FINAL REPORT

INTERNATIONAL WORKSHOP ON HIGH QUALITY FODDER AND FORAGE PRODUCTION IN PAKISTAN

April 23-27, 2018

Organized by

Muhammad Nawaz Shareef University of Agriculture Multan, Pakistan

Ayub Agricultural Research Institute, Faisalabad

Centre for Advanced Studies in Agriculture and Food Security, University of Agriculture, Faisalabad

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Executive Summary

Fodder is the backbone of livestock industry as it cannot survive without fodder. There is tremendous pressure of livestock on available total feed and fodder. Whereas, land available for fodder production is decreasing every year due to urbanization. For the production of high quality fodders and forages in Pakistan and enhancing their importance, Muhammad Nawaz Shareef University of Agriculture, Multan (MNS-UAM) in collaboration with Ayub Agricultural Research Institute (AARI), Faisalabad, and USPCAS-AFS University of Agriculture, Faisalabad organized an international workshop on April 23-27, 2018. As a part of this activity, one day workshops were organized at the MNS University of Agriculture, Multan, and Ayub Agricultural Research Institute, Faisalabad. A consultative session at USPCAS-AFS University of Agriculture, Faisalabad, meetings with research scientists and policy makers, and visit of different fodder farms were also the part of the activity. International delegates from USA and Argentina, and national scientists working on fodder and forage participated the workshops, consultative session, and meetings. Students, university faculty members, representatives of seed companies from public and private sectors, representatives of agro-chemical companies, farmers and other stake holders also attended the workshops. The event provided a pragmatic platform to discuss challenges faced by fodder crops and innovative technologies to address these challenges to ensure higher yields of good quality fodder.

The technical sessions covered major issues and their proposed solutions related to fodder production in Pakistan. Renowned foreign and local scientists working on fodder crops, and growers delivered their talks in technical session. Prof. Dr. Daniel Putnam and his team from UC Davis assured their technical cooperation for the improvement of yield and nutritional quality of fodder crops especially alfalfa and their conservation during the lean periods. Dr. Denial Basigalup from Argentina also encouraged collaborations among the institutions within and outside the country for progress in this sector, and also invited Pakistani scientists, academia, and private sector representatives to attend fodder conference to be held at the end of 2018 in Argentina. Scientists from various organizations of Punjab, representatives of public and private seed companies, and other stake holders emphasized to develop public-private partnership for research and development activities, farmer's awareness and training, certified seed production

of fodder crops and other activities to ensure production of high quality fodder for the improvement of dairy sector in the country. It was also reiterated that rapid growth of fodder sector is a requisite for a progress and improvement in the dairy sector of the country. The enhancement in fodder yield and quality can be achieved through developing new high yielding, multicut, abiotic and abiotic resistant varieties/hybrids of different fodder species by exploiting diverse germplasm, introducing new fodder species, mechanized farming, preservation of fodders in the form of hay and silage, awareness and training of farmers, use of improved production technology, and growing fodders in mixtures.

This was the first event on fodder and forages in Central and South Punjab regions of Pakistan as a collaborative effort of three organizations and was appreciated by all the participants and stake holders. It is believed that this forum helped in networking of scientists, academia, growers, business and industry to start joint ventures in future for improvement of fodder crop sector in the country. The memorandums of understanding (MoUs) for output-oriented collaboration between institutes of Pakistan, USA and Argentina were also signed to initiate joint research projects, exchange of human resource and plant material, mutual sharing of experiences and expertise.

Recommendations

As a result of the discussions and brainstorming during workshops, consultative sessions and meetings following are the recommendations for the improvement of fodder and forage yield and quality in Pakistan:

- Modern crop husbandry practices should be adopted for better production of fodder crops especially alfalfa.
- Certified seed should be preferred to ensure a good stand of fodder crops in the field.
- Hay and silage making with better practices, use of chemicals and modern machinery, should be promoted to ensure fodder supply during lean period to improve dairy sector in Pakistan.
- Although alfalfa is salt tolerant crop, yet if high salt level is present in the soil, seed rate should be increased to combat germination problem.
- Public-private partnership should be promoted in research and development, seed production, and seed business.
- The status of fodder and forages in Pakistan may be improved through:
    a) diversification of fodder crops.
    b) development of improved fodder verities/hybrids and their production technology.
    c) utilization of promising fodder germplasm.
    d) establishment and strengthening of fodder research institutes/stations.
- Improved tools for irrigation design and management should be used for efficiently using the water resources.
- Optimization of the best combination of different fodder crops in mixtures may be helpful to enhance fodder yield and quality.
- Different grasses, shrubs and trees may also be evaluated for fodder purpose.
- Educate farmers through multiple communication mediums like field days, kisan melas, demonstration plots as well as through TV/Radio programs, magazines and Newspapers.
- Use of biotechnological tools for incorporation of novel genes for the improvement of plant traits related to fodder yield and nutritional quality.

Background

Pakistan is blessed with diversified type of livestock that provides food security through supply of milk, meat and self-employment. Regular supply of adequate and nutritious fodder is essential for the promotion and development of livestock. Fodder crops are the main and cheapest source of feed for livestock. However, shortage of fodder production is the major limiting factor for livestock production in our country.

Fodder is the backbone of dairy industry but land available for fodder production is decreasing at 2% per decade. At present almost, all the seed of fodder crops especially alfalfa, berseem and sorghum needed for planting is imported from various countries of the world at a high cost. These imported seeds are less adaptable to local environmental conditions. So, there is great need to develop our local varieties/hybrids with high yield and good quality parameters. The fodder and forage growers are facing recurrent dilemma of having balanced yield and quality. So there is need for strong collaboration of fodder researchers, academicians, growers, and companies for improving this sector. Muhammad Nawaz Shareef University of Agriculture, Multan in collaboration with Ayub Agricultural Research Institute, Faisalabad, and USPCAS-AFS University of Agriculture, Faisalabad organized "International Training Workshop on High Quality Fodder and Forage Production in Pakistan" to address major issues and find solutions related to various fodder crops in Pakistan. Workshops at AARI, Faisalabad, MNS University of Agriculture, Multan, a consultative session at USPCAS-AFS University of Agriculture, Faisalabad, meetings of international delegates with fodder scientists and policy makers, and visit of different farms were the part of this activity. Fodder scientists from USA, Argentina and Pakistan, representatives of private sector companies, and fodder growers shared their experiences and learnings for better production of fodders. Stakeholders from academic and research institutes, representatives of seed and chemical companies, progressive growers, dairy farmers and students participated the event.

