SUSTAINABLE VALUE SUPPLY CHAIN POLICY FOR VEGETABLES

MNS- University of Agriculture Multan

PREFACE

Pakistan owes a wide range of natural resources & climate that allows for the production of a wide range of horticultural produce, including vegetables throughout year. Vegetables are high value crops and often provide income generating opportunities to farmers irrespective of their farm holding size. Pakistani farmers, however, over the number years remained unable to harvest the potential benefits from vegetable production due to number of agro-ecological, R&D, management and marketing constraints.

Pakistan is blessed with rich natural resources, biodiversity, rare and rich flora and fauna, diversity of ornamentals and forests, wealth of vegetables and fruits, and encouraging agro-climatic conditions. Pakistan is naturally a rich source for vegetable production but there is need to develop linkages between farmers and distant markets within country as well as for export.

From the MNSUAM platform, the Focal Group Discussion (FGD) by experts and stakeholders from across the country reviewed the major developments/ limitations in the vegetable sector of Pakistan with particular emphasis on crop production, seed sector development, storage, supply chain, and value addition of major vegetable crops i.e. tomato, potato, onion, and chillies. It was discussed that the productivity of these major vegetables in Pakistan is quite low as compared to other countries. It was all due to ignorance and no attention paid to horticulture sector. Experts were agreed that efforts are required to strengthen the rural areas to achieve the gaols linked with Sustainable Development Goals (SDGs) as well as making Pakistan a healthy place to live and work. Experts also pointed out that horticulture provides higher return per unit of land that ultimately create better economic opportunities for farming communities as well as encouraging them to produce and consume healthy foods.

As in Pakistan the vegetables and other horticulture crops potential has not been properly harvested due to lack of market and production practices, lack of awareness of farmers, poor infrastructure, meagre transportation system, Insufficient road network, lack of cold storage facilities and processing industries etc. These limitations can be converted into an opportunity. It was also highlighted that more emphasis should be given to the value addition of these commodities which remained neglected in our country.

MNSUAM took this initiative upon the direction of Government to promote development of horticulture crops in general and major vegetables (potato, tomato, onion and chilli) in particular. Appreciation is extended to Prof. Dr. Asif Ali, Vice-Chancellor, MNS University of Agriculture, and Multan, or his initiative to organize this national-level discussion on major vegetables which may lead to the establishment of Pakistan Vegetable Development Board (PVDB). Strategies proposed by PVDB would play a crucial role to achieve the goal of making Pakistan a true vegetable hub for entire world.

Chapter 1

Tomato

A Focused Group Discussion (FGD) was carried out in the committee room of Admin Block of MNS University of Agriculture Multan (MNSUAM) on October 27, 2020. **Vice Chancellor, MNUSAM Prf. Dr Asif Ali Khan** started he discussion by stating the objective of the FGD in the lioght of the policy 9interest of the Punjab Government for overall improvement in the productin and supply chain of the crop. He said that due to persistent fluctuations in vegetable prices around the country, the Federal level Vegetable Research Board is inevitable to ensure sustainable vegetable supply around the year across the country. **Dr Irfan Ahmed Baig, from** MNSUAM updated the participnsty woth few key challenges through presenting the past trends, current situation, and future of tomato production prices in the country. He said that Pakistan is currently facing productivity, seasonality, price fluctuation, and postharvest related constraints in tomato production and supply. Pakistan, per hectare yield of tomato, is around 10 tons, while it is 33 tons per hectare globally. House delibrated on the discussion points as under:

1.1 Recommendations

Production:

- Obsolete tomato production technology needs to be improved to enhance per Ha tomato production
- Tomato variety standardization thru area Specific Tomato varieties production and adaptation.
- Biotic and abiotic challenges to productivity: tomato yellow leaf curl viruses, nematodes, heat and drought stress needs to be addressed through seed biotechnology.
- The demand-led tomato breeding is required to cater the needs of cooking, and pulping and ketchup industry by investigating existing varieties, creating product profiles to meet stakeholders' needs, quantifying and validating the required performance of key traits with actors in the fresh and processed tomato value chains
- To explore the new areas for tomato production in KPK and Baluchistan for gap period production (Qalat, Quetta, Qila Saifullah, Harnai, North and South Waziristan)
- Tomato zonation and cluster farming to solve production and value chain problems.

- In protective farming of tomato, the introduction of bumblebees can enhance the production.
- Lack of nursery management expertise in case of tomato is a big challenge for farmers in Sindh.

Marketing/ Supply Chain

- Glut production management through value addition and variety selection.
- Understand the needs of each tomato value chain actor
- Develop strategies to improve domestic production to serve households and processing markets
- An institutional consortium required to bridge the information and research gap, thru farmer representation, Processing (National Foods, Volka, Mitchells etc.), University, Academia (MNSUAM, UAF, AAUR, UAT, UoP) Government policy and enabling environment, Seed industry (Yuksel Seed Asia, AARI, Haji Sons), CABI, Crop research and breeding institutes (PARC, Provincial Departments, Academia)
- Currently, tomatoes are being used for slicing and cooking small cherry tomatoes for salads, but a big chunk is required for the industry to make value-added products.
- Lack of reliable market is the major problem the farmers face with the lowest price, cheating by market queens, lack of enough funds by the processing factory is a big challenge to address the production glut.
- Lack of reliable market is the major problem the farmers face followed by the low price, cheating by market queens, lack of enough funds by the processing factory, that needs to be addressed by contract farming by arhties thru soft loaning to arhti system.
- Poor packaging of tomato, cost big postharvest losses, proper packing in a cardboard box instead of the wooden box.
- Access to information to vegetable growers; future extension systems should be modified, Web-based information of daily arrival and dispatch from each cold storage about daily debut and credit to know the exact information. Disinformation shall be an offence. Enactment, if needed, shall be made to have the accessibility of information
- Promoting protected agriculture in peri-urban areas; the vegetable supply chain can be made useful.

