vs. Conventional Cropping Practice and Rhizobia Inoculation on Peanut Yield and Rhizosphere Microbial Diversity

Dev Paudel, Liping Wang, Janam Acharya, Cleber Henrique Lopes de Souza, Esteban Rios, Jianping Wang

Agronomy Department, University of Florida, Gainesville, Florida, USA

Correspondence Email: dev.paudel@ufl.edu

Nitrogen is an essential and often growth-limiting nutrient for plants. Legumes like peanut (*Arachis hypogea*) fulfill their nitrogen requirement by symbiotic association with nitrogen-fixing bacteria called rhizobia. This symbiotic interaction results in the formation of root nodules that fix atmospheric nitrogen to enhance the growth and yield of peanuts. In addition to this, peanut yield also depends on variety, farming practice, type of rhizobia inoculation, and nutrient availability. Nutrient availability is largely determined by microbial activity in the rhizosphere that influences plant health, nutrition, yield, soil structure, and soil fertility. However, our understanding of the complex response of peanut yield and microbial diversity to organic vs conventional farming systems and to rhizobia inoculations is extremely limited. In this research, we studied the impacts of conventional vs. organic cultivation practices and rhizobial inoculation with commercial vs. single strain inoculum on peanut yield and soil microbial diversity of five peanut cultivars evaluated in a randomized complete block design with three replications. Samples from soil

rhizosphere were collected for DNA extraction. Yield on inorganic cultivated peanuts was significantly higher ($p < 0.05$) as compared to the yield on organic cultivation for all entries. Sequencing of the bacterial 16S rRNA genes showed a substantial variation in bacterial richness, diversity, and relative abundances of taxa between the cultivation types and inoculum, showing that there is preferential association of microbes to various genotypes and cropping systems. Results from this research have enabled us to dissect the response of cultivar to farming practice and inoculation, allowing us to identify peanut cultivars that are highly responsive to rhizobia inoculation and organic farming practices. This research guides farmers and scientists to improve peanut yield while promoting microbial diversity and increasing sustainability.

Keywords: 16s, Microbiome, Organic agriculture, Peanut, Rhizobia

~*~

223 O - Predictive Mapping of Above-ground Woody Biomass Using NAIP Images and LiDAR Data in Tennessee

¹Durga P. Joshi, ²Ghan S. Bhatt, ¹Bharat Pokharel

¹Department of Agricultural and Environmental Sciences, Tennessee State University, Nashville, Tennessee, USA

²Department of Mathematical Sciences, Tennessee State University, Nashville, Tennessee, USA
Correspondence Email: djoshi1@my.tnstate.edu

The predictive modeling and mapping of the spatial distribution of woody biomass are prerequisites for sustainable management and continuous supply of feedstock for biofuel production. Recent advancement of remote sensing technologies such as very high-resolution images (e.g., National Agriculture Imagery Program – NAIP images), and Light Detection and Ranging (LiDAR) method of acquiring data have gained popularity among resources managers, researchers, and landowners to estimate forest biomass and carbon stock across the forest landscape. In this project, we hypothesized that data matrix derived from LiDAR point clouds and textural analysis of the NAIP image will improve the prediction accuracy of forest stand-level variables such as biomass or carbon stock per unit area. A 2D discrete wavelet transform approach was used to predict forest characteristics. Forest Inventory and Analysis (FIA) data was paired with LiDAR-derived variables and digital elevation model, and with vegetation indices and wavelet coefficient from image analysis, from selected counties in Tennessee. Both parametric and non-parametric models were fitted, their model fit statistics were compared, and map-models were generated as a predictive map of above-ground forest biomass across the forest landscape. The non-parametric model developed using the Random Forests approach explained over 40% of variability for biomass with RMSE of 17 tons per acre. It is important to estimate above-ground forest biomass and carbon stock to estimate the role of forest in the regional and global carbon cycles and developing science-based forest management and climate change mitigation strategies through adaptive forest management schemes at local, regional, and national levels.

Keywords: Forest biomass, Image texture analysis, LiDAR, Wavelet transform

~*~

224 P - Use of Image Analysis and Photogrammetry as Tools to Quantify Tomato Spotted Wilt Virus Symptom Severity in Peanuts

¹*Santosh Sanjel*, ²*James Clohessy*, ²*Barry Tillman*, ²*David Wright*, ²*Ian M. Small*

¹Plant Pathology Department, University of Florida, Florida, USA

²North Florida Research and Education Center, University of Florida, Florida, USA

Correspondence Email: ssanjel@ufl.edu

Tomato Spotted Wilt Virus (TSWV) is an important pathogen of peanut in the Southeast United States. Phenotypic variation exists among peanut cultivars in their expression of TSWV symptoms. Evaluation of peanut varieties for their susceptibility to TSWV is a key step prior to release of new cultivars. Recently, image analysis in combination with machine learning has been explored as a tool to assist visual assessment of crop traits. The goal of this research is to investigate image analysis methods for their utility as assessment methods for spotted wilt severity. A full factorial design with peanut cultivar, plant population, and insecticide as main effects was conducted in Quincy, FL in 2017. Six peanut cultivars, differing in resistance to TSWV, were planted in mid-April to increase the probability of TSWV infection. Visual and multispectral images were acquired in the peanut plots and used to train a convolutional neural network (CNN) model for TSWV symptom recognition. Additionally, photogrammetry was used to generate 3D models to assess peanut canopy architecture and stunting of TSWV infected plants. Manual assessments using a visual rating scale for spotted wilt symptoms were compared to image analysis. Preliminary results indicate that the CNN model and photogrammetry approaches have potential as tools to evaluate spotted wilt symptom severity.

Keywords: Image analysis, Peanuts, Phenotyping, TSWV

~*~

226 P - Comparing Fruit Characteristics of KSU Pawpaw Cultivars with Commercially Available Cultivars

Anju Chaudhary, *Manisha Hamal*, *Jeremiah Lowe*, *Sheri Crabtree*, *Kirk W. Pomper*

Department of Environmental Studies, Kentucky State University, Frankfort, Kentucky, USA