Detailed Program

Monday April 23, 2018

Meetings and Visits

Activity	Venue
Meeting DG AARI,	Committee Room
Visit to AARI stations	AARI
Visit Nishat Dairies Alfalfa fields	Nishat Dairies Farms, Sukheki
Meeting with Secretary Ag, Punjab	Lahore
Meeting with Secretary LDD, Punjab	Lahore
Meeting with CE PARB in Lahore	Lahore
Travel to FSD	Serena

Tuesday April 24, 2018

Workshop at Ayub Agricultural Research Institute (AARI), Faisalabad

Session 1	
Welcome Address	Dr. Abid Mehmood, DG (Res.)
High Yielding Forage Production Systems in Argentina	Dr. Basigalup
Alfalfa Production Systems for Higher Yields in Environments Similar to Pakistan	Prof. Dr. Daniel Putnam
Remarks	Dr Asif Ali Khan, VC MNSUAM
Remarks by Guest of Honor	H.E. Ambassador of Argentina
Session 2	
Corn and Sorghum Variety Selection for High Energy Forages	Dr Jeff Dahlberg, UC Davis
Present Situation and Future Prospects of Fodder Production in Pakistan	Ch. Muhammad Saleem Akhtar, Director, FRI, Sargodha
Potentials of Breeding Forages and Future perspectives	Prof. Dr. Hafeez Ahmad Sadaqat
Need for Fodder Improvement in Pakistan to Enhance Dairy Production	Dr Qamar Shakil, Incharge Fodder Research Sub-station, AARI
Session 3	
Strategies for Effective Irrigation Management for High Yielding Alfalfa	Dr Khaled Bali, UC Davis
Seed Systems and Supply Chain for Forage crops in US and prospects in Pakistan	Timothy Blank, UC Davis
Importance of Regular Supply of Quality Fodder for Efficient Livestock Production	Dr Aslam Mirza, UAF
Role of insect pollinators in fodder seed production	Prof. Dr. Shafqat Saeed, MNSUAM
Concluding Remarks by the Chair	

Wednesday April 25, 2018

"Consultative Session on Challenges and Opportunities in Fodder Research"

USPCAS-AFS University of Agriculture, Faisalabad

Opening Remarks by the COP Prof. Dr. Iqrar Ahmad Khan
Moderato: Prof. Dr. Hafeez Ahmad Sadaqat, Chairman PBG UAF **Panelist:** 1. Dr Jim Hill 2. Dr Dan Putnam 3. Dr Daniel Basigalup 4. Dr Khaled Bali 5. Dr Aslam Mirza 6. Dr Qamar Shakil 7. Mr Timothy Blank

Thursday April 26, 2018

Workshop at MNS University of Agriculture, Multan

Session 1	
Welcome Address	Prof. Dr. Asif Ali, Vice Chancellor MNS-UAM
Contribution of Agri. Research System Punjab for the Improvement of Fodder Sector	Ch. M. Saleem Akhtar, Director FRI Sargodha
Alfalfa Production Systems for Higher Yields in Environments Similar to Pakistan	Dr. Daniel Putnam UC Davis
Session 2	
High Yielding Forage Production Systems in Argentina. Key Points: High Level of Grazing Management for Milk and Livestock Production	Dr Daniel Basigalup INTA Argentina
Importance of Quality Seed in Enhancement of Fodder Yield Potential	Mr. Timothy Blank UC Davis
Effective Irrigation Management for Alfalfa Production	Dr. Khaled Bali, UC Davis
Potentials of Breeding forages in Pakistan and Future Perspectives	Dr. Hafeez Ahmad Sadaqat, PBG UAF.
Fodders and Animal Nutrition: Proper Ration for Better Dairy Production	Dr. Muhammad Aslam Mirza, UAF
Session 3	
Role of insect pollinators in fodder seed production	Dr. Shafqat Saeed, MNS-UAM
Contribution of Maxim International in Growing Alfalfa in Pakistan to Feed Livestock	Dr. Rasheed Sindhu, Maxim International
Prospects of growing alfalfa for a better feed to livestock	Mr. Fida Gadi, Biotrack
Concluding Remarks	Dr. Daniel Putnam, UC Davis Dr. Abdus Salam Khan, UAF

Friday April 27, 2018

Visit of Alfalfa Farms at Khanewal

Monday April 23, 2018

Meetings and Visits of International Delegates

The international delegate from USA and Argentina was received and welcomed at Ayub Agriculture research Institute (AARI) Faisalabad by Dr. Aid Mahmood and his team. A meeting of DG (research) and Director FRI and scientists of FRS was held in the meeting room of AARI. Dr. Abid Mahmood briefed the guests about the situation of fodder in the Punjab and contribution of Punjab Agriculture system to solve the problems of fodder sector and innovations to improve the situation. H also focused on the collaboration among public private sector, and institutions and organizations in the country and other countries for sharing the knowledge and expertise, human resource development, collaborative research ventures and training and awareness of farming communities. the scientists from USA and Argentina appreciated the contribution of ARI and FRI in uplifting the dairy sector. They shared their experiences with local scientists in finding solutions of problems. They offered expertise in developing collaborative projects and human resource development for improving the fodder industry in Pakistan.

The delegate visited the Fodder Research Station (FRS) AARI Faisalabad where Mr. Saleem Akhtar, Director Fodder Research Institute Sargodha and Dr. Qamar Shakeel, Incharge Fodder Research Station were present to welcome the visiting team. Dr. Qamar Shakeel briefed the scientists about different scientific activities on the fodder crops. The delegate was then taken to the field where research experiments and germplasm of berseem, alfalafa and oats. Several issues and their possible solutions were discussed. Problem of dodder as weed was observed and discussed in the alfalfa fields and the guest scientists suggested that use of certified, pure and better quality seed to avoid this problem.

