

## **IMPACT OF COMPLETED PARB PROJECTS**

Sr.#	Pro#	Title of Project	Institute	Duration	Cost in Million Rs.	ACHIEVMENTS
1	24	Basic seed potato production of new varieties SH-5, FD 35-36 & FD 69-1 from in vitro propagated material & its demonstration in the farmer's fields (AARI, Faisalabad)	Plant Virology Section, AARI	(4 years) 2009-13	5.769	<ol style="list-style-type: none"> <li>1. In vitro virus free potato seed production technology was standardized and demonstrated in farmer field.</li> <li>2. 580000 Kg virus free pre-basic seed was produced</li> <li>3. 98300 kg virus free pre-basic seed was obtained from 6 locations (Faisalabad, Jhang, Toba, Gojra, ChichaWatni and Sahiwal).</li> <li>4. One variety SH-5 and two lines FD35-36 and FD69-1 were multiplied (120 t) &amp; their basic seed was provided to the progressive growers.</li> <li>5. Technology for production and propagation of pathogen free seed of potato was demonstrated to seed producers. This technology was adapted by public and pvt seed companies and they are now producing virus and disease free seed of potato for general cultivation.</li> <li>6. Seed produced in Pakistan is comparable with potato seed produced in advanced countries. In addition cost of local produced seed is much less than imported seed.</li> <li>7. Seed production is a continuous process. In coming years a huge quantity of seed will be produced locally by utilizing the seed production technology developed in</li> </ol>

						this project.
2	120	Improvement of chickpea productivity through the identification of drought tolerant and disease resistant chickpea genotypes for marginal lands	NIAB, Faisalabad	(5 years) 2010-15	37.356	<p>1) A variety NIAB-CH104 (Desi) was approved by Punjab Seed Council in its 51<sup>st</sup> meeting held on 09-08-2019 and released during August, 2019. Uptill now this variety is almost sown on 2000 acres during 2022. Economic value of this variety is approximately Rs.64 Million The yield of this variety i,e ( NIAB-CH 104) 9% higher than the check varieties at National level.</p> <p>2) Two high yielding and drought tolerant lines D-075-09 and FG0902 were evaluated in chickpea National Uniform Yield Trails during 2013-14 and 2014-15.</p>
3	143	Exploiting controlled atmosphere technology potential for extended storage and shipping of fresh produce to international markets	UAF	(3 years) 2009-12	21.159	<p>1) Controlled Atmosphere (CA) Storage involves precise control of gaseous composition (O<sub>2</sub>&amp;CO<sub>2</sub>) besides temperature and humidity.</p> <p>2) In CA storage conditions fruit exhibited minimum weight loss; better retention of fruit peel colour with more firmness, less disease development and high marketable index.</p> <p>3) Optimum atmospheric condition for mango varieties, chilies and kinnow mandarin has been determined</p> <p>4) Infrastructure Development: Two 20 feet containers; one reefer and one CA are imported from Germany</p> <p>5) <b>Economic Impact:</b> CA technology is extremely useful for export of fruits and vegetables to middle-east, northern and western countries with huge export</p>

						<p>earnings.</p> <ol style="list-style-type: none"> <li>i. The project outcomes have been widely disseminated through electronic and print media, overtime, to stakeholders in the public and private sector including growers, investors, visitors, academics, R&amp;D people, general public etc.</li> <li>ii. More than 25000 people have got information about the CA technology</li> <li>iii. As of now, two commercial CA stores have been established, one each in Sindh (Karachi) and Punjab (Bhai Pheru), having capacity of 3000 tons each.</li> <li>iv. The group having CA stores at Bhai Pheru is going to increase capacity to 6000 tons in near future.</li> <li>v. One CA-stores of 3000 ton capacity is being established in Gilgit and another CA-store of 1500 tons in progress in Faisalabad.</li> <li>vi. Investment in CA stores is going to increase in the country as more domestic and export market opportunities are arising particularly due to CPEC.</li> <li>i. For investors/operators of CA stores, the most reliable source of technical information on locally grown fruits and vegetables remains the outcome of the PARB CA- project.</li> </ol>
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						<ul style="list-style-type: none"> <li>ii. As far as exports are concerned, it is important to note that SOP developed for CA technology has been commercially used for shipping Sindhri mangoes to the supermarkets of UK/EU by the Sindh Mango Growers and Exporters group.</li> <li>iii. In Punjab, during 2021, for the first time, one container of Samar Bahisht Chaunsa mangoes (highly chilling sensitive) from Rahim Yar Khan, has been successfully shipped by sea to a Dubai, using modified atmosphere technology, with two weeks postharvest life, delivered in excellent conditions to the supermarket.</li> <li>iv. The commercial success of technology has built confidence in the grower as well as supermarkets, and export volume will grow overtime.</li> <li>v. Commercial operators of CA, have reported that appropriate postharvest handling and use of CA-technology can reduce losses in apples to as low as 5%, which in normal cold stores could be around 25-30%. This implies that with 10,000 CA stores installed capacity, an average 2500 tons would be saved. This demonstrate that the enormous benefits of CA-technology</li> </ul>
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4	161	Safeguarding Pakistani Wheat From Potential Disease Threats	WRI, AARI	(5 years) 2010-15	31.547	<p>1) One rust resistant variety MH 2021 has been approved by the Punjab Seed Council in its 54<sup>th</sup> meeting held on 28-01-2021 and released for general cultivation during 2021. Its multiplication is under process. Its certified seed will be available to farmers in coming years. This variety is a high yielding and disease resistant which will help reduce disease pressure in the province.</p> <p>2) The rust free wheat lines are used in development of rust resistant wheat varieties. Cultivation of rust free varieties will curtail the use of fungicide up to Rs. 1500- 2000 per acre and increase the yield by 5-10%.</p> <p>3) The wheat yield losses can reduce up to 5-10% by the use of resistant wheat varieties</p> <p>4) Following seed companies multiplying seed of MH-2021 during current crop year.</p> <ol style="list-style-type: none"> <li>i. Punjab seed corporation</li> <li>ii. Lalika seed company</li> <li>iii. Tezro seed company</li> <li>iv. Wared seed company</li> <li>v. Engro seeds</li> <li>vi. Green fort seeds</li> <li>vii. Rawal seeds</li> <li>viii. J.B. seed company</li> <li>ix. RCA</li> <li>x. Kanzo Ag</li> <li>xi. Jallundhar seeds</li> <li>xii. Abad agri seeds</li> <li>xiii. Arfat seeds</li> </ol>
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						<ul style="list-style-type: none"> <li>xiv. Hassan seed</li> <li>xv. Hashmi seeds</li> <li>xvi. Jubliee seeds</li> <li>xvii. Hafiz wala seeds</li> <li>xviii. Festivo</li> <li>xix. Sidhnai</li> <li>xx. Noureen Nasim seed company</li> </ul>
5	163	Sugarcane plant improvement through traditional and modern breeding technologies	Sugarcane Research Institute AARI	(6 years) 2010-16	27.836	<ol style="list-style-type: none"> <li>1. A collaborative Sugarcane breeding programme of Pakistan and Sri Lanka was initiated under the project. For this programme a systematized crossing programme was carried out. Sugarcane varieties were sent to Sri Lanka for crossing as Pakistani environment is not fit for sugarcane crossing. The resulting crossed fuzzi was brought back to Pakistan.</li> <li>2. One variety "CPSG-2525" has been approved by the Punjab Seed Council in its 55<sup>th</sup> meeting held on 20-09-2021.</li> <li>3. 1393 bi-parental crosses were carried out.</li> <li>4. 134 genotypes were exported and 113 imported from different countries.</li> <li>5. 230000 original seedlings were produced from fuzzi out of which 21000 promising seedlings were selected.</li> <li>6. Agricultural Biotechnology Research Institute also made marker assisted Sugarcane varieties and constructed</li> </ol>