Correspondence Email: chaudharyanju62@gmail.com

The North American pawpaw (*Asimina triloba* (L.) Dunal), a temperate member of the Annonaceae family, is a woody deciduous tree that has gained attention recently as a potential high-value tree fruit crop in the fresh market as well as in the processing industries. Pawpaw fruit has an intense flavor that resembles a combination of banana, mango, and pineapple. However, flavor varies among cultivars with some exhibiting a more complex flavor. Nutritionally, Pawpaw is superior to other fruits such as apple, grape, and orange because pawpaw has more vitamins, minerals, and amino acids. Generally, pawpaw is found in understory patches in forest areas with a low number of fruits that are of low quality. Kentucky State University was approved as the United States Department of Agriculture (USDA) National Clonal Germplasm Repository for Pawpaw (*Asimina* species) in 1994. The repository orchards currently contain over 2000 accessions collected from the wild in 17 states and more than 40 cultivars. The main goals of this repository are to preserve the genetic diversity of pawpaw, develop high-yielding cultivars with excellent fruit quality, and assist in pawpaw research and commercialization. Fruit from three KSU pawpaw cultivars (KSU-Atwood, KSU-Benson, and KSU-Chappell) were compared to fruit from commercially available cultivars (Mango and Sunflower) based on fruit weight, percent seed,

soluble solids, and *Phyllosticta* fungal spot coverage. KSU-Chappell had the largest fruit size (averaging over 228.02 g/fruit), the lowest percent seed (6.39%) and a Brix level similar to KSU-Atwood and Sunflower. However, KSU-Chappell had the highest incidence of *Phyllosticta* fungal spot, with an average coverage of 42.3%. Research is being conducted with various KSU cultivars to reduce the coverage of *Phyllosticta* fungal spot in pawpaw as well as evaluating new potential cultivars for release.

Keywords: Brix, Percent seed, *Phyllosticta* fungal spot

~*~

227 O - Assessment of Urban Heat Island in Relation to Normalized Difference Vegetation Index: A Case Study of Bharatpur, Nepal

Smriti Kandel, Jeremy Sandifer, Buddhi Gyawali,

College of Agriculture Communities and the Environment, Kentucky State University, Frankfort, Kentucky, USA

Correspondence Email: smriti.kandel@kysu.edu

Urban Heat Island (UHI) is an urban area which is relatively warmer than nearby rural areas due to the presence of infrastructure, such as buildings. Bharatpur is one of the fastest growing new urban centers in the Central Province of Nepal. Many farmlands and forests in its vicinity have been converted to urban areas, which cause negative effects on air pollution, wildlife population and movement, land fragmentation, and lack of open spaces for recreation. This study used the Moderate Resolution Imaging Spectro-radiometer (MODIS) 8-day product (MOD11A2) to evaluate land surface temperatures (LSTs) and the MODIS-derived Normalized Difference Vegetation Index (NDVI) 16-day product (MOD13Q1) to quantify land surface characteristics, as well as the MODIS-based annual land cover classification product to identify major land cover classes over the last 20 years. The spatial correlation between changes in LSTs and NDVI between 2000 and 2019 was quantified for multiple elevation ranges. Preliminary results indicate an inverse correlation between LST and NDVI, and LSTs for the urban areas are consistently greater than LSTs for the non-urban areas. These results suggest a need for systematic mapping, planning, and management of open and green areas and construction of new infrastructure in peripheral areas. The study also highlights the scope and challenges in applying traditional UHI conceptual models and data to rapidly developing urban areas in other Provinces, which vary in topographic, infrastructure, and demographic attributes, for better planning and management of open spaces and farmlands.

Keywords: Land cover, MODIS, NDVI, Urban heat island, Urbanization

~*~

228 O - Genotyping of Individual Microspores as Natural Protoplasts from Sweet Sorghum Varieties for Biofuel Production

Binod Gyawali, Aron Felts, Ahmad N. Aziz

Department of Agricultural and Environmental Sciences, Tennessee State University, Nashville, Tennessee, USA

Correspondence Email: gyawalibinod54@gmail.com

Comparative genomic markers can be used on individually isolated microspores for genetic enhancement studies. Microsporogenesis and cytokinesis occur simultaneously during meiosis of

pollen mother cells and the unicellular microspores immediately after tetrad separation have not fully developed exine. Recombination events and other genetic mechanisms can be studied through gametes analyses. Single-cell genotyping can be challenging since plant cell wall hinders the isolation and lysis for DNA analysis. However, individually isolated microspores are essentially natural protoplasts which can be lysed by reagents of REPLI-g Single Cell Kit. Four varieties of *Sorghum bicolor* L. (Achi Turi, Dale, Dasht Local, and Topper 76-6) were grown in a greenhouse to closely monitor their plant height, flag-stem length, and spikelet maturation characteristics during the development of enclosed panicles to capture free immature microspores. Appropriately developed anthers were collected to harvest microspores at uninucleate to early binucleate stages. The under-development of microspores' exine walls were confirmed under the high-power microscope, which were then individually isolated into PCR tubes using Cell-Tram micro-injector mounted on Marzhauser (HS-6) micromanipulator. Microsatellite (SSR) markers based analyses using Txp 51, Txp 141, Txp 227, Txp 273, Txp 279, Txp 286, and Txp 340 primer pairs were used to observe segregation of parental alleles in the microspores. This is a first report on whole-genome amplification from single-cell gametes with SSR markers segregation in sweet sorghum. Since sugar-traits related SSRs were selected for analyses, most showed distorted segregation when tested against the expected 1:1 Mendelian ratio ($\chi^2 \geq 2.1$, $P < 0.05$). Among four sweet sorghum varieties analyzed, the level of distortion ranged from 93.33% (Achi Turi) to 53% (Dasht Local). The protocols developed through this report allow studying microspores before requiring their germination, and thus entire meiotic products can be unbiasedly analyzed for gamete merit and other genetic assessments.

Keywords: Microspores, SSR, Sweet sorghum

~*~

229 P - CRISPR/Cas9 Mediated Genome Editing of CPC TRY in Soybean

Asmita Devkota

Agriculture and Environmental Sciences, Tennessee State University, Nashville, Tennessee,
USA

Correspondence Email: devkota.asmita1996@gmail.com

Root hairs are highly specialized cells found in the epidermis of plant roots that help in absorption of water and minerals from the soil. Molecular genetic studies showed that a common suite of putative transcription factors regulate the pattern of trichomes and root hair cells in *Arabidopsis*: a homeodomain protein, *Glabra2* (GL2), a WD-repeat protein, *Transparent Testa Glabra* (TTG), an R2R3MYB-type transcription factor, *Glabra1* (GL1) or *Werewolf* (WER), and two small MYB proteins, *Caprice* (CPC), and *Tryptichon* (TRY). CPC/TRY inhibits the formation of trichomes in the shoot and non-hair cells of *Arabidopsis* root. To our knowledge, no study regarding genome editing of TRY and CPC genes in soybeans has been reported. We were interested in modification of TRY and CPC genes in soybeans using CRISPR/Cas9 and understanding the molecular function of these genes in soybean. We designed a guide RNA for CPC/TRY gene and cloned it into the pBlu-gRNA vector. The presence of gRNA into the plasmid was confirmed through PCR and Sanger sequencing. The confirmed gRNA insert was cloned into the destination vector pMDC123 with Cas9 and bar resistance cassette. Finally, hairy root transformation was carried out using *Agrobacterium rhizogenes* for rapid confirmation of hairy root phenotypes in transgenic roots. This project helps us to better understand the regulatory mechanism in root hair development in soybean.