After visiting FRS, the team comprising of international delegates and fodder scientists of AARI travelled to Sukheki, approximately 70 km away from Faisalabad to visit "Nishat Dairy Farm" which is model farm for raising cows, growing fodder especially alfalfa, and making hay and silage on scientist grounds maintaining nutritive value and quality. The foreign team appreciated the scientific approach especially pivot system to irrigate the field. The team also extended suggestions for further improvement of fodder cultivation and preservation maintaining the maximum nutritive quality and palatability.

In the afternoon, the delegate moved to Lahore to attend a meeting with Additional Secretary (Planning) Agri. Department, Government of Punjab. Dr. Ghazanfar Ali, Additional Secretary welcomed the guests and briefed the foreign scientists about various activities and initiatives of government to improve the production of quality fodder. He informed that Punjab Agriculture Research Board (PARB) offers fund for research projects of applied nature and promoter inter-institutional collaboration to ensure maximum succeed. He also apprised the team about

production of pre- basic seed of different fodder crops involving different public sector universities and research organizations to ensure the provision of certified quality seed of fodder crops to the farmers to harvest highest yield. The scientist form USA and Argentina appreciated the steps taken by the Government of Punjab to ensure production of certified seed and improving the fodder sector through addressing the problems of farms and farmers. The delegate emphasized the improvement of fodder sector to improve dairy industry. They also extended their offer in cooperation and development of collaboration to conduct research project and human resource development through faculty and student exchange programs.

Tuesday April 24, 2018

Workshop at Ayub Agricultural Research Institute (AARI), Faisalabad

Inaugural Session

The inaugural session started with the recitation of verses from the Holy Qura'an. Director General (Res.), Directors of different Institutes of AARI, research scientists, faculty and students of UAF, fodder growers, dairy farmers, representatives of seed industry, representatives of private sector agro chemical companies participated the workshop. His Excellency, Ambassador of Argentina was the Chief Guest of the event.

Dr. Abid Mehmood, Director General (Res.) welcomed all for participation in the workshop. He especially extended his gratitude to Prof. Dr. Dan Putnam, Dr. Khalid Bali, Mr. Timothy Blank from University of California, USA and Dr. Daniel Basigalup from INTA Argentina for travelling a long way to participate this event. He welcomed and extended gratefulness to H.E. Ambassador of Argentina for sparing time from his busy schedule to grace the event as Chief Guest. He also welcomed scientists, academia, growers, and persons from private sector and all stake holders for participation in the workshop. He informed the participants about the importance and present scenario of daily sector and fodder sector in Pakistan especially in Punjab. He also presented the role of Agri. Research System of Punjab to develop high yielding varieties/hybrids of different fodder crops to ensure enhanced yield of nutritive forages to fulfil the needs of livestock for their better growth and production of milk and meat. He emphasized the development of collaborations among the institutes and trained human resource for the rapid growth of this neglected sector. At the end he appreciated the efforts of organizers for organizing a very successful event. He thanked MNS University of Agriculture, Multan, and USPCAS-AFS, University of Agriculture, Faisalabad for their active collaboration in organizing the sessions of the workshop at UAF and MNS-UAM for the training of scientists and fodder growers.

Prof. Dr. Asif Ali, Vice Chancellor, MNS University of Agriculture, Multan appreciated the organizers from AARI, UAF and MNS-UAM organizing a world class workshop with the

objective to address the problems of growing fodders and sharing experiences for the improvement of yield and quality of various fodder crops. He thanked the delegates from USA and Argentina for their participation to share their experiences and expertise for the improvement of fodder crops in Pakistan. Prof. Dr. Asif Ali emphasized the collaborative work for the result-oriented activities towards fodder improvement. He added that it would only be possible if scientists from different disciplines and organization will work together to solve the problems limiting the yield and quality of fodder crops in the country. He advised the young researchers and scientists to develop collaborations with international organizations for trainings and joint research projects to ensure success towards a better growth in fodder sector. He also expressed that government should take this sector as priority for the improvement of daily sector, and steps should be taken for a) strengthening of existing fodder research institutes/stations and establishing new ones, b) allocating more funds for research on fodder crops, c) arranging local and foreign trainings for human resource development in this sector. He reiterated that progress in dairy sector is only possible through improving the fodder sector. He told that this workshop may be a good step towards the progress in this direction.

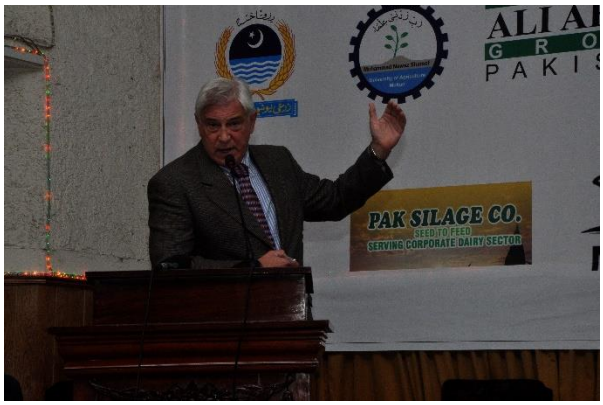
Address of Chief Guest, H.E. Ambassador of Argentina.

The Ambassador of Argentina acknowledged the organizers for setting a stage for different stake holders to address issue leading to low yields and nutritional quality of fodder crops and finding their solutions. He appreciated inviting scientists from USA and Argentina for participation in the workshops. He told that chances of success increase when tasks are taken by the teams rather than the individuals. He expressed his hope for success in progress

towards production of high yield and high quality fodder in Pakistan through developing collaboration among the local organizations and with foreign/international organization and scientists. He assured that research institutes of Argentina are open for any collaborative work in this direction. He proposed the exchange of plant material, scientists, academia, students, industry and business people between Pakistan and Argentina for a better development in the agriculture sector in general and fodder sector in particular.