Value Addition

- Industry required tomato paste, puree and pulp with more solid contents.
- Lack of value-added industry in the tomato production area, hence high transportation expenses and lack of infrastructure, fails to deliver benefits to the producer. The industry needs to be set up in clusters and production tomato areas.
- Processing, value addition, drying, purree, paste, ketchup, Processing line in a cluster
- Provision of pulpers and procurement facilities for small farmers in Sindh, Baluchistan and KPK through national Program.
- Mega Campaign at every level to promote value-added tomato products in Kitchen. Every cookery show shall have processed Tomato value-added products during cooking

1.2 Action Matrix

Bottleneck Theme	Bottlenecks	Recommendations	Strategies	Responsibility
Production	Low productivity	1. Increase productivity per square meter 2. Production of special purpose tomato in special zones	1. Improved Tomato hybrids 2. Contract farming 3. Joint ventures for High Value Agriculture introducing Hydroponics 4. Productivity enhancement program in Sindh	1. Extension department 2. Research Institutions
		Protective farming / Net houses for vegetable production	1. Bumble bees development 2. Indigenization of protective farming technologies / material (insect net sheet/ drip tape) by providing incentives to industry in SEZs	1. Extension department 2. Planning Commission 3. MnFSR 4. NARC
		1. ICT based Extension systems 2. Localised weather	1. Proper information about production	Extension department

		advisory	technology 2. Introduction of weather station for localised advisories 3. Specialised advisory services for vegetable production	
		Zoning for special purpose vegetable production especially tomato	1. Developing area specific/ usage specific varieties by conduction research/ trails 2. High SF content varieties for industrial use	1. Plant breeding research institution 2. Adaptive Research 3. Industry/ research Institutions collaboration
	Gap in production of crop	Exploring new areas of tomato production to bridge the gap in supply chain (September to January)	1. Exploring new areas in Baluchistan and Punjab (Soun Valley, Naseerabad, Pashin Basin etc.) 2. Contract farming arrangements (Industrial linkages with farmers) 3. Crop zoning	1. Provincial agricultural departments 2. Research Institutions
	Post-harvest losses	1. Improved packing and transportation mechanism 2. Value addition facilities at regional level	1. Empowering businesses for development of low cost packing and branding 2. Puree / paste making small plants in	

	Biotic and A biotic challenge to productivity	1. Climate Smart Varieties 2. Introducing/ promoting/ developing crop varieties resistant to disease attack	1. Plant breeding 2. Use of biotechnology 3. Varieties selection	Research Institutions
Supply Chain	Poor access to market	1. Better road/ transport infrastructure 2. Cluster development	1. Identification of potential tomato producing areas, 2. Develop clusters and connect them with markets	Provincial governments
	Enroute losses	1. Proper Packaging 2. Proper sorting/ grading	1. Developing packaging industries in vegetable growing areas 2. Introducing proper packing material 3. Collaboration with packaging material producing industries	1. Research intuitions 2. Extension department
	Poor market information	Web based/ modern information dispersion system	1. Gathering market information 2. Proper/ in time dispersion of information	Extension department
Value Addition	Low value addition	1. Specify areas for production 2. Developing processing/ value addition industries in clusters	1. Cluster development 2. Promoting agro value addition industries	Provincial/ Federal governments' relevant departments
	Less use of value added	To change eating habits to promote use of value added	Media campaigns	Extension departments

	tomato products	products	Meal competitions	Academic institutions
		Policy support for coordinated efforts	Vegetable Development Board at Centre	MnFSR PARC

1.3 List of Participants

Prof. Dr Asif Ali Khan, Vice-Chancellor, MNSUAM	Mr. Khurram Ziaf, A.P, UAF
Director General Agriculture Research Sindh,	Mr. Rehan Riaz
Dr Muhammad Javed Tareen, Director General, Agriculture Research, Balochistan	Mr. Hafiz Mehmood Rehman
Prof. Dr. Shafqat Saeed, Dean FA&ES, MNSUAM	Mr. Mehmood Nawaz Shah, Member BOD at (TDAP)
Prof. Dr. Irfan Ahmed Baig, Dean FoSS&H, MNSUAM	Mr. Tauqeer Ahmed
Prof. Dr Ashfaq, Chairman Department of Plant Pathology, MNSUAM	Mr. Kashif Aslam, Progressive Grower
Dr. Najeeb Ullah, Director Vegetable Research Institute	Mr. Saeed Ahmad Chishti, AARI Faisalabad
Dr. Fayyaz Ashraf, National Food, Karachi	Mr. Muhammad Asif, CABI, Rawalpindi
Dr. Abdul Ahad, Assistant Professor, AAUR	Dr. Nazar Fareed, Assistant Professor, Horticulture, MNSUAM
Dr. Nausherwan , SO, NARC, PARC	Dr. Abid Hussain, Assistant Professor, Soil Science, MNSUAM
Mr. Shoukat Ali, Progressive Tomato Farmer/ Owner Yuksel Seed Pakistan	Dr. Sami Ullah, Assistant Professor, Agricultural Economics, MNSUA

Chapter 2

Potato

Potato was the focus second FGD organized by the Centre for Agricultural Sustainability in South Punjab (CAS-SP) on November 05, 2020. Purpose of the FGD was to evaluate the current status of production and supply chain in Pakistan, problems / issues threatening the interests of growers, processors, consumers and traders and to come-up with a plan to overcome the identified gaps. House discussed the persistent fluctuation in the vegetable especially potato supply and value chain. House was also informed that Federal Govt. is interested in establishing a Vegetable Development Board which primarily involved the most consumed household vegetables including potato, tomato, onion and chili to ensure their sustainable supply throughout the year in the country. Current challenges of productivity, seasonality of supply, price fluctuation, and post-harvest losses were shared with the stakeholders. The participants discussed the issues pertaining to potato seed sector, production, storage, supply chain and value addition issues. The participants recommended certain measures to address the issue related to potato crop value chain.