						<p>homology tree of these varieties</p> <p>7. Currently during 2020-21, the promising clones selected from this project are at different stages of variety development programs are as under:</p> <ul style="list-style-type: none"> <li>i. S2016-SL-284 is under NUVYIT (National Uniform Sugarcane Varietal Yield Trials)</li> <li>ii. S2016-SL-41, S2016-SL-83, S2016-SL-127 are under Final varietal trials</li> <li>iii. S2016-SL-426 is under zonal testing</li> <li>iv. Scientists exchange programme with Srilanka was established.</li> </ul> <p>Genotyping of 185 strains of sugarcane was done based on DNA technology.</p>
6	176	Optimization And Standardization of Operational Parameters Of Hot Water Treatment (HWT) System To Control Post Harvest Diseases And Insects of Mangoes	AMRI, Multan	(5 years) 2010-14	9.103	<p>1) Hot Water Treatment plant was got fabricated from the project funds from the local market.</p> <p>2) Hot water treatment is relatively low price procedure as compared to other post harvest techniques as vapor heat and irradiation. It is quicker and easier to execute the killing of fruit fly larvae &amp; clean mango surface.</p>

						<p>3) 18 exporters have benefited from the technology for export of mangoes</p> <p>4) Following SOPs for hot water treatment of different varieties of Mango were standardized in the project:-</p>
<b>Recommended Temperature and Time for control of Fruit Fly</b>						
<b>Variety</b>		<b>Temperature (c)</b>		<b>Time (min)</b>		
Shindhri		46		60		
Choonsa		46		60		
Fajri		48		60		
White choonsa		48		60		
<b>Recommended Temperature, Time and Fungicide for Disease (Anthracnose Control)</b>						
<b>Variety</b>	<b>Disease</b>	<b>Fungicide</b>	<b>Temp (c)</b>	<b>Time (Min)</b>	<b>Control (%)</b>	
Shindhri	Anthracnose	Kabrutop	52	6	97.93	
Choonsa	Anthracnose	Kabrutop	54	6	98.29	
Fajri	Anthracnose	Kabrutop	52	3	94.13	
Whit	Anth	Kabe	52	6	74.0	

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<b><u>Recommended Temperature, Time and Fungicide for Disease (Stem end Rot) Control</u></b>											
						<b>Variety</b>	<b>Disease</b>	<b>Fungicide</b>	<b>Temp (c)</b>	<b>Time (Min)</b>	<b>Control (%)</b>
						<i>Shindhri</i>	Stem end rot	Kabrutop	54	6	97.66
						<i>Choonsa</i>	Stem end rot	Kabrutop	54	6	98.62
						<i>Fajri</i>	Stem end rot	Kabrutop	52	3	96.00
						<i>White Choonsa</i>	Stem end rot	Kabrutop	54	6	80.50
7	921	Advanced agriculture training programme in UK for up-skilling Punjab Agri Extension staf (ATP-UK)	Agri Extension Punjab	2017(1 year)	22.482	Sixty four experts/officers of the Agriculture Extension wing of Agriculture department were sent in 3 batches at NIAB Cambridge UK for training in following disciplines:- advanced technologies related to soil management precision farming, weed and disease management use of latest machinery for various farm operations, modern horticulture practices, plant nutrition management and field visits of agriculture farms.					

						After return from the training, the trainees have transferred their knowledge to the farmers through farmer days and regular training programs.
8	926	Evaluation of Efficacy of PB ropes in different ecological zones of Punjab	PW&QC Agri Deptt.	(6 Months) 2017	0.500	<ol style="list-style-type: none"> <li>1) Field trials were conducted to find out the efficacy of PB Ropes to control Pink bollworm attack on different cotton varieties in different cotton areas of Vehari, Burewala, Mailsi, Jampur, Rajanpur, Rojhan, and Mianwali on the block of 50 acre in each location.</li> <li>2) PB Ropes reduced Pink Bollworm attack up to 77% in first 90 days (July- Oct) of the installation</li> <li>3) PB Rope can play a role in PBW management as part of IPM Seeing the results of PB Ropes to control pink boll worm, Private sector is trying to import PB Ropes but due to some regulatory issues no import has yet been matured till 2021.</li> </ol>
9	600	Development of short duration sunflower hybrids with better yield	ORI, AARI	2015-20 (5 years)	31.767	<ol style="list-style-type: none"> <li>1. Two hybrids namely FH-648 and FH-675 have been developed and approved by Punjab Seed council (PSC) in the year 2021 for general cultivation in Punjab</li> <li>2. Both the hybrids have also been recommended by VEC and registered by FSC&amp;RD for general cultivation in Pakistan.</li> <li>3. Demonstration trials have been conducted at farmers' field in the last two years of the project (2019 and 2020)</li> <li>4. In 2021 and 2022, Demonstration trials for A and R lines have conducted at farms of following four companies for the</li> </ol>