Keywords: CRISPR, Gene, Root hair, Soybean

~*~

230 O - Revamping Agriculture Service Delivery Mechanism in Nepal

Ramjee Ghimire, Nanda Joshi

Department of Animal Science, Michigan State University, MI, USA

Correspondence Email: ramghi@gmail.com

Contributing one-third to gross domestic product and providing employment to and supporting the livelihoods of over two-thirds of the country's population, agriculture is the backbone of Nepal's economy. From 1956 until today, Nepal has implemented fourteen development plans with agriculture as the focal area and the fifteenth development plan is in the pipeline. Further, agriculture services have been restructured into federal, provincial, and local levels delegating more authority to the local level, assuming it would lead to a demand-driven, people-centered, and efficient system. Despite progress in a few sub-sectors (e.g., poultry, vegetable), Nepal's overall agricultural growth has been below standard. This is manifested by increasing import of agricultural products including foods, stagnating agricultural productivity of major agricultural crops and livestock, and growing food insecurity and hunger, among others, which in turn are the results of weak agricultural value chains and poor agricultural services, and government failures. Nepal has made a strong effort in planning agricultural programs but has underperformed in the post-planning phase, including program implementation, monitoring and evaluation, and beyond. With this background, this paper discusses the status of the agricultural services (AS) (private, public, non-profit, local, provincial, and federal); issues, opportunities, and challenges facing AS; and offers suggestions to revamp agricultural services that could effectively contribute to increase agricultural productivity and improve the country's economy.

Keywords: Agricultural productivity, Agricultural services, Government failures, Nepal

~*~

231 P - Effect of Physicochemical Modifications on Extraction and Physicochemical Properties of Some Legume Protein Ingredients

Bibek Byanju, Buddhi Lamsal

Department of Food science and Human Nutrition, Iowa State University, Ames, Iowa, USA

Correspondence Email: bbyanju@iastate.edu

Plant-based proteins are of increasing interest worldwide because of the low-cost, high quality food that has potential to replace expensive and scarce animal proteins, but the presence of cell wall and the location of proteins inside cells limit the extraction of proteins from plants. The objective of this study is to evaluate the effect of high-power sonication as a pretreatment for extraction and enhancing the fermentation performance to improve the nutritional profile. Anti-nutritional factors (ANFs) present in soybean like phytic acid, trypsin inhibitors, and tannins reduce the bioavailability of nutrients, but can be reduced by physical modification and fermentation. Soybean flakes/flour were dispersed in distilled water (1:10 w/v) and sonicated, and proteins were extracted at pH 8.5. Protein extraction was increased to 26-29% compared to 15.28% when sonication was applied. Furthermore, physical modification was done by sonicating for 2-4 mins at 100% amplitude to assist fermentation. Physically modified soybean flours were inoculated with 10⁸ CFU/mL probiotic microorganisms namely *Lactobacillus plantarum* and

Pediococcus acidilactici and fermented in shake flasks for 72 hours at 37 °C, with shaking at 200 rpm. Total phenolic compounds were reduced in all the substrates. We expect to see reduction of ANFs present in soybean and improve the digestibility of proteins and carbohydrates as an outcome of these treatments.

Keywords: High-power sonication, Fermentation, Anti-nutritional factors, Plant proteins

~*~

232 O - Genome-wide Family Prediction for Agronomic Traits in Alfalfa

¹Janam Acharya, ¹Yolanda Lopez, ²Ivonne de bem Oliveira, ²Marcio Resende, ²Patricio Munoz,

¹Esteban Rios

¹Agronomy Department, University of Florida, Gainesville, FL, USA

²Horticultural Science Department, University of Florida, Gainesville, FL, USA

Correspondence Email: janamacharya@ufl.edu

Alfalfa (*Medicago sativa* L.) is the most-grown cool season perennial forage legume in the world, because of its high yield, stress tolerance, biological nitrogen fixation ability, and high forage quality. Genomic selection (GS) is a new approach for improving quantitative traits in large plant breeding populations that uses whole genome molecular markers (high density markers and high throughput genotyping) and genomic prediction combines marker data with phenotypic and pedigree data (when available) to increase the accuracy of the prediction of breeding and genotypic values. The objective of this study was to test the predictive ability of Genome-wide Family Prediction (GWFP) models in alfalfa. A reference alfalfa population was created using 33 parents (six males and 27 females) and resulted in 145 full-sib and 33 half-sib families. The field experiment was designed as a row-column (14x32) with augmented representation of three controls ('Bulldog805', 'FL99' and an advanced breeding line from University of Florida). A total of 88K biallelic markers that presented population sequence depth higher than 40, SNP quality score higher than 30, and mapping quality above 10 were used in population genetic and in GWFP analyses. The linkage disequilibrium presented in the population decays over 433Kb considering the mean distance at the threshold of $r^2=0.2$. More than 21% of the variation was captured in the first two axes in a principal component analysis (PCA). In addition, discriminant analysis of the PCA suggested the presence of population structure; the six subgroups identified correspond to the six male parents used in the crosses. These results showed potential for using GWFP in breeding programs where individual plants are of limited interest and phenotypes are scored in field plots, such as breeding programs for out-breeding species.

Keywords: Alfalfa, Exome, Genome-wide family prediction, Genomic selection

~*~

Scientific and Proceedings Committee

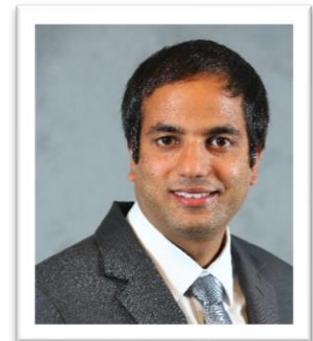
Manoj Karkee, PhD



Dr. Manoj Karkee is an Associate Professor in the Biological Systems Engineering Department at Washington State University (WSU). He received his undergraduate in Computer Engineering from Tribhuvan University, Nepal. His M.S. was in remote sensing and GIS from Asian Institute of Technology, Thailand and his Ph.D. was in Agricultural Engineering and Human Computer Interaction from Iowa State University. Dr. Karkee leads a strong research program in the area agricultural automation and robotics at WSU. He has published more than 70 peer-reviewed articles in such journals as ‘Journal of Field Robotics’ and ‘Computers and Electronics in Agriculture’, and 10 book chapters. Dr. Karkee was awarded “2020 Railbird Engineering Concept of the Year” by American Society of Agricultural and Biological Engineers and was recognized as ‘2019 Pioneer in Artificial Intelligence and IoT’ by *Connected World* magazine. Dr. Karkee served as a member of 2018-2020 NAPA Executive Committee.