Professor Dr. Daniel H. Putnam, University of California, Davis delivered a talk on the Alfalfa production systems for high yields in environments similar to Pakistan. He told that high quality and quantity of alfalfa is correlated with high level of dairy production. He mentioned that alfalfa is the queen of forages which is full of energy and proteins. He described some key cultural practices for the better production of alfalfa including timely sowing, soil preparation, fertilizer management, early weed control and proper irrigation management. He concluded that the cultivation of alfalfa provides stability to the environmental, conserve biodiversity and the co-cultivation of corn and alfalfa provides nitrogen to the corn crop.

Dr. Daniel Basigalup from National Institute of Agricultural Technology (INTA), Córdoba, Argentina gave a talk on "Alfalfa Production in Argentina". He described that there are more than 400 registered varieties of Alfalfa in Argentina since 1980. He enlisted major threats faced by Alfalfa in Argentina included insects, root and crown disease and leaf disease. He mentioned that INTA's breeding program is Joint venture. He said field selection and pest resistance selection were main features of breeding scheme for cultivar release. Dr. Daniel



also described his special lines of research which included Glyphosate tolerance, salt tolerance, bloat tolerances and salinity tolerance 8-22 ds/m. In his salt tolerance, the overall mean for salt treatments was 8 - 24.5 dS m^{-1}) and glyfosinate dose was 0, 2 and 4 l/ha of glufosinate.

Dr. Jeff Dahlberg from UC Davis, USA delivered a talk on use of sorghum as feed for dairy animals in chopped and/or ensiled form. He demonstrated that starch in sorghum grain should be processed before feeding to animals because these are harder to digest by cattle. Processing of grain involves grinding, rolling, steam-rolling and steam flaking. Dr. Dahlberg informed that all commercial grain sorghum hybrids in U.S. are free of tannins that enhance uptake of some proteins. Dr. Dahlberg described that novel genes can be incorporated in sorghum for improvement in characteristics like Photoperiod, reduced internode length, and drought tolerance etc. Dr. Dahlberg clearly described the signs of water stress include pre-flowering, leaf rolling, excessive leaf erectness, leaf bleach, tip and margin burn, reduction in seed size and delayed flowering. He recommended that use of nitrogen fertilizer is crucial for plant growth, high yield and good quality of sorghum. Diverse agronomic practices should be optimized to enhance sorghum yield. Dual purpose sorghums need to be harvested at correct time and need the grain processing. He summed up his talk with point that sorghum consume relatively less irrigation water compared to other crops like corn.

Muhammad Saleem Akhtar, Director Fodder Research Institute Sargodha gave an overview on present situation and future prospects of fodder in Pakistan especially Punjab province. He described the contribution of agriculture and live stocks in the economy of Pakistan. He informed that Fodder is grown over 2.11 million hectares of Pakistan out of which 1.83 million hectares are grown in Punjab contributing 86% share in total fodder production in the country. Mr. Saleem described constrains and bottlenecks of fodder production in the country including available land due to competition with cash crops, cultivation of low yielding unapproved fodder varieties, less availability of good quality and healthy seed, and unawareness of farmers regarding improved fodder production technology. Furthermore, biotic stresses (diseases, insect

pests and weeds), abiotic Stresses (drought, salinity, water logging and heat) and price fluctuations in market are also major reasons of low fodder production. He emphasized need to develop varieties with wider adaptability, and tolerant to diseases and insects pests to obtain high fodder yield. He suggested to evaluate fodder varieties on basis of contribution towards milk production and milk quality. He also proposed to develop fodder conservation technology, hay and silage making, optimization of the best combination of different fodder crops in mixtures may be helpful to enhance milk production and milk quality in dairy animals. He suggested to develop fodder varieties and standardise production technology of different fodder varieties to be grown under saline and drought environments. Different grasses, shrubs and trees may also be evaluated for fodder purpose. He also discussed that there is need to develop fodder protein bank and devising of scheme for availability of protein according to the animal requirement all over the year through fodder crops. Education of the farmers through multiple communication mediums like field days, kisan melas, demonstration plots as well as through TV/Radio programs, magazines and Newspapers can also contribute towards the production of better fodder. He also emphasized to train extension staff, develop collaboration between private and public sector, and mechanization of cultivation and harvesting of fodder crops for sustainable production of fodder.

Prof. Dr. Hafeez Ahmad Sadaqat who is an eminent fodder breeder from University of Agriculture Faisalabad, Pakistan presented a talk on the present situation of fodder breeding and importance and potential of fodder breeding in future. He informed the audience that growth of dairy and livestock sector is directly related with the growth in fodder yield and nutritional quality through development of improved and diversified cultivars, efficient input supply and marketing system. He proposed the breeding strategies to solve the issues of producing high yield of quality fodder. This can be achieved through using diversified germplasm in breeding programmes, using modern strategies of breeding and innovative techniques of biotechnology.

He also explained that that establishment of fodder research and seed production units at regional level, training of farmers and the stakeholder can improve the fodder cultivation in Pakistan.

Dr. Khaled M. Bali from UC Kearney Agricultural Research and Extension Center, Parlier, specialist in irrigation management presented the yield of alfalfa and other fodder crops can be enhanced if new techniques of irrigation management are used which are more efficient. He compared different methods of irrigation like Surface irrigation (flood or gravity), Border strip irrigation, drip irrigation etc. He proposed different methods of irrigation management for efficient use of water at grower's farms to produce better yield of alfalfa and other forage crops. He emphasized to calculate the amount of water required on the basis of crop stage and weather conditions and application of water accordingly to save water and avoid wastage of water.

Mr. Timothy Blank from California Crop Improvement Association (CCIA), informed the participants that higher yields of fodder in the field can be ensured by using better quality and certified seed to get a healthy weed free crop stand. He presented the procedures, requirements, and standards for the seed certification and crop inspection of alfalfa crop in California state of US. He suggested to use the data information and experiences of California Crop Improvement Association for the improvement of fodder and forage sector in Pakistan. This information is available at the website of CCIA. He informed that according to CCIA, minimum germination standards is 85%, while Pakistan Federal Seed Certification and Registration Department (FSC & RD) has minimum 80% germination standard. CCIA has zero tolerance for noxious weeds in seed lots for all classes of seed.