						<p>production of hybrid seed for auction purpose:</p> <ol style="list-style-type: none"> <li>Kenzo</li> <li>Sun crop</li> <li>Certus</li> <li>Tara group</li> </ol> <p>5. During 2020-2, 6980 ton sunflower seed was imported in Pakistan worth Rs. 11.9 million (Pakistan Bureau of Statistics 2020-2021). It is expected that in the coming years hybrid sunflower seed will be produced in Pakistan and a handsome amount of foreign exchange spent on the import of sunflower hybrid seed will be saved.</p> <p>Local sunflower hybrids mature 20-25 days earlier and heat resistant than the imported ones. Approximately 88% area under sunflower crop is in cotton growing area, therefore because of short duration local hybrids cotton crop can be sown well in time in future.</p>
10	51	Standardization and Popularization of Direct Seeding to Increase Rice Productivity & Resource Conservation	RRI, AARI	(4 years) 2009-13	13.908	<ol style="list-style-type: none"> <li>Direct seeding of rice (DSR) has been identified as an alternate option to cope with the problems of water and labour shortage associated with conventional flooded rice.</li> <li>Average increase in paddy yield of DSR technology over traditional transplanting methods was 13% and 12% in case of coarse and fine rice varieties, respectively</li> <li>DSR technology was demonstrated on 2170 acres at farmers' field.</li> <li>For sowing the DSR crop 115 DSR drills were manufactured by private sector and</li> </ol>

						<p>sold to farmers</p> <p>5. Total area under DSR was reached to 1,00,000 acres in 2017-2018 but later declined to 50,000 acres because of non availability of proper herbicide for a noxious weed that is <i>Leptochloa chinensis</i> (Ghorra Grass).</p> <p>Attempts are being made to pursue the private pesticide sector to import the proper herbicides that are being used in other countries (India, Philippines, Indonesia, etc) for the control of this weed for successful cultivation of DSR crop.</p>
11	49	Control of bacterial leaf blight (BLB) in rice through management and resistant varieties	RRI, AARI	(5 years) 2009-14	74.474	<ol style="list-style-type: none"> <li>1. Bacterial leaf blight (BLB) is an important disease of rice in Pakistan, effecting yield significantly.</li> <li>2. Six bacterial leaf blight (BLB) resistant uniform lines having cooking quality better than Super Basmati have been developed.</li> <li>3. All the morphological traits of Super Basmati have been recovered in these lines, in addition plant height was reduced.</li> <li>4. Fourteen lines were also selected from F5 generation having combination of genes and resistant behaviour against BLB.</li> <li>5. One BLB resistant variety i.e. Suer Gold have been approved in 2019.</li> <li>6. Area under this variety is approximately 1 % in 2021.</li> </ol> <p>Demand for purchasing the seed is being increased by every year, therefore area will be increased in future.</p>
12	50	Developing Parboiling	RRI, AARI	(3 years)	9.854	<ol style="list-style-type: none"> <li>1. A protocol for improved parboiling</li> </ol>

		Technology and Rice Varieties Suitable for Parboiling		2009-12		<p>technology was developed</p> <ol style="list-style-type: none"> <li>2. Three extra long grain rice varieties (PS-2/PK-1121 aromatic, Kissan Basmati. PK 2021 aeromatic) were developed and approved from the material/lines developed under this project for parboiling.</li> <li>3. Gradually area have been increased and area under these varieties are 39% of the total area in Punjab in 2021.</li> <li>4. Disseminated new parboiling technology among rice parboiling industry stake holders especially in southern Punjab.</li> <li>5. About 1000 rice parboiling units/mills are working in Punjab.</li> </ol> <p>Out of 4 million tons of Basmati export, 72,000 tons of Basmati catagory Parboiled rice was exported during 2020-21. In 2021-22 it is expected that 85,000 tons of parboiled rice will be produced.</p>
13	179	Clonal propagation of guava through softwood cutting	UAF	2010-17 (5 years)	11.707	<ol style="list-style-type: none"> <li>1. Guava is being propagated through seed in Pakistan. plants cutting propagation method is recommended for true to type nursery plants.</li> <li>2. Various guava accessions were collected by survey of 7 guava producing districts to find out potential cultivars.</li> <li>3. Progeny orchard of guava was established at UAF, and Shrkpur Sharif. Methodology for true to type nursery raising through soft cutting was formulated. planting cutting during Oct-Nov. gave the highest rooting of cutting, treatment of cutting with Indole Butyric Acid was recommended, the best</li> </ol>

						temperature was 25-30C with 70% R. H. spray of fungicide on weekly basis was recommended. Silt + sugarcane compost (50% each) found best as rooting media.
14	227	Development of vaccine for the control of buffalo and cattle calf diarrhea	UVAS	(3 years) 2011-14	14.130	<ol style="list-style-type: none"> <li>1. The pathogens responsible for causing calf diarrhea were successfully isolated, adopted on cell culture for the preparation of vaccine.</li> <li>2. The vaccine prepared by QOL, UVAS was successfully administered on 100 Dams and calves at LPRI.</li> <li>3. Efficacy testing of vaccine showed sufficient immunity level for calves to remain safe from pathogens causing diarrhea.</li> <li>4. More than 50,000 doses of vaccine had been produced successfully.</li> </ol>
15	320	Preparation and field evaluation of thermostable Newcastle disease vaccine	UAF	(3 years) 2011-14	13.819	<ol style="list-style-type: none"> <li>1. Indigenous Newcastle disease vaccine was produced through cell culture that can bear upto 26 °C compared to imported vaccine (8 °C).</li> <li>2. Thermostable Newcastle disease vaccine (Thermo-Vac) commercially prepared by Veterinary Research Institute, Lahore.</li> <li>3. Now Thermo-vac Newcastle disease vaccine is available in VRI for poultry farmers at free of cost. 0.6 Million doses administered in the field through Veterinary Research Institute, Lahore.</li> </ol>
16	469	Nutritional enhancement of agricultural wastes and its use in animal feeding”	Livestock Production Research Institute, Okara	(2 years) 2015-17	17.278	<ol style="list-style-type: none"> <li>1. Nutritional value of corn stover was improved through ensiling by using different feed additives like molasses, Urea and lime.</li> <li>2. The silage produced from corn stover</li> </ol>