Aditya R. Khanal, PhD

Dr. Aditya R. Khanal is an Assistant Professor of Agricultural and Applied Economics at Tennessee State University. He received his Ph.D. in agricultural economics, M.S. in finance and M.S. in agricultural economics from Louisiana State University and a M.A. in economics from Virginia Tech. Dr. Khanal's area of expertise include production economics, agricultural finance, agribusiness, and food security. He has produced nearly 50 research publications and has generated research grants as principal investigator and co-investigator. He was named as “*Outstanding Young Scholar of Agricultural Finance*” from Agricultural and Applied Economics Association (AAEA). He serves as reviewer of the dozens of journals in agriculture and applied economics. Dr. Khanal is a life member of NAPA and serves as a member of Resource and Capacity Building Committee (2018-present), member of NAPA Executive Committee (2020-2022), and a member of the Scientific Committee 2020.



Rajan Ghimire, PhD



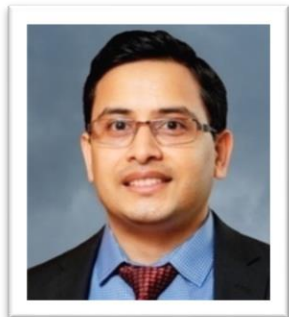
Dr. Rajan Ghimire is an Assistant Professor at New Mexico State University. Dr. Ghimire received B.S. (Agriculture) and M.S. (Soil Science) from Tribhuvan University, Nepal, and a Ph.D. (Soil Science) from the University of Wyoming. He was a Postdoctoral Scholar at Oregon State University before joining New Mexico State University in 2015. Dr. Ghimire leads a multidisciplinary research program on soil health and soil C and nutrient cycling in diverse cropping systems, tillage, nutrient, and crop management approaches. He has published 57 peer-reviewed journal papers and book chapters, 23 extension articles, and >100 professional meeting abstracts and proceedings. Dr. Ghimire received the “*Emerging Scientist Award*” from the Western Society of Crop Science in 2020. He is 2021 Leader of the ASA Soil Carbon and Greenhouse Gas Emissions Community. He is a member of the NAPA Scientific Committee 2020 and the Resource and Capacity Building Committee 2020-2021.

Sushil Thapa, PhD

Dr. Sushil Thapa is an Assistant Professor of Agronomy at the University of Central Missouri. Previously, he worked as an Assistant Research Scientist and Adjunct Professor at the Texas A&M University System. While in Texas A&M, he received two prestigious awards – “*Award of Excellence*” and “*Special Achievement Award for Research Collaboration*.” Dr. Thapa earned his M.S. in Agro-Ecology from Wageningen University, the Netherlands and Ph.D. in Systems Agriculture/ Agronomy from West Texas A&M University. His productivity has resulted in more than 70 publications in the forms of journal articles, book chapters, and abstracts, including 17 peer-reviewed journal articles as the first author. In 2013, he was selected for the “*Future Leader Fellowship Program*” by the Association for International Agriculture and Rural Development (AIARD), Washington, D.C. Dr. Thapa serves NAPA as a member of the Executive Committee (2020-2022), editor-in-chief of Agri-Connection Newsletter, and member of the Scientific Committee 2020.



Santosh Dhakal, PhD



Dr. Santosh Dhakal is a Postdoctoral Researcher at Johns Hopkins University. He earned B.V.Sc.&A.H. (2011) from Tribhuvan University, Nepal, and M.S. (2015) and Ph.D. (2018) in Comparative and Veterinary Medicine from The Ohio State University. His research interests include viral immunology, vaccine development and animal model development. Dr. Dhakal has published over 40 peer-reviewed journal articles. He works as the Editor of Nepalese Veterinary Journal, and as the reviewer for more than 15 scientific journals. Dr. Dhakal has continued his agricultural connection to Nepal professionally alive through mentoring undergraduate/graduate student research activities and through his involvement in two agriculture farms. Dr. Dhakal is a NAPA life member. He serves as the co-chair of NAPA Membership Drive Committee (2018 – Present); treasurer of the NAPA executive committee (2020 – 2022); advisor for the NAPA Student Coordination Committee (2020 – 2022); and conference secretary for the 2nd NAPA Biennial International Scientific Conference.

Ramjee Ghimire, PhD

Dr. Ramjee Ghimire is a Program Coordinator for the WorldTAP International Food Safety Course at Michigan State University (MSU). He received his undergraduate degree in Veterinary Science from Maharashtra Animal & Fishery Sciences University (formerly Konkan Agricultural University), India. His Ph.D. was in International Agricultural Development from Michigan State University. He serves at the MSU Department of Animal Science Diversity Equity and Inclusion Committee. Dr. Ghimire coordinates a capacity building program focusing on food safety at WorldTAP, MSU. Professionally, his focus is on program evaluation and leveraging research-extension-education linkages. He has published over 12 peer-reviewed articles in such journals as ‘Evaluation and Program Planning Journal’, and ‘Journal of International, Agricultural and Extension Education’. He has authored over 40 book chapters, evaluation reports, conference proceedings, professional abstracts, and training manuals. At NAPA, Dr. Ghimire serves as the General Secretary and led the Policy and Research Brief Editorial Committee from 2018-2020.



Pradeep Wagle, PhD



Dr. Pradeep Wagle is an internationally recognized scientist on biosphere-atmosphere interactions, carbon and water cycles of terrestrial ecosystems, and remote sensing of vegetation as documented over 50 SCI indexed peer-reviewed articles and ~100 conference abstracts. He received his Ph.D. in Crop Science from Oklahoma State University (OSU) in 2013. Since 2016, he has been working as a Research Ecologist with the USDA-ARS. Dr. Wagle has received “*Certificate of Merits/Outstanding Performance Awards*” from the USDA for consecutive years for his exceptional research and professional achievements. As an adjunct faculty, he also supervises/mentors graduate students at OSU and University of Oklahoma. He is heavily involved with NAPA since its inception. Currently, he serves as Vice President of NAPA. He is the managing editor for NAPA’s journal: *Global Journal of Agricultural and Allied Sciences*. He is also an Associate Editor for the *Remote Sensing Journal* and a reviewer for myriad professional journals of meteorology, ecosystems/ecology, climate change, and remote sensing.