2.1 Recommendations

General

- Fair and square crop production data for appropriate potato production and export policy development
- Capacity building and refreshment courses of Agriculture extension field officers and researchers. Besides, field offices should be in field and direct contact of farmers.
- Farm insurance policy should start to accommodate the farmers against natural disaster
- Loan should be provided with less mark up as to industry.
- Promoting cooperative farming based on protection of common interests among small farmers
- Establishment of National Potato Institute containing stakeholders from all provinces of Pakistan preferably in public-private partnership to address potato industry seed, pre- and postharvest challenges. Additionally, National level coordination amongst the academia and researchers of potato should strengthen.

- Fertilizer and plant protection chemical price regulation should enforce during crop sowing. Besides, coupon system of fertilizer subsidy should be replaced with direct reduction in prices

Seed Sector

- Core issue of the potato sector. Current year price of imported seed potato is about 15000 PKR/50 Kg bag.
- Indigenous specialized variety system should be developed as per market/consumer/industry demand (French fried, crispy, table, starch etc) with higher quality, shelf-life and storability
- Seven varieties developed by Potato Research Institute (PRI), Sahiwal. Special consideration should focus on their marketing and distribution involving private sector.
- Importantly, importers should add the seed potato harvesting date so that farmer may know about the dormancy period, thereby tuber emergence and later crop growth and maturity as per indigenous growing season.
- Member of farmer community or society should introduce in potato section of Punjab Seed Corporation (PSC) and also involve in the monitoring of seed potato sale process.
- Seed potato certification at field level should be started preferably under the supervision of FSC&RD for quality seed production, multiplication.Farmers should grow seed potato in separate plot instead of selection from main grown crop plot. Moreover, regular rouging should be carried out for quality on-farm seed potato production.
- Training and capacity building of the farmer community for relatively certified disease-free seed potato production and multiplications at farmer field to ensure seed standard.
- Seed potato import system should make competitive by allowing other countries to introduce their varieties in Pakistan. Besides, one window operation should be started for the evaluation of imported varieties in minimum time preferably one year instead of 3-4 year. Pest Resistance Analysis (PRA) also needs consideration.
- The import of seed potato of those countries should give preference which would be interested to purchase Pakistani potatoes.

- Intellectual Property Rights (IPR) should only be enforced on those verities which registered after 2016. The varieties available before 2016 should consider as free varieties. China has already adopted this model.
- Potato crop cycle should strengthen in whole Pakistan with special inclusion of Baluchistan to ensure timely production and supply of seed potato for autumn crop (85% share) in Punjab.
- Research institutes especially potato research institute should focus on climate resilient hybrid potato seed production as a new game-changer in the potato industry of Pakistan in collaboration with private sector.
- The director general of agriculture research of Baluchistan offers complete support for national seed potato development and also invited to visit the potato directorate in Pashin.

Crop Production

- Govt. should develop crop zones with appropriate planting time. Crop zone-based weather forecasting should ensure to facilitate the farmers in decision making of crop production
- Improved production technology should be developed for different potato categories (French fried, crispy, table, starch etc) keeping in view the zone, soil, water quality and crop type. Moreover, precision agriculture practices including balance use of fertilizers, plant protection chemicals and irrigation practices should adopt to increase crop production and its quality along-with reduction in cost of crop production. Moreover, it was suggested to use the recommended doses of nutrition as per soil analysis report along-with appropriate micronutrients especially where exhaustive crops have been grown continuously.
- Extensive R&D should be carried for biotic (especially scab) and abiotic stresses (especially high temperature during planting and low temperature during tuber bulking, drought, salinity) Additionally, public-private research consortium for the market-oriented research by the academia and research institutions.
- Provision of testing kits to field officers for random testing of the produce to ensure quality and improve shelf life and storability as per crop type.

- Potato basket diversity should focus to produce use specific potato. For example, potato production for starch or industrial use
- Exploration of South Punjab and Baluchistan as future potato production areas.
- Govt. machinery institutes should develop economical planting and harvesting machinery particularly focusing on small farmers and provision of subsidy by the govt. to reduce the postharvest losses.
- Issue (frost, scab, blight etc) specific R&D based product as per local Env

Storage

- The seed potato should store separately from potato tables in cold storage. Moreover, new bags should be used for seed potato storage.
- The storage should be controlled, and new cold storage should be built on Public-Private Partnership (PPP) in Punjab and anywhere in Pakistan.
- In Baluchistan, government should facilitate the farmers/middlemen for the establishment of cold storage system in potato growing areas of Baluchistan.
- The well standard cold storage of potato seed should be established

Supply Chain and Value Addition

- Timely announcement of export policy to ensure sustainable supply and appropriate profit for farmers and other stakeholders
- Capacity building of the exporters to make the Pakistani potato competitive in Int. market
- Small packaging as per market of export countries
- Farmer share in profit as per international market rate
- Establishment of potato starch plant
- Small processing units (chip, snack, starch) at farmer level and capacity building of farmers through cooperative or cluster-based farming system especially among small farmers. Currently, not a single starch plant installed in Pakistan.

2.3. Action Matrix

Bottleneck Theme	Bottlenecks	Recommendations	Strategies	Responsibility
General	Issue of fair and square data	Fair and square data collection of area and production, storage & export	- Timely data collection	- Agriculture Dept. - Pakistan Bureau of Statistics
	Less crop support loan and its mark-up relative to industry	Crop loan announcement as per recent production technology	- One window operation with higher loan amount that would be competitive to industry in overall amount and mark-up - Conversion of ZTBL to ADBP	- Agriculture Department - State bank of Pakistan (SBP) - ZTBL
	Lack of national potato policy	- Establishment of national potato research institute in collaboration with all stakeholders - Development of 5-year plan - Announcement of special projects call	- Collaborative involvement of Agriculture department, research and academia of all provinces - Inclusion of all stakeholders	- Respective federal and provincial ministries
	Lack of updated crop production and technology information	- Regular refreshment courses of researchers and extension officers	- Development of Improved production technology along-with recent machinery and IoT based technology	- Academia-Research - Ministry of Information technology - Agriculture Dept.
Seed Potato	Dominance of imported seed especially Netherland originated	- Competitive environment for international seed potato import - Development of local varieties as per industry demand	- Development of national potato institute - One window operation for Int. seed import testing - Academia-research and industry linkages for R&D on variety development	- Federal Govt. - Agriculture Dept. - Strong collaboration among private seed potato distributing companies - Plant Protection Department