Prof. Dr. Shafqat Saeed, an experienced Entomologist from MNS University of Agriculture Multan explained how different insect pollinators are important for seed production of fodder crop especially alfalfa. Alfalfa crop, being entomophilous cross pollinated crop, totally depends on insect pollinators for seed production. According to him more than 20,000 species of bees act

as pollinators and provide free of cost service of pollination in nature. He presented the role of alfalfa leaf cutter bees in tripping of alfalfa flowers that is needed for pollination and seed set. He informed that honey bees do not have efficiency to trip the alfalfa flower, therefore, cannot play role in pollination of alfalfa. He emphasized to develop conservation plans for bees including, planting the flowering crops, leaving some untilled areas in field, creating artificial nesting sites, limiting the use of insecticides and managing the planting dates of alfalfa.

Dr. M. Aslam Mirza, Director, Institute of Animal and Dairy Sciences, University of Agriculture, Faisalabad informed that Livestock is a major sub-sector of Agriculture accounts for more than 50% share in agriculture GDP. He further informed participants that 1.3 billion people of the world whereas, 40-45 million (20% of the total population) in Pakistan depend on livestock for their livelihood. He emphasized the use of balanced nutrition to enhance animal productivity up to 50% with the existing gene pool. He described that green fodder is the most valuable and the cheapest source of nutrients satisfying nutritional needs maintaining good equilibrium between fermentable carbohydrates and RDP in rumen. He informed that When animals reach at their peak production, the fodder production shows declining trend-affecting production and persistency, next reproductive cycle, fetus growth, BCS and lactation length.

Dr. Noor ul Islam, Chief Executive, Punjab Agricultural Research Board (PARB), and Ex Director General (Research) Punjab informed the audience that Ayub Agricultural Research Institute, Faisalabad and its Stations and sub-stations have contributed a lot towards crop improvement and have developed around 500 varieties of wheat, cotton, rice, potato, and sugarcane. These varieties have uplifted the standards of the farming community by increasing the per unit area farm produce. He further reiterated that fodder had not been the priority area and there had been many deficiencies in this sector. He informed the participants that he himself had worked as alfalfa breeder and was the first to develop improved lines of alfalfa in 1985. He apprised that as CE PARB he has allocated maximum funding for this Fodder Workshop in the history of PARB. He further assured that PARB will encourage research proposal on fodder crops for funding in future. He appreciated and encouraged fodder scientists and emphasized to focus their commitment for the improvement in this sector of agriculture to improve the dairy sector and overall progress of the country.

ڈاکٹر عابد محمود ڈائریکٹر جنرل زراعت (ریسرچ) ایوب زرعی تحقیقاتی ادارہ، فیصل آباد اور پروفیسر ڈاکٹر ڈین پٹم یونیورسٹی آف کیلیفورنیا، امریکہ جدید زرعی ٹیکنالوجی کے اشتراک کے معاہدہ پر دستخط کر رہے ہیں۔








ALI AKBAR
GROUP
PAKISTAN

PAKISTAN

Wednesday April 25, 2018

Consultative Session on "Challenges and Opportunities in Fodder Research" at USPCAS-AFS University of Agriculture, Faisalabad

The consultative session to discuss the "Challenges and Opportunities in fodder research" was held in the Auditorium of the USPCAS-AFS building University of Agriculture, Faisalabad on April 25, 2018. Prof. Dr. Iqrar Ahmad Khan, Chief of Party USPCAS-AFS, former Vice Chancellor University of Agriculture, Faisalabad chaired the session. Prof. Dr Hafeez A Sadaqat, Chairman, Department of Plant Breeding and Genetics UAF performed the duty of moderator of the session. The session was attended by academia, research scientists, progressive farmers, and students. The discussion panel consisted of following scientists from USA, Argentina, and Pakistan, and representatives of multinational and national private sector seed and Research and Development companies.

1. Dr. James E. Hill, University of California, USA
2. Dr. Dan Putnam, University of California, USA
3. Dr. Daniel Basigalup, National Institute of Agricultural Technology, Argentina
4. Dr. Khaled Bali, University of California, USA
5. Mr. Timothy Blank, University of California, USA
6. Dr. Aslam Mirza, University of Agriculture, Faisalabad
7. Representative of MONSANTO
8. Representative of JASPAL

The moderator introduced the panelist and their specialization area. The panelists gave a brief overview of their current research activities and general overview of issues in sustainable fodder production.

The main points of discussion were as follows:

It was pointed out that non-persistent supply of nutrients has resulted in late puberty, stunted growth, and low yield potential. Moreover, poor performance of exotic breeds in harsh weather of Pakistani and loss of indigenous genepool due to mixing/poor breeds handling has resulted in an overall dismal state of livestock genetics in the country. As a result, Pakistan is still among lowest per animal head productivity stage in terms of milk and meat production in the world. The livestock share to GDP can be enhanced through enhanced productivity through sustainable fodder supply, animal health and breed improvement.

Cuscuta was described as one of the biggest issue in alfa alfa. The prevailing practice in USA shows that the issue can be only resolved through Zero Tolerance to Cascuta in fodder seed and destroying fields having Cuscuta infestation. It was emphasized to add seed health in Federal Seed Certification program as practiced in USA so that the diseases can be eradicated at seed certification and distribution stage.

Value of fodder is dependent on breeds and efficiency of breeds to give economic returns on investment in fodder. It is therefore important to work on breed improvement, animal health and fodder to get best results. Value addition was identified as single most important factor in enhancing profitability for livestock holders.

Sustainable fodder production is possible through quality seeds, production technology, efficient extension service, entrepreneurship and enabling policy environment to promote fodder production.

Possibility for use of waste water for fodder production should be explored as there is huge waste water usage potential for peri urban fodder production after proper analysis of water quality and treatment to safe limits (using WHO guidelines for use of waste water).

The lack of IP /PBRs was identified as one of the major obstacles to development of fodder varieties. The MNCs are also hesitant to introduce new varieties due to blurred PBRs/IPRs in Pakistan.