Megha N. Parajulee, PhD

Dr. Megha Parajulee is a Regents Fellow Professor and Cotton Entomology Program Leader at Texas A&M University. A former faculty member at the Institute of Agriculture and Animal Science (IAAS), Nepal, Dr. Parajulee earned his Ph.D. in Entomology from the University of Wisconsin-Madison and joined Texas A&M University as cotton entomologist in 1994. He has authored/co-authored 115 refereed and >350 non-refereed publications, organized several international symposia, presented >400 scientific papers, and mentored 35 M.S./Ph.D. students. He has been active internationally with plenary/keynote speaking roles in 17 countries. A Fulbright Senior Fellow to Nepal and Uzbekistan, Dr. Parajulee has received the Texas A&M Vice Chancellor's Award in Research Excellence, Faculty Fellow Award, Regents Fellow Award, Vice Chancellor's Award in Collaboration, and Jewel of Nation Award from Nepal. He is a founding life member and current President of NAPA, and the founding Editor-in-Chief of *Global Journal of Agricultural and Allied Sciences (GJAAS)*.



Lila B. Karki, PhD

Dr. Karki is an Agricultural Economist/Research and Extension Program Coordinator at Tuskegee University Cooperative Extension. Earlier, he served as the Planning Analyst, Adjunct Professor of Economics, Institutional Research Statistician and Research Analyst respectively at University of Maryland, Eastern Shore, Georgia Military College, University of Phoenix, Alabama State University, and University System of Georgia. He also served as the Under Secretary at Ministry of Agriculture and Cooperatives, Nepal. Dr. Karki earned his Ph.D. from Justus-Liebig University, Giessen, Germany. Currently he is the editor for four Journals and peer/reviewer for 19 journals/grant proposals/ review panelist/ conference papers /book chapter/impact statement. He is the President-Elect of Gamma Sigma Delta International and Director for Extension 1890 Land Grant Universities; Agricultural and Applied Economics Association. He was the founding and immediate past president of NAPA. Dr. Karki was granted the US President's Volunteer Service Award: gold and bronze pins for his outstanding community service.



Affiliated Institutions of Authors and Co-authors

| SN | Institute |
|----|---------------------------------------------------------------------------------------------|
| 1 | Agribiz RD& E Services, Australia |
| 2 | Agriculture and Agri-Food Canada, Beaverlodge Research Farm, Canada |
| 3 | Agriculture and Forestry University, Nepal |
| 4 | Alabama A&M University, USA |
| 5 | American Mold Experts, USA |
| 6 | Arizona State University, USA |
| 7 | Auburn University, USA |
| 8 | Bioversity International, Nepal |
| 9 | Centennial College, Canada |
| 10 | Central Department of Environmental Sciences, Tribhuvan University, Nepal |
| 11 | Central Department of Hydrology and Meteorology, Tribhuvan University, Nepal |
| 12 | Central Queensland University, Australia |
| 13 | Central Veterinary Hospital, Nepal |
| 14 | Certus Analytics, USA |
| 15 | CIMMYT, South Asia office, Nepal |
| 16 | Climate Change, Agriculture and Food Security Program, World Food Organization, Nepal |
| 17 | Commission for Investigation of Abuse of Authority, Nepal |
| 18 | Department of Agricultural Engineering, Tribhuvan University, Nepal |
| 19 | Department of Crop and Environmental Sciences, USA |
| 20 | Department of Livestock Service, Nepal |
| 21 | Department of Pest Risk assessment, Plant Quarantine and Pesticide Management Center, Nepal |
| 22 | Federal University of Agriculture, Abeokuta, Nigeria |
| 23 | FFRobotics Inc, Israel |
| 24 | Himalayan College of Agricultural Science and Technology, Nepal |
| 25 | Improved Seed for Farmer Program (ISFP), Nepal |
| 26 | Institute for Study and Development, Sydney, Australia |
| 27 | Institute of Agriculture and Animal Science, Tribhuvan University, Nepal |

| SN | Institute |
|-----------|-----------------------------------------------------------------------------------|
| 28 | Institute of Rubber and Jatropha Research – Nepal, USA |
| 29 | International Development Department, Michael Adedotun Oke Foundation, Nigeria |
| 30 | International Food Policy Research Institute, South Asia Office, India |
| 31 | Iowa State University, USA |
| 32 | Johns Hopkins University, USA |
| 33 | Kansas State University, USA |
| 34 | Kentucky State University, USA |
| 35 | Landmark University, Nigeria |
| 36 | Leonard J. Chabert Medical Center, USA |
| 37 | Liam International Corporation, Canada |
| 38 | Louisiana State University, USA |
| 39 | Mahendra Ratna Campus, Tribhuvan University, Nepal |
| 40 | ManTech International Corporation, USA |
| 41 | Michael Okpara University of Agriculture, Nigeria |
| 42 | Michigan State University, USA |
| 43 | Ministry of Agriculture, Nepal |
| 44 | Ministry of Land Management, Agricultural and Cooperatives, Province No. 5, Nepal |
| 45 | Mississippi State University, USA |
| 46 | Murdoch University, Australia |
| 47 | Nepal Agricultural Research Council, Nepal |
| 48 | Nepal Health Research Council, Nepal |
| 49 | New Mexico State University Agricultural Science Center, USA |
| 50 | Noble Research Institute, USA |
| 51 | North Dakota State University, USA |
| 52 | Nutrition Evaluation Program, UNICEF, USA |
| 53 | Oregon State University, USA |
| 54 | Palm Beach State University, USA |
| 55 | Partnership for Sustainable Development, Nepal |
| 56 | Poverty Alleviation Fund, Nepal |

| SN | Institute |
|-----------|------------------------------------------------------------------------------|
| 57 | Research and Development Department, Saradore Trust Nigeria Limited, Nigeria |
| 58 | Rhino Research, Thailand |
| 59 | Salem College, USA |
| 60 | Shahjalal University of Science and Technology, Bangladesh |
| 61 | Southern Illinois University, USA |
| 62 | Supply Chain Department, Hedmee Agro and Daily Foods Limited, Nigeria |
| 63 | Sustainable Research & Development Center, Nepal |
| 64 | Sustainable Water Management Research Unit, USA |
| 65 | Tennessee State University, USA |
| 66 | Texas A&M University, USA |
| 67 | Texas Tech University, USA |
| 68 | The Ohio State University, USA |
| 69 | The University of Tennessee, USA |
| 70 | The University of Western Australia, Australia |
| 71 | Thomas Jefferson University, USA |
| 72 | Tuskegee University, USA |
| 73 | Unique Seed Company, Nepal |
| 74 | University of California, USA |
| 75 | University of Central Missouri, USA |
| 76 | University of Georgia, USA |
| 77 | University of Hawaii at Manoa, USA |
| 78 | University of Lethbridge, Canada |
| 79 | University of Oklahoma, USA |
| 80 | University of Parakou, Benin Republic |
| 81 | USDA-ARS, USA |
| 82 | Washington State University, USA |
| 83 | West Virginia State University, USA |