			and evaluation as per zone and industry demand	
	Lack of seed certification at farm level	- Proper seed certification at farm level	Training of seed related stakeholders for certified seed development and plant rogueing at farm level	- FSC&RD - Agriculture Dept. - Academia-Industry collaboration
	PRI varieties multiplication and marketing	Encourage private companies and farmer cooperative society to invest in the promotion of indigenous potato seed sector	- Good working environment to private stakeholders - On farm farmer days of PRI varieties at farm level	- Respective provincial Govts and private stakeholders
	Strengthening potato cycle and development of climate resilient hybrid seed potato	- Seed potato multiplication in different regions (KPK, GB, Baluchistan) of Pakistan for timely availability of physiologically matured seed for autumn crop in Punjab. - Mentioning date of planting and harvesting of seed potato. - Climate resilient R&D	- Establishment of national potato research institutes. - Academia-research of all provinces and private linkages for production of physiologically matured disease-free certified seed potato - Special project	- FSC&RD - Agriculture Dept. - Academia of all provinces - Involvement of Private seed potato companies
Production	Low productivity	Increase productivity per acre	- Crop zoning - Modern production technol. - New varieties - Cluster development/ Contract / Corporate farming	- Agriculture Dept. - Academia-Research Industrial collaboration
		Modern Extension systems	- Proper information about production technology	- Agriculture Dept.

			- In time information dissemination regarding production technologies, varieties, plant protection and weather conditions - Area/ variety specific extension services	
		- Provision of seed on time along-with date of harvesting. - Seed potato multiplication during summer in northern areas	- Sustainable supply of seed from Punjab to northern areas on regular basis	- Agriculture Dept. - Industry/ research collaboration
	Sustainable Supply chain during Sept-Dec.	- Year-round Zone based crop production - Biotic and abiotic stress tolerant varieties development as per local environment	- Exploring new areas of potato production i.e. Baluchistan, AJK, KPK - Issue specific R&D involving all stakeholders - Focus on less developed/far flung areas - Cluster development/ Contract farming - Crop zoning	- Provincial agricultural departments - Academia- Research Institutions
	Lack of field crop and tuber testing as per crop type	- Capacity building of agriculture/horti culture field officers	- Provision of testing kits	- Agriculture Dept.
	Natural calamities	- Stakeholder especially farmers support against natural calamities	- Crop insurance policy	- Agriculture Department - SBP - Commercial banks

	Lack of economical planting and harvesting equipment's for small farmers	Development of low cost equipment's for small farmers	- Strengthening indigenous machinery instruments	- Agriculture machinery research institute - Academia-research and private agencies
Supply Chain	Poor market information	- Web based/ modern information management system	- Assimilating updated market information and effective dissemination using Dashboards / ICT tools	- Agriculture Dept.
	Poor access to market	- Better road/ transport infrastructure - Cluster based cooperative farming	- Infrastructure development in crop producing areas, - Farmer's capacity building for Cluster development to promote cooperative farming	- Provincial governments - Agriculture Dept. -
	Enroute losses	- Proper handling from field - Proper grading	- Developing economical quality bags that should not reusable - Introducing purpose specific cold storage - Collaboration with private sector	- Potato Research Institutors - Agriculture Dept. -
	Supply demand gap estimation issues and price fluctuations	- Proper information regarding supply and demand - Timely announcement of export policy	- Gathering market information - In time dispersion of market signals to all stakeholders e.g., policy makers - Export policy announcement during Oct-November	- Agriculture Dept. - Ministry of food security and research - Ministry of commerce and industry
	Low price in	- Improving	- Growers and exporters capacity	- Research and academia

	international market	product quality, its development process and its value	building for export quality tuber production as per Int. market - Trickle down export profit to farmers for quality prod. - Improving packaging material and size	- Ministry of food security and research - Ministry of Commerce and Industry - Private stakeholders
Storage	Seed and consumption tuber in same cold storage	- Separate storage of seed tubers and consumption tubers	- Development of standard cold storage for storing seed tubers	- Provincial govt.
	Old jute bags (120 kg/bag) for seed potato storage	- Utilizing new and aerated net bags that should contain max. 50 kg/bag	- Promoting net bags industry	- Respective Govt. and private stakeholders
Value Addition	Low value addition	- Developing and promoting processing/ value addition industries	- Promoting value addition industries - Development of small tuber processed plants	- Provincial/ Federal governments' relevant department - Agri. Dept.
	Developing Purpose specific varieties like starch, chip etc	- Variety to product development and testing	- Academia – Research and Industry collaborative R&D	- Agriculture Dept. - Academia - Private stakeholders
	Less use of value-added potato products	- Consumption pattern change and affordable availability of value added products	- Print and electronic media campaign	Agriculture Dept. PEMRA: Print and electronic media