						<p>fodder is not much different the silage of maize hybrid in palatability, digestibility, weight gain and milk production.</p> <p>3. Value addition of rice husk was increased from 4% to 12% through urea treatment. In urea treated rice husk crude protein and it was use in animal feed formulation at different proportion. %</p> <p>4. Both agricultural waste was used in animal feeding after their value addition in lactating and growing buffalo &amp; cattle, proved economically efficient without any harmful effect.</p> <p>Through Seminars at LPRI, Bahadurnagar, Okara &gt; 150 stakeholders from L&amp;DD department professional academia, feed mills, farmers and breeders participated. All were convinced and agreed to adopt the entire research at their own level to cover the scarcity period of fodder.</p>
17	633	Prevalence and degradation of pesticide residue in feed and milk	UVAS	2018-2021 (2 years)	7.28	<p>1. Pesticide residue was analyzed from 400 feed/fodder, 400 milk samples and 100 animals blood samples collected from different districts of four divisions ( Faisalabad, Gujranwala, Multan and Bahawalpur).</p> <p>2. The residue effect of 8 pesticides (Carbofuran, Clodinofof, Fipronil, Lufenuron, Acetamiprid, Imidacloprid, Bromoxynil and Lambda Cyhalothrin) were detected greater than the MRLs level in 131 milk samples &amp; 243 feed / fodder samples.</p> <p>3. Developed and validated the HPLC</p>

						<p>methods for determination of above mentioned eight (8) pesticide residues in feed/fodder and milk.</p> <p>4. For the removal or degradation of pesticides in milk (<i>In-vitro</i> and <i>In-vivo</i>), different techniques have been developed and optimized using different chemicals, nanoparticles, enzymes and biochars. Project outcomes commercialized by presenting the technical findings at online webinar, workshops/seminar and meetings with concerned industrial sectors and regulatory authorities.</p>
18	27	Introgression of cotton leaf curl virus resistance genes from <i>Gossypium Arboretum</i> (Desi Cotton) into <i>Gossypium hirsutum</i> (Upland Cotton) (Cotton Research Station, Multan)	CRI, AARI	(6 years) 2009-15	12.724	<ol style="list-style-type: none"> <li>1. Technology was developed and finalized for interspecific hybridization in cotton. CLCV tolerance genes from Desi cotton to upland cotton were introduced.</li> <li>2. Cotton leaf curl virus tolerant varieties MNH 1050 was developed by crossing of Desi cotton with upland cotton, which was approved by Punjab Seed Council in its 55<sup>th</sup> meeting held on 20.09.2021. the seed of this variety of produced by seed producing companies for general.</li> <li>3. Cotton Cyto-genetics laboratory was established</li> <li>4. Foreign scientists invited/visited Pakistan in under this PARB project 1 (Dr. James McD Stewart, a scientist at University of Arkansas, USA ) visited Cotton Research Station Multan from 14-9-2009 to 20-9-2009 and imparted training to scientists on hybridization methods using ovule culture for transfer of CLCuV resistance genes from <i>G. arboreum</i> to <i>G. hirsutum</i>,</li> </ol>

						<p>colchicine application methods for doubling chromosome number and study of chromosomes. He also identified the germplasm with potential to obtain the project's objectives.</p> <p>5. cotton germplasm comprising of 250 different entries was imported from University of Arkansas and Texas, USA. This germplasm is being used for crossing purposed to developed new improved varieties of cotton.</p>
19	890	Training of Agriculture Extension Wing, Federal seed certification & Registration department and private sector personel in detection, identification and quantification of BT cotton	ABRI, AARI	2017-18	11.000	<ol style="list-style-type: none"> <li>1. Through the project awareness developed among regulatory bodies ( Agri. Ext. and FSC&amp;RD), farming community and seed producers regarding the importance of pure Bt seed for getting better production.</li> <li>2. To maintain the purity &amp; quality of cotton capacity development of technical staff of Agri. Ext. and FSC&amp;RD and private sector has been done for the production of certified seed of Bt. Cotton.</li> <li>3. More than 300 experts from Public &amp; private sector were trained in Bt cotton identification, detection, and quantification through PCR and ELISA.</li> <li>4. 10000 samples were analysed at farmer fields in cotton zone of Punjab for 03 genes ( Cry1Ac, Cry2Ab and RR)</li> <li>5. All the experts were trained in detection of Bt through qualitative DNA analysis method utilizing primers specific for two Bt genes like Cry1Ac, Cry2Ab, and one herbicided gtolerant gene i.e RP gene. A comprehensive Training Manual has been prepared for all stakeholders to assess</li> </ol>

						biotech crops through these tests.
20	955	Production and dissemination of heat tolerant rural chicken for egg and meat production	UAF	2018-20 (2 years)	5.784	<ol style="list-style-type: none"> <li>1. Poverty can be reduced through sustainability and self sufficiency of rural community in eggs and meat yield.</li> <li>2. Meat type rural poultry birds having higher growth rate as compared to local breeds were produced for local community food security as cheap organic protein source.</li> <li>3. 600 meat type unigold chicken were produced at nucleus and field level.</li> <li>4. 580 adult unigold birds were available for multiplication.</li> <li>5. 300 unigold meat type chicks from cross 2 were distributed to 30 registered farmers as per PC-I.</li> </ol>
21	190	Development of Tomato Hybrids Suitable For Sowing In Tunnels And Open Fields of Punjab	VRI, AARI	(7 years) 2010-17	22.486	<ol style="list-style-type: none"> <li>1. Approval of an indeterminate tomato hybrid <b>Saandal F<sub>1</sub></b> suitable for high tunnels during 2013.</li> <li>2. Approval of an indeterminate tomato hybrid <b>Sundar Hybrid</b> suitable for high tunnels during 2016.</li> <li>3. Approval of a determinate tomato hybrid <b>Ahmar Hybrid</b> suitable for low tunnels and open fields during 2016.</li> <li>4. Approval of an indeterminate tomato hybrid <b>Surkhail F<sub>1</sub></b> suitable for high tunnels during 2017.</li> <li>5. Auction of <b>Saandal F<sub>1</sub></b> for hybrid seed production and marketing rights through Public Private Partnership to Kanzo Quality Seeds, Multan in 2020.</li> </ol>