Alphabetical List of Authors (1/4)

| SN | Author | Abstract ID | SN | Author | Abstract ID |
|----|---------------------|---------------------------------|----|--------------------|--------------------|
| 1 | Acharya, B. | 17, 213, 215 | 46 | Bhattacharai, U. | 106 |
| 2 | Acharya, B. | 184, 214 | 47 | Bhattacharai, S. | 11, 152, 200, 219 |
| 3 | Acharya, J. | 222, 232 | 48 | Bhusal, B. | 156 |
| 4 | Acharya, M. | 119 | 49 | Bhusal, B. | 146 |
| 5 | Acharya, M. C. | 143 | 50 | Bhusal, S. | 106 |
| 6 | Acharya, Y. | 120 | 51 | Bhusal, S. P. | 129 |
| 7 | Adhikari, B. | 108 | 52 | Bidari, A. | 185 |
| 8 | Adhikari, B. B. | 133 | 53 | Bista, P. | 170 |
| 9 | Adhikari, D. | 148 | 54 | Bohora, S. | 215 |
| 10 | Adhikari, G. | 173, 179 | 55 | Buck, J. W. | 122, 204 |
| 11 | Adhikari, K. | 179 | 56 | Burton, M. | 109 |
| 12 | Adhikari, M. | 160, 195 | 57 | Byanju, B. | 231 |
| 13 | Adhikari, N. R. | 133 | 58 | Chakraborty, A. | 127 |
| 14 | Adhikari, P. | 143, 185 | 59 | Chapagain, A. S. | 111 |
| 15 | Adhikari, R. K. | 151 | 60 | Chapagain, S. | 196 |
| 16 | Adhikari, S. | 189 | 61 | Chaudhari, S. | 218 |
| 17 | Adhikari, S. | 107 | 62 | Chaudhary, A. | 130, 161, 226 |
| 18 | Adhikari, S. | 140 | 63 | Chaudhary, B. | 17 |
| 19 | Adhikari, S. | 123, 147 | 64 | Chaulagain, B. | 131 |
| 20 | Adhikari, S. P. | 137 | 65 | Chee, P. | 134 |
| 21 | Aiken, R. | 18 | 66 | Chittem, K. | 101 |
| 22 | Akinbode, S. | 191 | 67 | Clohessy, J. | 224 |
| 23 | Amgain, L. P. | 133, 140 | 68 | Crabtree, S. | 209, 226 |
| 24 | Ankumah, R. | 141 | 69 | Dahal, B. R. | 7 |
| 25 | Aryal, N. | 124 | 70 | Dahal, P. | 21 |
| 26 | Arya, S. | 21 | 71 | Dahal, U. | 218 |
| 27 | Ashaolu, O. | 191 | 72 | Das, S. | 120 |
| 28 | Aziz, A. N. | 228 | 73 | Davis, D. D. | 12, 183 |
| 29 | Bag, S. | 134 | 74 | de Souza, C. H. L. | 222 |
| 30 | Bajgain, R. | 201 | 75 | Deb, S. K. | 205 |
| 31 | Basara, J. | 201 | 76 | Devkota, A. | 229 |
| 32 | Basnet, A. | 214 | 77 | Devkota, I. | 206 |
| 33 | Basnet, H. B. | 206 | 78 | Devkota, N. R. | 8, 177, 180, 187, |
| 34 | Bayelu, A. E. | 6 | 79 | Devkota, S. | 1 |
| 35 | Bell, J. | 18 | 80 | Dhakal, B. | 177, 180, 182, 187 |
| 36 | Bhandari, T. | 105 | 81 | Dhakal, C. K. | 194 |
| 37 | Bhandari, T. | 216 | 82 | Dhakal, D. | 140, 163 |
| 38 | Bhatt, G. S. | 223 | 83 | Dhakal, D. P. | 26 |
| 39 | Bhatt, K. R. | 145 | 84 | Dhakal, I. P. | 21 |
| 40 | Bhattachan, B. | 164 | 85 | Dhakal, K. | 197, 214 |
| 41 | Bhattachan, B. K. | 142, 144, 164, 165, 166, 221 | 86 | Dhakal, M. | 205 |
| 42 | Bhattacharai, A. | 173 | 87 | Dhakal, S. | 125, 210, 218 |
| 43 | Bhattacharai, N. | 111, 148, 169 | 88 | Dhakal, S. C. | 119, 146 |
| 44 | Bhattacharai, S. K. | 112 | 89 | Dharel, T. | 211 |
| 45 | Bhattacharai, S. P. | 24 | 90 | Dhungana, S. M. | 185 |

Alphabetical List of Authors (2/4)

| S.N. | Author | Abstract ID | S.N. | Author | Abstract ID |
|------|-----------------|-------------------|------|-----------------|------------------------------------------|
| 91 | Dhungel, J. K. | 24 | 134 | Idehen, O. | 141 |
| 92 | Dipeolu, A. | 186, 191 | 135 | Iqbal, S. | 127 |
| 93 | Dulal, P. R. | 10 | 136 | Jaishi, M. | 14 |
| 94 | Dumenyo, K. | 184 | 137 | Jessup, K. | 18 |
| 95 | Dumre, A. | 119 | 138 | Jha, A. | 164 |
| 96 | Edewor, K. | 190, 191 | 139 | Jha, D. K. | 143 |
| 97 | Edewor, S. | 190, 191 | 140 | Jha, R. K. | 108,173 |
| 98 | Ellis, N. | 11, 152, 200, 219 | 141 | Jones, M. G. K. | 127 |
| 99 | Fapojowo, O. E. | 6 | 142 | Joshi, D. | 213, 215 |
| 100 | Felts, A. | 228 | 143 | Joshi, D. P. | 223 |
| 101 | Gairhe, S. | 120 | 144 | Joshi, G. | 198 |
| 102 | Garl, K. | 158 | 145 | Joshi, G. R. | 150 |
| 103 | Gauchan, D. | 199 | 146 | Joshi, N. | 230 |
| 104 | Gautam, G. | 129 | 147 | Joshi, N. B. | 150 |
| 105 | Gautam, S. | 204 | 148 | Joshi, P. P. | 2 |
| 106 | Gelal, M. P. | 27 | 149 | Kafle, S. | 133 |
| 107 | Ghimire, B. | 204 | 150 | Kagulire, J. | 28 |
| 108 | Ghimire, B. | 122, 158 | 151 | Kahani, A. | 106 |
| 109 | Ghimire, L. | 174 | 152 | Kandel, P. | 214 |
| 110 | Ghimire, N. | 161 | 153 | Kandel, P. | 211 |
| 111 | Ghimire, R. | 169 | 154 | Kandel, S. | 108 |
| 112 | Ghimire, R. | 230 | 155 | Kandel, S. | 130, 227 |
| 113 | Ghimire, S. | 161 | 156 | Karkee, M. | 106 |
| | | | | Karki, L. B. | 4, 150, 151, 159, 198, 207, 219 |
| 114 | Ghimire, S. | 125, 170 | 157 | | |
| 115 | Ghimire, S. | 176 | 158 | Karki, S. | 141, 213 |
| 116 | Ghimire, S. | 1 | 159 | Karki, T. B. | 120 |
| | | | | Karki, U. | 11, 152, 159, 198, 200, 206, 207, 219 |
| 117 | Ghimire, S. | 214 | 160 | | |
| 118 | Ghimire, Y. N. | 137 | 161 | Karmacharya, A. | 101 |
| 119 | Gorkhali, N. A. | 148 | 162 | Karn, R. | 10 |
| 120 | Gourapura, R. | 125 | 163 | Karna, R. D. | 139 |
| 121 | Gowda, P. H. | 104 | 164 | KC, D. | 182 |
| 122 | Grant, J. | 23 | 165 | KC, S. | 107 |
| 123 | Gurung, G. B. | 20 | 166 | Kehinde, M. | 181 |
| 124 | Gurung, P. | 175 | 167 | Kemerait, R. | 134 |
| 125 | Gurung, T. B. | 182 | 168 | Khadka, R. B. | 131, 132 |
| 126 | Gyawali, B. | 228 | 169 | Khanal, A. | 13 |
| 127 | Gyawali, B. | 130, 227 | 170 | Khanal, A. | 214 |
| 128 | Hakeem, A. | 23 | 171 | Khanal, A. R. | 123, 147 |
| 129 | Hale, F. | 23 | 172 | Khanal, N. | 9, 10 |
| 130 | Hamal, M. | 130, 209, 226 | 173 | Khanal, S. | 179 |
| 131 | Hegstad, J. | 101 | 174 | Khanal, T. R. | 110 |
| 132 | Hirshfeld, O. | 106 | 175 | Kharal, S. | 168 |
| 133 | Hulbert, S. H. | 158 | 176 | Kharel, G. | 205 |