The issue related to HEIS in fodder fields like rodents etc were discussed and possible solutions were explored. The virtual water in international trade was discussed. The experts said that value for water may be a rational criterion while considering the virtual water trade issue. Some crops may require high water and may have higher economic returns and higher net profitability.

The issue of authenticity of available data for livestock was discussed and it was recommended to conduct livestock census using modern survey tools for authenticity and credibility.

The constraints of small holders to grow perennial fodder was discussed and role of financial institutions highlighted to support small holders. It was also emphasized to understand economic feasibility of fodder crops in isolation and in connection with livestock economics.

The role of political economy of wheat and sugarcane to discourage fodders and other non-conventional crops was discussed and favorable policy environment for efficient allocation of resources was recommended.

The salinity issue was identified as a necessary evil in dry areas with reliance on groundwater. The fodder crops are generally salinity tolerance and for high salinity the resistant crops like kalar grass etc can be grown.

The stakeholders from private sector identified contract farming as one of the successful model for popularization of fodder crop where the private companies provide fertilizer and seed with agreement to purchase fodder crop.

CPEC is likely to bring market for dried fodder and there will be huge demand from China. Keeping in view the potential as China is already importing fodder from different countries, the fodder production should be enhanced to earn profit and foreign exchange.

The participants lauded role of CAS in funding fodder projects and it was highlighted that centers like CAS can play key role in such initiatives due to their very governance structure and interdisciplinary approach. The role of AARI for R&D and PARB for funding such initiatives was appreciated.

Thursday April 26, 2018

Workshop at MNS University of Agriculture, Multan

Inaugural session

Workshop was started with the verses from Holy Quran. The worthy Vice Chancellor, MNSUAM, Director General (Research) Punjab, Deans, Directors, Chairmen/HoDs, faculty members of MNS-UAM, Faculty and scientists from other universities, Directors and researchers from research institutes, representatives of private companies, dairy farmers and fodder growers, postgraduate and undergraduate students attended the workshop.

Welcome Address by Vice Chancellor MNS-UAM

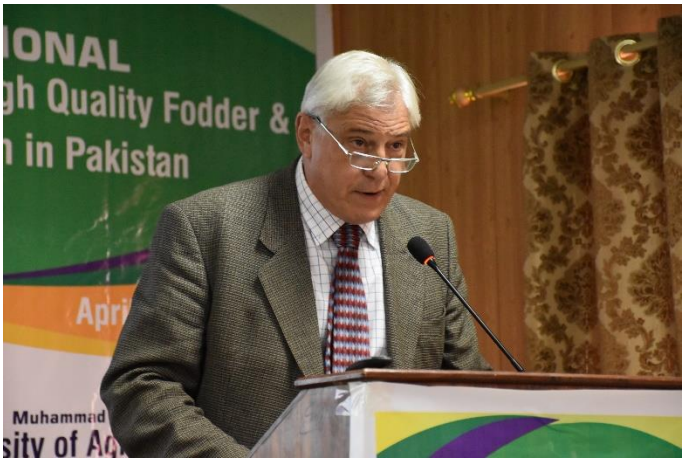
The Vice Chancellor, MNSUAM, Prof. Dr. Asif Ali warmly welcomed participants of the conference especially the foreign scientists from the University of California, Davis, and National Institute of Agricultural Technology (INTA), Córdoba, Argentina. The Vice Chancellor highlighted the importance of fodder and forages and give a briefed introduction about the academic and infrastructural development of MNSUAM. He mentioned various activities of faculty members and students for character building and leadership development. He also mentioned various research projects running in the university with collaboration of national and international agencies. Prof. Dr. Asif Ali emphasized on improving the educational system, activity and research-oriented system, and collaborative efforts for improvement of agriculture in general and fodder sector in particular in the country.

Professor Dr. Daniel H. Putnam, University of California, Davis delivered a talk on the Alfalfa production systems for high yields in environments similar to Pakistan. He told that high quality and quantity of alfalfa is correlated with high level of dairy production. He mentioned that alfalfa is the queen of forages which is full of energy and proteins. He described some key cultural practices for the better production of alfalfa including timely sowing, soil preparation, fertilizer management, early weed control and proper irrigation management. He concluded that the

cultivation of alfalfa provides stability to the environmental, conserve biodiversity and the co-cultivation of corn and alfalfa provides nitrogen to the corn crop.

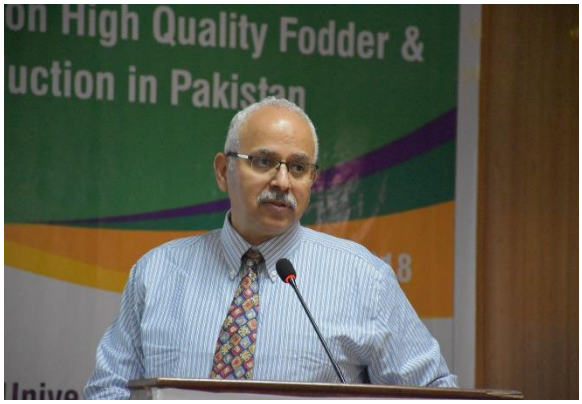
In question answer session, in response to a question about difference of protein quality between fresh harvest and hay of alfalfa, Dr. Putnam informed that it depends that how good hay making process is and there is not a huge difference between fresh and hay of alfalfa if availability of the water to the animals is not a problem. In response to another question he suggested the weed control in Pakistan through a) use of high quality seed and b) burning, close chopping and chemical controls if weeds are already present in the field. Professor Putnam expressed thanks to Prof. Dr. Asif Ali and organizers for their efforts for holding the very successful workshop.