2.3 List of Participants

Dr. Irfan Ahmed Baig, Dean, (FoSS&H), MNS-UAM.	Dr. Syed Ijaz-ul-Hassan, Director, Potato Research Institute, Sahiwal, Punjab
Dr. Javed Tareen, DGA (Research), Baluchistan.	Representative, Director General Agriculture Research, KP
Dr. Ashfaq Ahmad, Institute of Plant Protection, MNS-UAM	Dr. H. Nazar Faried, Assistant Professor, Horticulture, MNS-UAM
Dr. Abid Hussain, Assistant Professor, Soil & Env. Sci., MNS-UAM	Dr. Nadim Ahmed, Assistant Professor, Institute of Plant Protection, MNS-UAM
Mr. Ali Imran, Lecturer, Agri Business and Applied Economics	Ch. Maqsood Jatt, Chairman, Potato Research and Development Board
Mr. Saleem Bari, CEO, Seethi Seeds	Rana Aftab Ahmad, Potato Grower, Dipalpur, Okara
Dr. Abdul Ahad, Assistant Professor, Department of Horticulture, PMAS-UAAR.	Mr. Muhammad Asif, CABI
Mr. Hafiz Mehmood Rehman, Dua Foundation	Dr. Fayyaz Ashraf, Head, Innovation, R & D, National Foods, Karachi
Mr. Akhtar Nawaz, Director, Hazara Agriculture Research Institute, Abbottabad, KP	Dr. Ijaz Akhtar, Senior Scientist, Abbottabad
Dr. Amina, Senior Scientist, Hazara Agriculture Research Institute, Abbottabad, KP	Mr. Muhammad Asif, Project Manager, CABI-Pakistan

Chapter 3

Onion

To deal with all possible bottleneck in chilli value supply chain, a Focused Group Discussion (FGD) was carried out in the committee room of Academic Block of MNS University of Agriculture Multan (MNSUAM) on October 28, 2020, at 14:00 to 16:00. The Vice Chancellor initiated the discussion and briefed the participants regarding objectives of the session. He said that due to persistent fluctuations in vegetable prices around the country, Federal Vegetable Board is need of time to ensure sustainable vegetable supply around the year across the country. Dr. Ashfaq presented a detailed background on the past trends, current situation, production, price trends and future of chillies production in the country. The discussion was shared by scientists from provincial, national and international organizations, leading management of private sector and farmers. All the stakeholders outlined major bottlenecks, recommendations and strategies for the improvement of Chilli value supply chain.

The participants discussed the issues pertaining to Chilli seed sector, production, post-harvest and supply chain issues. The participants recommended certain measures to address the issue related to chilli crop value chain. All the participants agreed to provide their services for a mutual collaboration on chillies to solve issues elaborated in length earlier and for the betterment of farming community and country. The meeting was attended by scientists from provincial, national and international organizations, leading management of private sector and farmers. The participants discussed the issues pertaining to Onion seed sector, production, post-harvest and marketing issues. The participants recommended certain measures to address the issue related to Onion crop value supply chain.

3.1 Recommendations

Seed Sector

1. Genetic resource bank should be established to store local and international germplasm.
2. Improve efficiency of seed distribution system for certified seed procurement by small farmers.
3. The potential for seed production in Balochistan and Sindh provinces should be exploited for local seed production.

4. Hi-tech based threshers should be introduced in order to avoid any seed damage.
5. Seed branding should be done at provincial level to protect the intellectual property rights of all stakeholders.

Crop Production

1. Strengthening of research institutions to increase research on Onion crop.
2. Development of local hybrids.
3. Development of diseases resistant germplasm for breeding programs.
4. Precision agriculture practices should be adopted to increase crop production and for judicial use of inputs.
5. Increased coordination among all the research institutions, academia and private sector working on Onion crop.

Storage

1. Drying units and cold storages should be installed at district level to mitigate post-harvest losses.

Supply Chain and Value Addition

1. Export driven varietal development
2. Support price should be fixed.
3. Value added Onion products for export markets.
4. Small farmers group entrepreneurs should be facilitated.
5. Case studies of major Onion exporting countries should be conducted.

All the participants agreed to provide their services for a mutual collaboration on Onion crop to resolve issues related to Onion value supply chain. The Vice Chancellor thanked all the participants and hoped that this fruitful discussion would bring concrete solutions for Onion value supply chain in Pakistan.

3.2 Action Matrix

Bottleneck Theme	Bottlenecks	Recommendations	Strategies	Responsibility
1. Seed production and nursery	1. Impure seed and nursery 2. Low quality seed and nursery 3. Seed and nursery	1.Genetic resource bank establishment 2.Improve and certified seed system.	1. Networking of Farmers 2. Incentives for adopting best practices and	1. Federal GOV and Provincial GOV 2. National

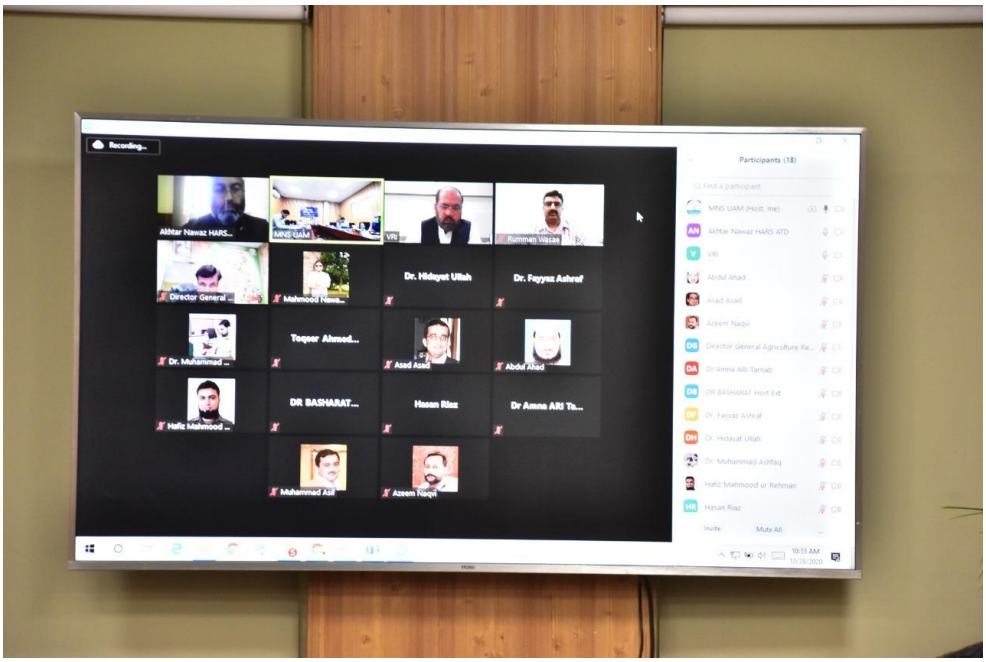
	availability 4. Infected seed and nursery 5. High cost of seed and nursery	3. Core areas for seed production 4. Hi-tech based threshers 5. Seed branding	certification regimes 3. Training stakeholders to adopt ISPMs 4. Holding competition and rewards for seed producers	Institute like National Onion Research Centre 3. Research Institutes 4. Private sector 5. Seed Producing Farmers
2.Crop production	1. Old technology 2. Thresher availability 3. Labour	1. Strengthening of research institutions 2. Development of local hybrids. 3. Development of diseases resistant germplasm 4.Precision agriculture 5.Increased coordination among all stakeholders.	1.Development and supply of latest and certified varieties to farmer networks 2. Promote Contract Farming 3. Promoting certified onion fields 4. *T*raining in nursery raising and cop management 7. Importing new machinery	1. Federal GOV and Provincial GOV 2. Research Institutes 3. Private sector 4.Crop Producing Farmers
3. Storage	1.Warehouses 2.Drying Units 3.Cold storage	1 Drying units and cold storages should be installed at district level	*1.* Instalment of new warehouses 2. Instalment of new drying units 3. Instalment of new cold storage	1. Federal GOV and Provincial GOV 2. Research Institutes 3. Private sector 4. Seed Producing Farmers
4. Value addition	1.New Products 2.Processing Units 3.Packaging	1.Value added Onion products for export markets. 2. Small farmers group entrepreneurs	1. Establishing Collection Centers 2. Instalment of new Onion Processing units 3.Promoting dried onion and its products	1. Federal & Provincial Govt 2. National Institute like National Onion Research