						<p>6. 6 kg hybrid seed production (sufficient for 120 Acres) of <b>Saandal F<sub>1</sub></b> during 2021 and 12 Kg in 2022 by Kanzo Quality Seeds, Multan and this is the 1<sup>st</sup> ever indigenous tomato hybrid seed production in Pakistan.</p> <p>7. The process for the hybrid seed production of <b>Saandal F<sub>1</sub></b> during the current year (2022) is in progress.</p> <p>8. Sale price of locally developed hybrid seed of Saandal F<sub>1</sub> marketed by Kanzo Quality Seeds, Multan is Rs. 860 per gm while sale price of imported hybrid seed of Sahel F<sub>1</sub> marketed by Syngenta International is Rs. 1300 per gm.</p> <p>9. Reduction in import bill incurred on tomato seed.</p> <p>10. Employment generation opportunities due to the commercial seed production of tomato hybrids in Pakistan.</p>
22	892	Import of Olive Oil Extruction Plant	BARI, AARI	(1 year) 2017-18	39.380	<p>1. First modern commercial olive oil extruction plant was imported in Pakistan with oil analysis facility.</p> <p>2. Availability of quality extraction services motivated farmers for olive plantation.</p> <p>3. The initiative created a pull in the olive plantation drive because utility of olive fruit was visible to olive farmers.</p> <p>4. 500 farmers brought 253 tons olive fruit and produced 30 Tons olive oil for local market up to 2021, this activity will remain continue for the next years and</p>

						<p>thousands of farmers will get benefit.</p> <ol style="list-style-type: none"> <li>5. The premium quality olive oil is being marketed by a number of farmer entrepreneurs @Rs. 2500 to 3500/litre because of its premium quality.</li> <li>6. Provision of extraction services encouraged farmers to plant olives on 6514 acres of marginal land up to 2021.</li> <li>7. State of the art unit is producing quality olive oil with better recovery (Av.12%).</li> <li>8. The success of this project encouraged Federal Government to plant 05 new commercial cold press extraction unit (600kg/h) and 10 medium capacity (100-200 kg/h) plants in the country.</li> </ol>
23	141	Documenting and mitigating the impact of pesticides and heavy metals residues on vegetables	UAF	(3 years) 2010-13	19.500	<ol style="list-style-type: none"> <li>1. The pesticide residues (PR) of deltamethrin, permethrin, cypermethrin, profenofos, triazophos, chloropyriphos, bifenthrin and endosulfan, were commonly found in vegetables.</li> <li>2. Heavy metals nickel, lead, zinc, copper, arsenic and mercury were also usually found in spinach, cauliflower, okra and brinjal, primarily from sewage water</li> <li>3. Wastewater was the single largest contributor of heavy metals accumulation in vegetables.</li> </ol> <p><b>Suggestion:</b></p> <ol style="list-style-type: none"> <li>1. The washing of vegetables with tap water and household chemical solutions not only remove the dirt and dust particles but also reduce the residues of pesticides significantly</li> <li>2. The pesticide residues were significantly reduced more as compared to heavy</li> </ol>

						<p>metals when vegetables were subjected to different washing treatments.</p> <p>3. All the washing chemicals showed significant reduction of pesticide in spinach, cauliflower, okra and brinjal. Among all washing treatments the acetic acid exhibited the maximum reduction of pesticide residues in all vegetables.</p>
24	185	Standardization of Olive Propagation and its value addition techniques	BARI, AARI	(4 years) 2010-14	21.974	<ol style="list-style-type: none"> <li>1. Establishment of 5 olive nurseries in private sector 65000 olive plants were prepared.</li> <li>2. Establishment of more than 60 olive orchards in Pothwar area by provision of 9452 true to type and disease-free olive plants.</li> <li>3. Capacity building of 530 farmers through professional trainings, farmer's days and workshops.</li> <li>4. Trained 200 farmers for olive value addition and the development of olive cottage industry.</li> <li>5. Facilitated more than 50 farmers for free olive oil extraction.</li> <li>6. Strengthened olive GPU at BARI, Chakwal by addition of 15 new exotic high temperature and drought tolerant cultivars above the targets.</li> <li>7. Developed protocols for the propagation of olive through cutting techniques by using of local media and resources.</li> <li>8. Conducted Genetic analysis of 7 olive varieties through DNA finger printing technique.</li> <li>9. An extensive survey regarding existing olive plantation in ten districts of Punjab</li> </ol>

						<p>was conducted for future selection and evaluation of Germplasm</p> <p>10. Strengthening of the institute in terms of Skill enhancement, olive related Machinery &amp; Equipment.</p> <p>11. Establishment of Olive cottage industry by value addition of olive in Pothwar.</p> <p>12. Pilot testing of olive plantation in Pothwar that enabled farmers to convert marginal lands into productive olive groves through identification of varieties suitable for Pothwar</p> <p>13. Production of 65000 olive plants by private sector saved about Rs. 19.5 million foreign exchange.</p> <p>14. Propagation techniques paved way for local production of olive nursery plants.</p> <p>15. Trained manpower availability ensured for further up-scaling</p>
25	924	Acquisition of Advance Technologies for Cotton Production and Characterization of Cotton Germplasm and Acquisition of Advance Technologies for Rearing of Beneficial Insects for Biological Control of Cotton Insect Pests in Pakistan	CRI, AARI	(6 Months) 2017	1.170	<p>1. Mass Rearing Technology of Parasitoids of Cotton was developed.</p> <p>2. <i>Bracon habitor</i> is being reared at AARI lab. For the control of Bollworm of Cotton</p>
26	908	DNA barcoding/ fingerprinting for identification of Cotton, Wheat, Maize, Potato, Tomato and Date Palm varieties	ABRI, AARI	(1 year) 2018-19	22.77	<p>1. Successfully developed varietal identification key based on DNA fingerprints among 24 genotypes of cotton, 08 of maize, 13 date palm, 15 of wheat, 13 of tomato and 12 genotypes of Potato using 300, 215, 210, 233, 212 and 217 SSR markers respectively.</p>