Dr. Daniel Basigalup from National Institute of Agricultural Technology (INTA), Córdoba, Argentina gave a talk on "Alfalfa Production and Breeding in Argentina". He described that there are more than 400 registered varieties of Alfalfa in Argentina since 1980 out of which 130 are still in the market. The varieties range from fall dormancy to non-dormant types. He explained that major Alfalfa in Argentina faces major threats including insects, root and crown disease and leaf disease. He gave a brief overview of the INTA's breeding program and



activities for the improvement of alfalfa crop through breeding procedures. Field selection and pest resistance selection were main features of breeding scheme for cultivar release. He told that alfalfa varieties of INTA share 20% of market in Argentina. Dr. Basigalup also described his special lines of research which included glyphosate tolerance, salt tolerance, bloat tolerances and salinity tolerance. In his salt tolerance studies, the overall mean for salt treatments was 8 - 24.5 dSm^{-1} and glyphosate dose was 0, 2 and 4 l/ha. He suggested to grow germplasm accessions in areas with high salinity for preliminary screening and selection of accessions on the base of survival for further use in breeding progrmme. For a better grazing management of alfalfa he recommended rotational grazing system. At the end, Dr. Denial Basigalup invited faculty, and scientists of MNSUAM, AARI, other research institutes, and representatives of seed companies on workshop going to held in Argentina from November 11-14, 2018 entitled "Global Interaction for Alfalfa Innovation".

Mr. Timothy Blank from California Crop Improvement Association (CCIA), presented the advantages of certified seed in getting a healthy weed free crop stand and high fodder yields in the field. He presented the seed certification and crop inspection of alfalfa crop in California state of US. He proposed that the data information of California Crop Improvement Association can be used in Pakistan. He informed that according to CCIA, minimum germination standards is 85%, while Pakistan Federal Seed Certification and Registration Department (FSC & RD) has minimum 80% germination standard. CCIA has zero tolerance for noxious weeds in seed lots for all classes of seed. With Certified seed farmers have confidence that seed will have high germination, Low weed presence, No noxious weeds, and nematodes etc.



Dr. Khaled M. Bali from UC Kearney Agricultural Research and Extension Center, Parlier presented the importance of effective

irrigation management for improving the yield of alfalfa. He compared different methods of irrigation like Surface irrigation (flood or gravity), Border strip irrigation, drip irrigation etc. He proposed different methods of irrigation management for efficient use of water to produce better yield of alfalfa. He emphasized to calculate the amount of water required on the basis of crop stage and weather conditions and application of water accordingly.

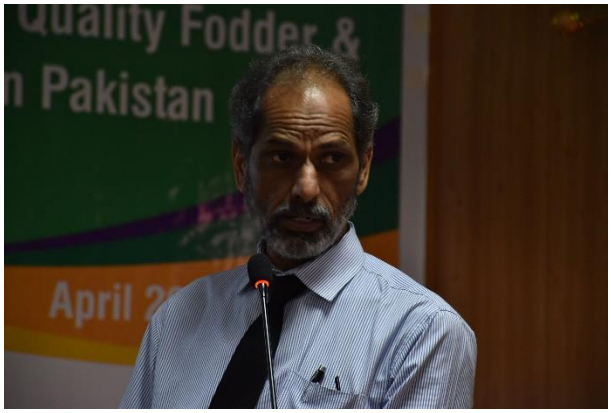
A presentation about the contribution of Agri. Research institutes for the improvement of fodders was delivered by **Mr. Muhammad Saleem Akhtar**, Director Fodder Research Institute, Sargodha. He described that 27 varieties of fodder crops have been developed by Agriculture Research Punjab and have a lot of promising lines of maize, sorghum, berseem and alfalfa. Moreover, the Agri. Research Punjab is also involved in various extension programs guiding farmers about the proper cultivation of fodder crops.

Prof. Dr. Hafeez Ahmad Sadaqat, Chairman Department of Plant Breeding and Genetics University of Agriculture Faisalabad, Pakistan discussed "Potentials of breeding fodders and future perspectives". He explained that the sustainable agricultural growth is possible by enhanced farm income, food security and environmental protection through development of improved and diversified cultivars, efficient input supply and marketing system. He mentioned various limitation in fodder production, and proposed the breeding strategies to solve the issues of producing high yield of quality fodder. He proposed that establishment of fodder research and seed production unit at regional level, training of farmers and the stakeholder can improve the fodder cultivation in Pakistan.

Prof. Dr. Shafqat Saeed, Dean of Faculty of Agriculture & Environmental Sciences MNS University of Agriculture Multan Pakistan elaborated the role of insect pollinators in seed production of fodder crop with special reference to

alfalfa. He demonstrated that alfalfa seed production is highly dependent on insect pollinators, especially leaf cutter bees. He informed that more than 20,000 species of bees provide free of cost service of pollination in nature. He also mentioned that alfalfa leaf cutter bees play significant role in tripping of alfalfa flower leading to pollination and seed set. He also told about the inefficiency of honey bees in alfalfa pollination due to their inefficiency in tripping the flower. Dr. shafqat proposed a conservation plan for bees including, planting the flowering crops, leaving some untilled areas in field, creating artificial nesting sites, limiting the use of insecticides and managing the planting dates of alfalfa.

Dr. M. Aslam Mirza, Director, Institute of Animal and Dairy Sciences, University of Agriculture, Faisalabad informed that 1.3 billion people of the world whereas, 40-45 million (20% of the total population) in Pakistan depend on livestock for their livelihood. He mentioned that Livestock is a major sub-sector of Agriculture accounts for more than 50% share in agriculture GDP and ensures 'Food Security' through food diversity. He presented the significance of balanced nutrition to enhance animal productivity up to 50% with the existing gene pool. He described that green fodder is the most valuable and the cheapest source of nutrients satisfying nutritional needs maintaining good equilibrium between fermentable carbohydrates and RDP in rumen. He informed that When animals reach at their peak production, the fodder production sees a declining trend-affecting production and persistency, next reproductive cycle, fetus growth, BCS and lactation length.