			4. Holding competition and rewards for processors 5. Networking of Traders 6. Branding of onion products	Centre 3. 4. Private sector 4. Seed Producing Farmers
5.Supply chain	1. Constant/Regular Supply 2. Inefficient Transport services 3. Support price	1. Export driven varietal development 2. Support price should be fixed. 3. Small farmers group entrepreneurs 4. Improved transport system	1. Providing market information 2. Sponsoring international tours 3.Holding competition and rewards for exporters	1. Federal GOV and Provincial GOV 2. Private sector 3. Seed Producing Farmers 4. Transporters 5. Exporters

3.3 List of Participants

Prof. Dr. Asif Ali, VC, MNSUAM	Dr. Muhammad Anjum Ali, DGA (Ext. & AR),Punjab
Dr. Muhammad Abdur Rauf, DGA (Research), KP	Director General, Agriculture Research, Sindh
Dr. Irfan Ahmad Baig, Dean, Faculty of Social Sciences, MNSUAM	Prof. Dr Ashfaq, Plant Pathology, Institute of Plant Protection, MNSUAM
Mr. Akhtar Nawaz, Director, Hazara agriculture research institute, KPK	Dr. Najeeb Ullah, Director Vegetable Research Institute, AARI, Faisalabad
Dr. Fayyaz Ashraf, Head, Innovation, R & D, National Food, Karachi	Dr. Abdul Ahad, AP, Department of Horticulture, PMAS-AAUR.
Dr. Muhammad Hammad Babar, Assistant Professor, IBMS, UAF	Dr.Hidayullah SSO, Horticultural research institute, NARC, Islamabd
Mr. Toqeer Ahmed, Agriculture research officer, Sindh agriculture department.	Mr. Muhammad Asif, Project Manager, CABI-Pakistan
Mr. RumanWasae, Onion Farmer	Dr. Muhammad Imran, AP, Department of SES, MNSUAM.
Dr. Nazar Fareed, Assistant Professor, Horticulture, MNSUAM	Dr. Umar Ijaz, AP, Agricultural Economics, MNSUAM
Dr. Nadeem Ahmad, AP, IPP, MNSUAM	Dr. Hasan Riaz, Assistant Professor, Plant Pathology, IPP, MNSUAM
Dr. Mirza Abid Mehmood, Lecturer, Plant Pathology, IPP, MNSUAM	

3.4 Pictures of the session


Recording...
Akhtar Nawaz HARS...
MNS UAM
VRI
Rumman Wasas
Director General ...
Mahmood Nawa...
Dr. Hidayat Ullah
Dr. Fayyaz Ashraf
Dr. Muhammad ...
Teqeer Ahmed...
Asad Asad
Abdul Ahad
Hafiz Mahmood ...
DR BASHARAT...
Hasan Riaz
Dr Amna ARI Ta...
Muhammad Asif
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Participants (18)
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MNS UAM (Host, me)
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Director General Agriculture Re...
Dr Amna ARI Tarnab
DR BASHARAT Hort Ext
Dr. Fayyaz Ashraf
Dr. Hidayat Ullah
Dr. Muhammad Ashfaq
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Hasan Riaz
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10/28/2020

Chapter 4

Chilli

Chilli is considered as one of the important cash crops. Chili is grown both in Kharif and Rabi seasons and the crop takes around 180-200 days for maturity. Over the years, Pakistan has experienced a declining area trend while production have also decreased which may be due to unfavourable chili prices in the domestic market. Pakistan is going through difficult period to compete global market for chilli export. Major hindrances are higher price compared to other exporting countries, secondly its lower quality. Chilli export of the country can be strengthened by strictly following the quality improvement laws. Although, Pakistan is among the major chilli producers and exporters viz. India, China, Morocco, Mexico and Turkey, but in the global scenario Pakistan stand at 17^{th} position out of 118 countries in chilli export in the world.

To deal with all possible bottleneck in chilli value supply chain, a Focused Group Discussion (FGD) was carried out at MNSUAM on October 28, 2020, at 14:00 to 16:00. Dr. Ashfaq initiated the discussion with a detailed background on the past trends, current situation, production, price trends and future of chillies production in the country. The discussion was shared by scientists from provincial, national and international organizations, leading management of private sector and farmers. All the stakeholders outlined major bottlenecks, recommendations and strategies for the improvement of Chilli value supply chain (Annexure-IV)

The participants discussed the issues pertaining to Chilli seed sector, production, post harvest and supply chain issues. The participants recommended certain measures to address the issue related to chilli crop value chain. All the participants agreed to provide their services for a mutual collaboration on chillies to solve issues elaborated in length earlier and for the betterment of farming community and country.