Alphabetical List of Authors (3/4)

| S.N. | Author | Abstract ID | S.N. | Author | Abstract ID |
|------|---------------------|--------------|------|------------------|---------------------|
| 177 | Khatri, R. | 160, 219 | 223 | Northup, B. K. | 104 |
| 178 | Klink, V. | 160 | 224 | Obayelu, A. | 186 |
| 179 | Kobayashi, H. | 126 | 225 | Ogbe, A. | 186 |
| 180 | Kohar, G. R. | 214 | 226 | Ogbe, O. | 172 |
| 181 | Koirala, B. | 1 | 227 | Ogunnaike, M. | 181 |
| 182 | Kumar, A. | 123 | 228 | Ogunnaike, M. G. | 6 |
| 183 | Kunwar, S. R. | 176 | 229 | Oke, M. A. | 116, 117 |
| 184 | Labiyi, I. | 4 | 230 | Olodo, V. | 4 |
| 185 | Lambdin, P. | 23 | 231 | Osti, N. P. | 8 |
| 186 | Lamichhane, S. | 178 | 232 | Paneru, B. | 11, 152, 200, 219 |
| 187 | Lamsal, B. | 231 | 233 | Pant, C. | 2 |
| 188 | Leng, Y. | 101 | 234 | Pant, S. R. | 177, 180, 187 |
| 189 | Li, H. | 127 | 235 | Panta, S. | 15 |
| 190 | Li, J. | 192 | 236 | Panth, B. P. | 146 |
| 191 | Li, X. | 101 | 237 | Pantha, S. | 13 |
| 192 | Li, Z. | 204 | 238 | Parajulee, D. | 15 |
| 193 | Liu, Y. | 101 | 239 | Parajulee, M. N. | 14, 23, 24, 26, 194 |
| 194 | Lowe, J. | 209, 226 | 240 | Parajuli, D. | 153 |
| 195 | Lucas, S. | 126 | 241 | Parajuli, M. | 192 |
| 196 | Magar, P. B. | 136 | 242 | Pandit, S. | 209 |
| 197 | Mahato, P. L. | 111 | 243 | Pandey, B. K. | 210 |
| 198 | Mahto, B. N. | 136 | 244 | Paudel, A. | 13 |
| 199 | Malika, C. | 171 | 245 | Paudel, B. | 129 |
| 200 | Manhar, H. K. | 17 | 246 | Paudel, D. | 222 |
| 201 | Martinez, A. D. | 122 | 247 | Paudel, K. | 107 |
| 202 | Mahato, P. L. | 111 | 248 | Paudel, P. | 118 |
| 203 | Mahto, B. N. | 136 | 249 | Paudel, S. | 185 |
| 204 | Malika, C. | 171 | 250 | Paudyal, S. | 121 |
| 205 | Manhar, H. K. | 17 | 251 | Pathak, S. | 149 |
| 206 | Martinez, A. D. | 122 | 252 | Pokharel, B. | 223 |
| 207 | Mbia, M. | 12, 183 | 253 | Pokharel, S. | 107 |
| 208 | McElhenney, W. | 141 | 254 | Pokhrel, K. R. | 136 |
| 209 | Menke, E. | 204 | 255 | Pokhrel, S. | 154 |
| 210 | Mentreddy, S. R. | 12, 183, 207 | 256 | Pokhrel, K. R. | 136 |
| 211 | Mergoum, M. | 122 | 257 | Pokhrel, S. | 154 |
| 212 | Miller, S. A. | 132 | 258 | Pomper, K. W. | 209, 226 |
| 213 | Mishra, A. | 162 | 259 | Ponce, M. S. | 193 |
| 214 | Mishra, A. K. | 123 | 260 | Porbeni, J. | 186 |
| 215 | Mishra, B. P. | 188 | 261 | Poudel, A. | 138 |
| 216 | Mishra Tripathi, K. | 188 | 262 | Poudel, A. | 173 |
| 217 | Mmbaga, M. T. | 156 | 263 | Poudel, B. | 101 |
| 218 | Mullins, J. | 101 | 264 | Poudel, D. | 128, 176 |
| 219 | Murray-Prior, R. | 109 | 265 | Poudel, G. | 147 |
| 220 | Naharki, K. | 25 | 266 | Poudel, I. | 157 |
| 221 | Neel, J. P. S. | 104 | 267 | Poudel, K. | 161, 173 |
| 222 | Neupane, B. | 138 | 268 | Poudel, M. | 143, 185 |