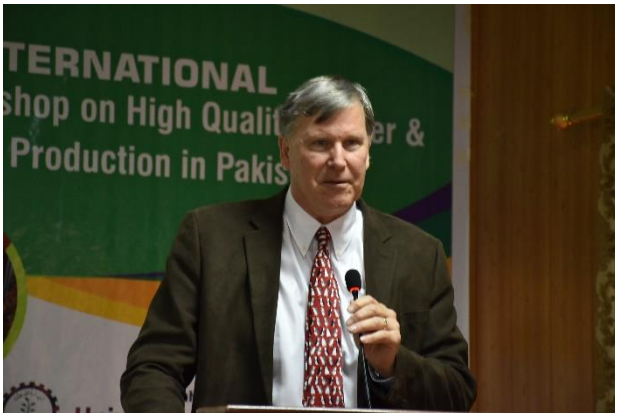
Mr. Rasheed Ahmad Sindhu from Maxim International Private gave talk on contribution of Maxim Int. in growing Alfalfa in Pakistan. He claimed that Sultana variety proved the best in saline soil and high water table i.e. 12-15 feet. He mentioned herbicides from his company are effective in sandy soil and rainy days. He

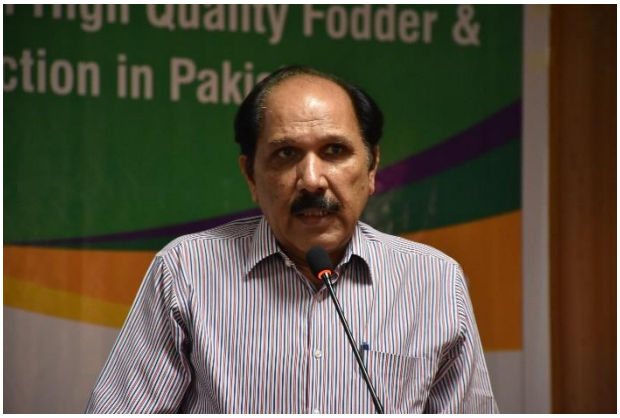
informed the participants that Pakistan has suitable soils and best weathers where farmers can earn more than 1.25 Lacs per acre income through growing of alfalfa. Alfalfa hay production is not a crop production but an industry which can give farmer revenue on daily basis. He mentioned that in the month of July and August weed emergence suppress Alfalfa growth, however, the use of herbicide for example, Helaxafop give good results to control narrow leaves weeds. Leaf shattering in summer and drying in winter are major issues in Hay making which can be managed by tiding/racking timely and using conditioner mower.

Mr. Fida Gadi, CEO Biotrack Enterprises, informed that rural economy system in Pakistan especially Punjab province mainly depends on livestock sector that is the vital sub-sector of Agriculture, contributing 11.8% to GDP which is 56.3% of the Agriculture share to GDP. It is predicted that milk and meat consumption will grow at 2.8% per annum in developing countries like Pakistan. The ever-increasing human population in Pakistan demands more milk and meat production to meet the nutritional requirements. Milk and meat production of livestock in Pakistan is very low compared to those in developed countries. The main reason is that available fodder for livestock does not meet the nutritional requirements allowing them to express full genetic potential. In this situation alfalfa may be a better option to provide nutritious fodder throughout the year. Alfalfa is being cultivated in Pakistan for green fodder as well as for Hay and haylage purpose. Low germination, and slow initial growth of alfalfa is a problem due to various soil related problems in most of the alfalfa growing areas in Punjab. Biotrack Enterprises is focused to sustain role as a Leader in the market by introducing new technology and services to enhance per acre yield of crops especially alfalfa at lowest cost of production keeping in view the international standards and demands. The motto of the company is capacity building of the farmers for profitable farming at their doorsteps. The company deals with pesticides, seeds, and fertilizers, along with growing alfalfa for hay and haylage purpose. The Biotrack company has also introduced an organic manure with the tradename of ‘Bionic’ that improves the soil properties helping the enhanced germination and

early growth establishing a good crop stand. We are harvesting upto 8-9 cuts of alfalfa in a season that are used for making hay and haylage. The company also offers trainings to the farmers regarding best practices for growing alfalfa and making hay and haylage without minimum loss of nutritional quality. It is believed that with the growing interest of private sector in growing alfalfa will improve the fodder production in the country leading towards a better feed for livestock enhancing production of daily products.

Prof. Dr. Daniel Putnam and Prof. Dr. Abdus Salam Khan, in their concluding remarks appreciated the efforts of MNS University of Agriculture, Multan, and Ayub Agricultural Research Institute, Faisalabad for providing an opportunity to the researchers, academia, growers, public and private sector seed producers, students and other stakeholders to sit together and discuss the issues faced by fodder crops and finding solutions of the problems. Prof. Putnam emphasized collaborations among the institutions and organizations for sharing of expertise and facilities for growth in fodder sector. He, on the behalf of his team, offered collaboration with AARI and MNS-UAM for research and human resource development for strengthening research and development for fodder in Pakistan. Prof. Khan emphasized the government to increase funding for the strengthening the fodder research institutes and stations and establishing new stations for this purpose. He also emphasized on the training of farmers for growing fodders and ensuring better yields maintaining better nutritional quality using the advanced production technology and mechanization of farm activities. Prof. Putnam and Prof. Khan emphasized to strengthen the extension wing with the main responsibility of disseminating the information among the farmers regarding the latest research in the fodder sector leading to enhanced yield and better nutritional quality.





Prof. Dr. Shafqat Saeed, Dean FAES, MNS-UAM thanked everyone especially the scientists from USA and Argentine who came a long way to make this workshop a successful event. He applauded the support of government research institutions and private sector for holding international conference on fodder crops. He congratulated organizers for conducting such a marvelous event providing an opportunity for stakeholders to sit together for a discussion for improvement of fodder situation. Prof. Saeed extended his gratitude to Punjab Agriculture Research Board (PARB), Biotrack Enterprises, Maxim International Private, Farm Dynamics Pakistan, and other for providing funding and sponsoring the event. He also thanked Dr. Abid Mehmood, Director General (Agri. Res.) Punjab, Dr. Qamar Shakeel and his team from Ayub Agricultural Research Institute for developing collaboration for the conduct of various activities. Dr. Shafqat Saeed also thanked the farmers, who are the true stakeholders, for their active participation in the workshop. He also thanked the faculty and students for their team work in organizing the workshop and participation in the event.




Friday April 27, 2018

Visit of Agricultural Mechanization Research Institute Multan

Visit of Alfalfa Farms at Khanewal





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