						<p>2. The technology developed for finger printing is being used for the registration of plant varieties and approval of varieties under Seed Act and PBR Act.</p> <p>3. Now the identification of varieties at molecular level is available in Pakistan as the outcome of this project. This will help local and foreign investment in seed sector.</p>
27	563	Development of Drought Tolerant doubled haploid maize hybrid for Plant Breeding & Genetics	UAF	(5 years) 2015-20	29.137	<p>Double haploid production technology in maize was developed.</p> <p>Twenty drought tolerant DH maize lines were produced and 45 single crosses were evaluated for drought tolerance.</p>
28	342	Exploration Of Rice Bran Oil Production	RRI, AARI	(3 years) 2010-13	12.334	<p>Improved Rice Bran Oil (RBO) technology for stabilizing rice brain, its extraction and refining has been developed.</p> <p>Dissemination of RBO technology was successfully done in different areas of Punjab and give especially to all stake holders of rice and oil related industry.</p> <p>FFA's analysis of raw and parboiled RBO was carried out for refined as well as crude oil. Data has been prepared regarding FF'A analysis for raw and parboiled RBO.</p>
29	288	Development of Sorghum-Sudan Grass Hybrids for Better Forage Yield and Quality under normal and Drought Stress	UAF	(5 years) 2015-20	27.288	<p>Sorghum-Sudan grass hybrid was developed for better yield and quality of fodder</p>
30	532	Development of short duration, high yielding and disease resistant mungbean cultivars for Rice-Wheat Cropping system	PRI, AARI	(5 years) 2015-20	30.440	<p>Moong varieties and production technology were developed which can be grown in Rice-Wheat system during interval of wheat harvesting and rice transplanting.</p>

31	13	Integrated pest management (IPM) of aphids on wheat crop	Centre for Applied Biosciences International (CABI)	(4 years) 2009-13	44.534	<ol style="list-style-type: none"> <li>1. 464 wheat varieties/lines were screened for aphid tolerance</li> <li>2. Incorporation of aphid resistance to elite wheat lines.</li> <li>3. IPM package for aphid management in wheat was developed</li> <li>4. Best Agricultural practices for aphid management were demonstrated on farmers fields in 5 districts of Punjab for 2 years.</li> </ol>
32	34	Development of nutrient efficient wheat germplasm for food scrutiny in rainfed areas of Pakistan	BARI, AARI	(3 years) 2009-12	14.447	<ol style="list-style-type: none"> <li>1. 153 genotypes of wheat were evaluated for drought tolerance, nutrient use efficiency and high yielding at BARI Chakwal.</li> <li>2. One nutrient efficient genotype i.e., DH-31 is under final stage of testing</li> <li>3. Lab was established and necessary machinery was procured.</li> </ol>
33	40	Development of Drought Tolerant Variety Of Cotton	CRI, AARI	(5 years) 2010-15	17.472	<ol style="list-style-type: none"> <li>1. One drought tolerant variety FH-326 has been developed and approved for general cultivation.</li> <li>2. One lab having capabilities of DNA extraction, PCR amplification and QTL mapping was established under this project</li> </ol>
34	213	Development and dissemination of production technology of Sugar leaf (Stevia rebaudiana).	ARI, AARI	(6 years) 2010-16	14.300	<ol style="list-style-type: none"> <li>1. Stevia variety "Honey Stevia" was developed for Punjab</li> <li>2. Production and processing technology was developed.</li> <li>3. Out of the 10 Distts of Punjab, Rawaplindi, Chakwal, Sialkoot and Kasur were found best for Stevia cultivation.</li> <li>4. Seed production technology was developed.</li> </ol>
35	215	Development and	CEMB,	(6 years)	21.251	<ol style="list-style-type: none"> <li>1. CEMB-Bt (Cry1Ac+Cry2A) and CEMB-</li> </ol>

		Commercialization of Cotton Leaf Curl Virus resistant/tolerant indigenous transgenic Bt and Glyphosate resistant Cotton hybrids	PU Lahore	2011-17		GTGene were transformed in selected 4 best cotton inbred lines provided by CRS, Multan and Four Brothers, Multan. 2. Transgenic seeds of all inbred lines have been handed over to CRS, Multan and Four Brothers, Multan for generation advancement and selection of best event.
36	263	Development of egg laying chicken lines for backyard poultry production	UVAS	(5 years) 2011-16	20.302	1. The final product have double egg number (180 eggs/year) and better egg size (50 gm) as compared to their competitors under village level extensive production system. 2. The technology has been disseminated to poor families at village level.
37	951	Improvement of berseem clover ( <i>Trifolium alexandrinum</i> ) seed quality by managing fungal seed infections and infestations with a special emphasis on stem and crown rot	UAF	(2 years) 2018-20	5.304	Control of Fungel disease of stem and crown rot in Barseem fodder was identified.
38	959	Rapid development of high yielding drought tolerant line of wheat through introgression of stable QTLs/Genes based on novel 90K Iselect snp ASSAY AND Circular Consensus Sequencing (CCS)	UAF	(2 years) 2017-19	5.992	Combined high yield and drought tolerance through introgression of stable QTLs in 40 lines.
39	212	Improvement of lentil germplasm for high seed yield and disease resistance	NIAB Faisalabad	(5 years) 2011-16	15.119	In Lentil fifteen resistant lines for Fusarium wilt, 26 lines for Collar rot, 6 lines for Rust and 9 lines for Botrytis Grey mould were identified
40	902	Diagnostic Survey of Plant Defense controllers (Beneficials) in District Sahiwal	PW&QC Agri Deptt.	(6 months) 2017	0.500	Diagnostic survey of pesticide resistant strains of beneficial insects and their habitat in Sahiwal Distt was carried out.
41	901	Survey/Monitoring of Wheat	PW&QC	(6 months)	0.500	Survey of various diseases of wheat plant and