Alphabetical List of Authors (4/4)

| S.N. | Author | Abstract ID | S.N. | Author | Abstract ID |
|------|------------------|---------------|------|--------------------|---------------|
| 269 | Poudel, N. R. | 182 | 315 | Small, I. M. | 224 |
| 270 | Poudel, P. | 119, 126 | 316 | Sodiya, C. I. | 6 |
| 271 | Poudel, R. | 21, 161 | 317 | Srinivasan, R. | 204 |
| 272 | Poudel, S. | 219 | 318 | Steber, C. M. | 158 |
| 273 | Poudel, U. | 218 | 319 | Subedi, B. | 214 |
| 274 | Pudota, M. | 12 | 320 | Subedi, K. | 176 |
| 275 | Puri, K. D. | 101 | 321 | Subedi, S. | 182 |
| 276 | Rana, R. B. | 182 | 322 | Subedi, S. | 177, 180, 187 |
| 277 | Rawal, R. | 170, 193 | 323 | Subedi, S. | 120 |
| 278 | Regmi, R. | 169 | 324 | Subudhi, P. K. | 196 |
| 279 | Regmi, S. | 210 | 325 | Suman, S. | 140 |
| 280 | Rijal, J. | 169 | 326 | Thapa, D. B. | 13 |
| 281 | Rijal, S. | 7 | 327 | Thapa, S. | 18 |
| 282 | Rios, E. | 222 | 328 | Thapa, Y. B. | 3 |
| 283 | Roberts, P. | 134 | 329 | Thapa-Magar, D. B. | 137 |
| 284 | Roka, K. | 221 | 330 | Tillman, B. | 224 |
| | Rola-Rubzen, M. | | | | |
| 285 | F. | 109, 137 | 331 | Timilsina, A. | 144 |
| 286 | Rooney, W. | 18 | 332 | Tiwari, A. | 170 |
| 287 | Sah, S. K. | 10 | 333 | Tiwari, M. R. | 182 |
| 288 | Sanguinet, K. A. | 158 | 334 | Upadhayaya, S. | 129 |
| 289 | Sanjel, S. | 224 | 335 | Upadhyaya, S. | 151 |
| 290 | Sapkota, A. | 167 | 336 | Upadhyay, K. P. | 136 |
| 291 | Sapkota, B. | 109 | 337 | Upreti, G. | 5 |
| 292 | Sapkota, D. | 173 | 338 | Villalobos, C. | 205 |
| 293 | Sapkota, S. | 148 | 339 | Wagle, P. | 104, 138, 201 |
| 294 | Scheerens, J. | 193 | 340 | Wang, J. | 222 |
| 295 | Sedhain, N. P. | 134 | 341 | Wang, L. | 222 |
| 296 | Shange, R. | 141 | 342 | West, C. P. | 205 |
| 297 | Sharma, A. | 21 | 343 | Whitaker, J. | 134 |
| 298 | Sharma, K. P. | 142 | 344 | Whittinghill, L. | 126 |
| 299 | Sharma, M. | 210 | 345 | Wiggins, G. | 23 |
| 300 | Sharma, S. | 133, 135 | 346 | Witcher, A. | 157 |
| 301 | Shittu, A. | 181 | 347 | Wright, D. | 224 |
| 302 | Shittu, A. M. | 6 | 348 | Wylie, S. J. | 127 |
| 303 | Shrestha, A. K. | 107, 108, 168 | 349 | Xiao, X. | 201 |
| 304 | Shrestha, B. | 179 | 350 | Xue, Q. | 18 |
| 305 | Shrestha, B. K. | 108 | 351 | Yabi, J. | 4, 198 |
| 306 | Shrestha, J. | 133, 214 | 352 | Yadav, D. P. | 8 |
| 307 | Shrestha, M. | 155 | 353 | Yadav, R. K. | 173 |
| 308 | Shrestha, R. | 137 | 354 | Yadav, R. B. | 136 |
| 309 | Shrestha, S. M. | 17 | 355 | Youmans, M. | 122 |
| 310 | Sandifer, J. | 130, 227 | 356 | Zhang, Q. | 106 |
| 311 | Sigdel, S. | 179 | 357 | Zhao, Y. | 212 |
| 312 | Sigdel, U. P. | 15 | 358 | Zhong, S. | 101 |
| 313 | Singh, O. P. | 151 | | | |
| 314 | Skaggs, T. H. | 104 | | | |

List of Sponsors for NAPA 2020 Conference

| SN | Name | Donation (USD) |
|--------------|-------------------------------------------------------|----------------|
| 1 | Ambika Tiwari | 101 |
| 2 | Ananta Acharya | 101 |
| 3 | Bharat Pokharel | 101 |
| 4 | Bhawani Mishra | 15 |
| 5 | Chakra Budhathoki | 101 |
| 6 | Dainik Karki Nepali | 155 |
| 7 | Dev Paudel | 111 |
| 8 | Dilip Panthee | 50 |
| 9 | Drona Rasali | 103 |
| 10 | Gita Koirala Bhandari | 101 |
| 11 | Gopi Upreti | 20 |
| 12 | Kemika Bhandari | 525 |
| 13 | Liam International Corporation, Canada | 500 |
| 14 | Lila B. Karki | 551 |
| 15 | Manoj Karkee | 151 |
| 16 | Multidisciplinary Digital Publishing Institute (MDPI) | 500 |
| 17 | Megha Parajulee | 551 |
| 18 | Nabin Sedhain | 5 |
| 19 | Narayan Khadka | 100 |
| 20 | Nanda P. Joshi | 600 |
| 21 | Nitya Nanda Khanal | 105 |
| 22 | Omkar Joshi | 51 |
| 23 | Pradeep Wagle | 525 |
| 24 | Rajan Ghimire | 100 |
| 25 | Raju Adhikari | 40 |
| 26 | Ramesh Khanal | 103 |
| 27 | Ramjee Ghimire | 101 |
| 28 | Santosh Dhakal | 101 |
| 29 | Shiva Makaju | 101 |
| 30 | Shyam Kandel | 151 |
| 31 | Steve Turner | 200 |
| 32 | Sushil Thapa | 101 |
| 33 | Tilak Mahato | 40 |
| 34 | Uma Karki | 301 |
| Total | | 6,462 |

NAPA's Accomplishments: At a Glance

(Association of Nepalese Agricultural Professionals of Americas)

Established: 2016

Total members: 410

Good standing members: 300

Functioning committees:

- Executive Committee
 - Advisory Council
 - Webinar/Talk Series
 - Online Newsletter; Agri Connection
 - Membership Drive
 - Student Coordination
 - Scholarship for Academic Excellence
 - Book Publication
 - Peer Reviewed Journal; *Global Journal of Agricultural and Allied Sciences*
 - Research/Policy Brief
 - Resource and Capacity Building
 - Women in Agricultural and Allied Professionals
 - Information Technology

Website visit: 43,000 +

Facebook followers: 6,000 +

Collaborative research-mini grant projects awarded: 18

- Award amount NRs. ~4,00,000.00

Scholarships granted: 35

- Award amount NRs. ~3,00,000.00

Webinar/talk session hosted: 23

Online newsletter published: 17

Research/policy brief published: 6

Seminal book on food security: 1

Peer reviewed journals: 2 issues