4.1 Recommendations

Seed Sector

1. Genetic resource bank should be established with proper pedigree of each chilli genotype.
2. Establishment of seed clusters to produce quality certified seeds.
3. Well equipped seed certification labs at provincial level.
4. Certification of chilli nurseries.

Crop Production

1. Development of locally developed climate resilient hybrids.
2. Specialized Chilli research institutions at provincial level.
3. Development of diseases resistant germplasm for breeding programs.
4. Precision agriculture practices should be introduced to protect nurseries and increase crop production.
5. Public-private research consortium for the market oriented research by the academia and research institutions.
6. Exploration of South Punjab window as a future chilli production area.
7. Uniform cultivation of dundicut variety zones to avoid cross pollination between varieties.
8. Explore the potential of bio-control agents against biotic and abiotic stresses in chilli.
9. Comprehensive soil survey to establish judicial fertilizer requirement of the chilli crop.
10. National level coordination is required amongst researchers.

Post-Harvest

1. Drying units should be installed at district and tehsil level to mitigate post-harvest losses to chilli crop.
2. Measures should be adopted to keep aflatoxin level below 10ppb in order to capture European markets.

Marketing

1. Export driven varietal development and production zones.
2. Small farmers group entrepreneurs should be facilitated.

All the participants agreed to provide their services for a mutual collaboration on chillies to solve issues elaborated in length earlier and for the betterment of farming community and country. Prof. Dr. Muhammad Ashfaq thanked all the participants and hoped that this fruitful discussion would bring concrete solutions for chilli production and supply chain-related issues in Pakistan.

4.2 Action Matrix

Bottleneck Theme	Bottlenecks	Recommendations	Strategies	Responsibility
Variety development &Seed Stewardship	Lack of genetic resources	Establish a centralized local and genetic resource bank	1. National Vegetable Germplasm Centre 2. Cataloguing of collected germplasm for agro-ecological zones	Plant genetic resource institute, NARC.
	Lack of quality local seed production	1. Identification of seed production zones 2. Development of farming clusters for seed production through Industrial Collaboration	1. Seed companies and farmers MoUs for seed production in identified clusters 2. Restricting chilli cultivation in seed clusters for production purpose	1. Provincial agriculture departments and seed companies
	Non availability of certified seed	1. Establishment of seed certification labs in each zone 2. Promoting Public-Private partnership and implementation of seed laws for quality seed	1. Regulations for seed companies to get seed certification from these labs 2. Incentives for technology adaptation for commercial seed production 3. Skilled human resource for seed sector	Provincial Agriculture Departments Seed companies
	Lack of certified nurseries	Certification of nurseries according to the international standards	Only certified nurseries are allowed to sell chilli seedlings	1. FSCR&D 2. Provincial agriculture departments
Crop Production	Adverse climatic conditions for chilli production in main growing areas	Development and capacity building of local hybrids program	1. Local hybrids approval at par with international hybrids 2. Area specific hybrid approval	1. PARC 2. Provincial Agriculture Departments
	Lack of R&D for	Establishment of	One research	Provincial

	special vegetables	Chilli research institutes	institution in every province	governments
	Lack of pre-breeding material against biotic and abiotic stresses	Development of resistant germplasm against major biotic and abiotic stresses (Chilli leaf curl disease, Chilli veinal mottle disease, Chilli wilting and foot rot, Heat stress)	Projects should be awarded to scientists with an outcome of resistant genotypes to be used in breeding programs. 2. The developed germplasm should be available to all scientists through genetic resource bank	PARB Agri. varsities
	High cost of production	Introduction of precision agriculture systems	Initiation of Technology transfer program funded by government and private sector partnership	Provincial Agriculture Departments
	No special purpose chilli production	1. Introduction of special purpose chilli production 2. Development of forward linkages for special purpose Chilli	B2B linkages development and backward linkages thru buying contracts for special purpose chillies	1. Ministry of Commerce 2. Provincial Agriculture Departments
	Very limited on exploration of new production windows	Exploration of new production areas previously not known to major chilli cultivation	1. Adaptation trials to recommend best cultivars in new areas. 2. The areas of other cash crops must not be compromised. 3. The new cultivation areas must be accompanied with latest production and post-harvest technologies	1. PARC 2. Provincial Agriculture Departments
	Non uniform variety cultivation	Uniform cultivation of varieties to avoid cross pollination	1. Area must be demarcated separately for seed production and general crop production. 2. Farmers should be educated to understand the cross pollination	1. Provincial Agriculture Departments