		Blast Disease in Punjab Pakistan	Agri Deptt.	2017		post harvest samples in cotton and rice zone of Punjab was carried out.
42	379	Development Guidelines For Improving Water Use Efficiency And Testing of Locally Developed Water Soluble Fertilizers Under Drip Irrigation System For Various Crops	PMAS-Arid Rawalpindi	(3 years) 2014-17	32.596	Developed technology for water Use Efficiency and testing of locally developed water soluble fertilizer for tomato, cucumber, maize and citrus.
43	28	Insecticidal Bioactivity of Essential Oils of Local Medicinal Plants Against Insect Pests of Stored Wheat	UAF	(4 years) 2009-13	4.804	<ol style="list-style-type: none"> <li>1. Stored grain pest control by local medicinal plants was identified.</li> <li>2. Among 50 species tested, plant extracts of <i>Colocynthus citrulus</i> (Tumma) is the most effective, followed by <i>Azadirachta indica</i> (Neem), <i>Datoora anoxia</i> (Datoora), <i>Nicotiana tobaccum</i> (Tobacco) and <i>Euclayptus globulous</i> (Safaida) for control of stored grain pests.</li> <li>3. The stored grain pest control was more effective when the plants extracts/oils applied in combination with phosphine.</li> <li>4. Two labs with necessary equipment were developed.</li> </ol>
44	101	Development Of Transgenic Sugarcane ( <i>Saccharum Officinarum</i> L.) Against Major Abiotic Stresses	NIBGE, Faisalabad	(8 years) 2009-17	19.587	<ol style="list-style-type: none"> <li>1. GMO versions (8) of Four sugarcane varieties (CP-246, HSF-240, SPF-213, and SPF-234) tolerant to salt, drought &amp; frost have been developed.</li> <li>2. GMO versions are under bio-safety evaluation.</li> </ol>
45	139	Biological management of root knot nematodes on vegetables in Punjab	UAF	(4 years) 2009-13	13.03	<ol style="list-style-type: none"> <li>1. The biological agent (<i>Pasteuria penetrans</i>) applied in vegetable fields reduced root knot nematodes disease caused by nematodes and increased crop yield in chilies, tomato, okra and cucumber.</li> <li>2. The <i>Pasteuria</i> increased crop yield by</li> </ol>

						<p>16.38% in tomatoes 15.49 % in cucumber, 18.57% in okra, and 17.25% in chillies, in treated plots as compared to control plots in farmer's field trials.</p> <p>3. The patency of <i>Pasteuria</i> root powder from IPO Pakistan and its commercialization with private firm is in progress.</p>
46	150	Characterization of Native and Potential Mango Varieties in Relation to <i>Ceratocystis</i> Mangineceans and Other Economic Traits	UAF	(4 years) 2010-14	24.999	<p>1. 9 new mango accessions have been identified.(KHW-251, MLT-658, MLT-248, MLT-239, MLT-240, RYK-644, RYK-426,KHW-250 and MLT-369)</p> <p>2. Resistance Specific SSR markers have been initially screened for <i>ceratocystis</i> tolerant genotypes</p> <p>3. One international workshop at UA, Faisalabad; two mango shows at AJK and Islamabad were organized.</p>
47	152	Development, Optimization And Technology Dissemination Of Indigenous Based Skin Coating Material (SCM) For Fruits And Vegetables	PHRI, AARI	(4 years) 2010-14	11.571	<p>1. Skin Coating Material (SCM) for fruits and vegetable has been developed locally and tested on industrial scale successfully.</p> <p>2. The new SCM is low cost and it can save US\$ 01 million annually .</p> <p>3. The new SCM is easily suited to existing application system of citrus industry of the country.</p>
48	165	Evaluation of phosphoric Acid (52% P <sub>2</sub> O <sub>5</sub> ) as an alternative to commercial phosphate fertilizers and enhancing its efficiency for higher crop productivity	NIAB, Faisalabad	(5 years) 2010-15	16.85	<p>1. Green house and field studies in Punjab proved that phosphoric acid is an effective and cheaper alternative to commercial P fertilizer and can be used for wheat, rice and maize production.</p> <p>2. The placement of P through developed wheat drill or maize planter has immense positive effect on P use efficiency</p> <p>3. Application of phosphoric acid by</p>

						fertigation is also recommended. 4. No adverse effect on soil properties indicated sustainability of phosphoric acid used for crop production.
49	188	Development Of Wheat With Low Phytate For Increasing Bioavailability Of Iron And Zinc	FC College Lahore	(5 years) 2010-15	27.288	1. The total bioavailable iron level in endosperm of transgenic wheat lines increased up to 38 % as compared to non-transgenic wheat. (FSD-2008 and Sahar-2006) 2. In vitro bioavailability assay for iron and zinc in dough and chapatti of transgenic lines revealed a significant increase in iron and zinc contents. 3. The transgenic material is under mandatory testing.
50	235	Development & commercialization of indigenous Bt and herbicide	CEMB, PU Lahore	(7 years) 2010-17	18.257	CEMB-Bt and GTGene were transformed in selected parental lines of 5 best maize hybrids and handed over to Agri Farm Services for generation advancement and selection of best event.
51	933	Genetic engineering for enhancing salinity tolerance in wheat	UAF	(2 years) 2018-20	1.008	Wheat lines for salinity tolerance were produced
52	966	Composite flour technology; A step towards managing malnutrition and food security in Pakistan	UAF	(2 years) 2018-20	6.178	1. Malnutrition and food security (58% population of Pakistan) aspects were addressed. 2. Sixty seven combinations of composite flours were evaluated for sensory, nutritional profile, phenolics, antioxidant activity and anti nutritional content. There financial aspects were also calculated. 3. Wheat, sorghum, millet, quinoa and sorghum flour blend was identified as best source of nutrition.
53	12	Utilizing Bacterial ACC-	UAF	(5 years)	20.275	1. Two bacterial highly nutrient efficient