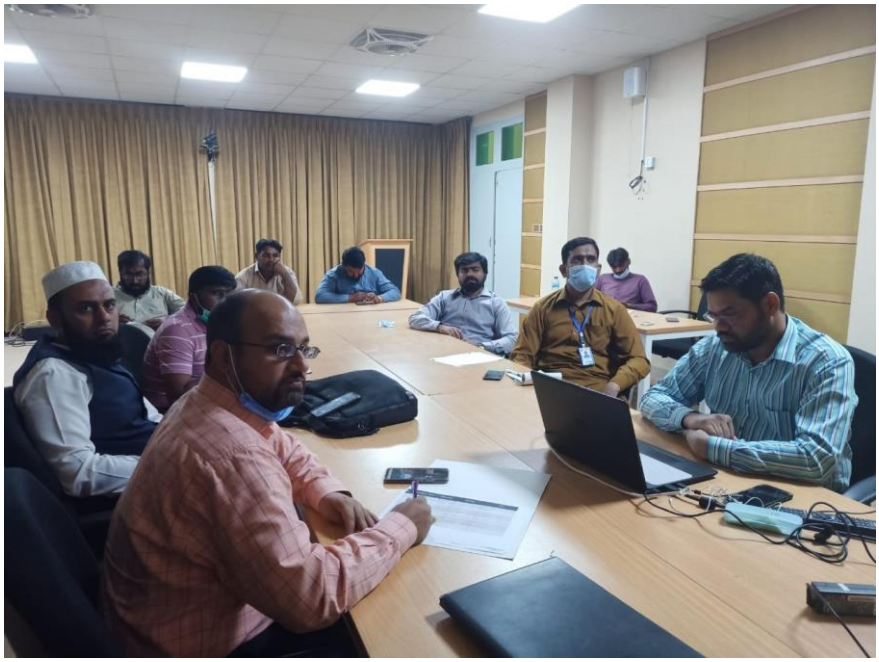
			effect on the purity of the seeds	
	Excessive use of pesticide	The use bio-control agents should be encouraged to lessen the use and effect of chemical pesticides	1. Projects should be awarded to research on bio-control agents in chilli crop preferably locally isolated bio-control agents to have maximum harmonization with the ecosystem	1. CABI-Pakistan 2. PARC 3. Provincial Agriculture Departments
High Post Harvest losses &Low value Addition	Lack of drying units	Installation of drying units at Tehsil level	1. Drying units should be install through private companies especially food processing companies. 2. Private investment should be invited by offering export incentives.	1. Ministry of Commerce 2. Provincial Agriculture Departments
	Aflatoxin production	Measures to minimize aflatoxin production to keep it below 10ppb	1. New research to minimize aflatoxin production 2. Case studies of low aflatoxin producing countries for adoption of similar practices	1. PARB 2. Agri. Varsities
	Very less value added products	Export oriented chilli value added products using special purpose chillies (dried) should be introduced by private sector	1. Indian export model of chilli value added products 2. Nationwide food processing companies for marketing of export quality value added products. 3. Incentivise import of new processing technology 4. Export incentives on new products for certain time period	1. Ministry of commerce 2. Pakistan institute of developmental economics 3. MNS University of Agriculture Multan
Marketing	No knowledge about export demand	Export oriented chilli production should be encouraged	1. Farmers should be educated to grow exportable chillies 2. MOU between exporters and farmers	1. Ministry of Commerce 2. Provincial Agriculture Departments

			to safeguard farmers and exporters interest	
	No access of small farmers to main and export markets	Small farmers should be reached to share export market	1. Small farmers entrepreneur groups should be established and linked with exporters	1. Ministry of Commerce 2. Provincial Agriculture Departments
	High marketing margins and long supply-chain	Efficiency in marketing channel by improving access to information and better infrastructure	1. B2B linkages and cluster farming of chillies 2. ICT based system for the provision of real time market demand and pricing to the farmers.	1. Ministry of Science and Technology, Isb 2. Provincial Agriculture Departments

4.3 List of Participants

Dr. Muhammad Ashfaq, Institute of Plant Protection, MNSUAM	Director General Agriculture Research Sindh Tandojam
Dr. Najeeb Ullah, Director Vegetable Research Institute, AARI, Faisalabad	Dr. Fayyaz Ashraf, Head, Innovation, R & D, National Foods, Karachi
Dr. Abdul Ahad, AP, Department of Horticulture, PMAS-UAAR.	Dr. Mubashir Mehdi, Assistant Professor, IBMS, UAF
Dr.Nausherwan Nawab, PSO, Horticultural Research Institute, NARC	Mr. Jam Mukhtar, Chilli Farmer
Mr. Hafiz Mehmood Rehman	Mr. Akhtar Nawaz, Director, Hazara Agriculture Research Institute, Abbottabad, KP
Mr. Toqeer Ahmed, Director Agriculture Ext., Sindh Agriculture Department.	Mr. Muhammad Asif, Project Manager, CABI-Pakistan
Dr. Muhammad Imran, Assistant Professor, SES, MNSUAM	Dr. Umar Ijaz, Assistant Professor, Agricultural Economics, MNSUAM
Dr. Nadeem Ahmad, Assistant Professor, Plant Pathology, IPP, MNSUAM	Dr. Hasan Riaz, Assistant Professor, Plant Pathology, IPP, MNSUAM
Dr. Muhammad Arslan Khan, Assistant Professor, Plant Pathology, IPP, MNSUAM	Dr. Mirza Abid Mehmood, Lecturer, Plant Pathology, IPP, MNSUAM
Dr. Nazar Fareed, Assistant Professor, Horticulture, MNSUAM	Dr.Haibat Ullah Asad, Research officer, CABI-Pakistan.
Mr. Muhammad Ismaeel, Agricultural Research, KP	

4.4 Pictures of the session



Chapter 5

The Way Forward

5.1 Research and Development Interventions

- Genetic resources enhancement for breeding purposes
- Varietal development
- Hybrid production under local climatic conditions
- Precision agriculture practices
- Disease forecasting systems
- Research for markets and industry

5.2 Seed Sector Interventions

- Seed production clusters for local seed production
- Improved seed distribution system
- Seed certification labs at provincial level

5.3 Farm Management Interventions

- Efficient water use and efficient nutrient management
- Facilitate new agro-technologies
- High tech machinery for plantation and harvesting
- Accessible and easy to understand information sources for farmers
- Technology transfer programs
- Research and extension linkage through industrial support

5.4 Post Harvest Interventions

- Drying units and cold storages to prevent post-harvest loss
- Aflatoxin inhibition especially in Chillies below 10ppb
- Proper packaging for longer shelf life and export

5.5 Marketing Interventions

- Marketing information systems
- Farmers groups / cooperatives for better marketing initiatives, risk aversion and entrepreneurship
- Streamlining the middlemen profit / efficient discharge of services
- Real-time data recording for production, consumption, imports and exports

5.5 Marketing Interventions

- Facilitation of policies, designing of R&D initiatives and development of cross-sectoral linkages through establishment of National Vegetable Board