		Deaminase Biotechnology to Enhance Water Use Efficiency for Sustainable Production of Cereals		2010-15		strains (R11 and RW2) have been identified. 2. Impact of both bacterial strains is an increase in biomass and grain yield 10-25% of wheat and rice crop. 3. Both bacterial strains have been commercialized through UAF in collaboration with Jaffer brothers (pvt.) Ltd. Pakistan
54	103	Wheat Crop Improvement For Drought Tolerance Through Biotechnology	NIAB Faisalabad	(6 years) 2010-16	12.808	1. The drought tolerant lines having genes DREB1A, AVP1, HVA1 and HVPID are under evaluation in various stages at Wheat Research Institute, Faisalabad. 2. 20 Kg seed of each GMO drought tolerant line was produced
55	127	Novel Approach To Generate Wide Spectrum Virus Resistance to all 3 Begomoviruses Infecting Cotton And Other Cultivated Crops	SBS, Punjab University Lahore	(6 years) 2009-15	32.073	Transformed CLCV tolerant genes provided by IAGS, PU, Lahore against Begomovirus in selected cotton cultivars and handed over to IAGS Univ. of the Punjab Lahore and CRI, Faisalabad for field testing.
56	193	Genetic Improvement of Sugarcane for Herbicide and Borer Resistance	CEMB, PU Lahore	(7 years) 2010-17	22.35	1. CEMB- GTGene transformed in selected four best sugar cane varieties and CEMB double Bt genes in one variety of sugarcane. 2. Transgenic sugarcane of 4 varieties were handed over to SRI Faisalabad with Good BT and GTG Expression. 3. First year contained trials were encouraging, however, Director SRI has reported that during 2016 trials at SRI low expression of genes in transgenic lines have been noted. We have collected eight samples from SRI and ELISA was performed. It was found that two lines

						have shown good Bt and GTGene expression.
57	207	Economics of Livestock Production and its marketing in Punjab	LPRI, Bahadurnagar	(1 year) 2011-12	2.950	<ol style="list-style-type: none"> <li>1. Major constraint in livestock production was the negative or inconsequential rate of return on its investment</li> <li>2. Feeding and management constraints can be overcome through training &amp; awareness to farmers by extension agents.</li> <li>3. The marketing constraints can be addressed that certain amount received through the auction of livestock markets should be spent on the development of livestock markets.</li> </ol>
58	240	Development of meat type japanese quail ( <i>Coturnix Coturnix japonica</i> ) with higher body weight acclimatized to indigenous managerial conditions through 6 generations of selective breeding programme	UVAS	(4 years) 2011-15	14.444	<ol style="list-style-type: none"> <li>1. Quail weigh was increased in all 6 generations of selective breeding program in 1<sup>st</sup> generation the body weight increased from 150 to 166 gram</li> <li>2. In 2<sup>nd</sup> generation it is increased to upto 179 g showing an increase of 12.4 g body weight in birds in generation 2.</li> <li>3. In generation 3, the birds body weight was increased up to 194.5 g showing an increment of 15.2 g in this generation.</li> <li>4. In generation 4,5 and 6, the birds body weight was achieved as 211, 225 and 251 grams, respectively</li> </ol>
59	335	Development, evaluation and production of distillery yeast sludge (DYS) based cost effective feed and prebiotic agent for poultry	UAF	(3 years) 2011-14	12.930	<ol style="list-style-type: none"> <li>1. The distillery yeast sludge was properly processed to remove impurities and then was tested to determine its potential to replace soybean meal from poultry rations.</li> <li>2. The DYS successfully replaced 10% soybean meal on nitrogen equivalent basis in broiler, layer-starter and layer-grower</li> </ol>

						<p>rations.</p> <ol style="list-style-type: none"> <li>It also replaced 5% soybean meal in layer's rations without any deleterious effect on layers health and egg quality.</li> <li>In the collaborating institute, the product (Bio Wache) was also developed which successfully replaced AGP, reduced heat stress and enhanced immunity which resultantly improved bird's growth performance.</li> </ol>
60	337	Improvement of salt tolerance in wheat through biotechnology	NIBGE Faisalabad	(6 years) 2010-16	16.585	<ol style="list-style-type: none"> <li>Transgenic salinity tolerant wheat was successfully developed and tested</li> <li>Transgenic lines of Punjab-2011 showed 4-35% higher grain yield whereas Saher 2006 showed 12-45% higher grain yield as compared to non transgenic lines.</li> <li>Biosafety studies studies showed that transgenic wheat lines are safe for human consumption.</li> </ol>
61	572	Diagnostic Survey for Newcastle disease (ND) in Poultry	UVAS	(6 months) 2013	0.500	<ol style="list-style-type: none"> <li>Samples from 20 differen districts of Punjab for presence of New Castel disease were collected.</li> <li>Phylogenetic analysis depicted that presence of susceptible host provides opportunity to virus to multiply resultle in outbreak of disease.</li> <li>Analysis showed that mortality rate was significantly higher in controlled sheds as compared to open sheds.</li> </ol>
62	144	Transgenic approach to improve drought and salinity tolerance in wheat	UAF	(3 years) 2009-12	14.078	<ol style="list-style-type: none"> <li>10 drought and salinity tolarant Wheat lines harboring DREBIA and GDHA genes, have been developed.</li> <li>Transgenic lines are under mandatory</li> </ol>

						testing. 3. Established wheat Biotechnology Research Laboratory.
63	175	Micro propagation of date palm through tissue culture	Horticultural Research Station Bahawalpur, AARI	(6 years) 2010-16	24.061	1. Technology for mass propagation of date palm plants will be available. 2. One lac true-to-type in vitro raised plantlets of promising date cultivars will be available. 3. This project may not deliver one lac plants for commercialization.
64	203	Development and comparison of innocuity and potentiating effect of three oil adjuvant against HS disease caused by <u>Pasteurella multocida</u> in buffalo/cattle	Veterinary Research Institute Lahore	(3 years) 2011-14	10.696	1. <i>Three oil adjuvant vaccines</i> i.e. LP+PA, ISA 206 & ISA 50 were prepared and tested for their efficacy. 2. The results showed that ISA 50 & LP+PA are superior to others. 3. The new developed vaccines conferred solid immunity against the disease for whole one year . So only a single shot of vaccine is enough to protect the animal for whole year. This innovation has helped in reducing the cost of vaccination process. 4. About 25 million doses have been administered in the field
65	210	Enhancing performance of buffalo through improved feeding management at different physiological stages upto first lactation.	UVAS	(5 years) 2011-16	19.054	1. Technology to decrease calf mortality, increased growth rate, early puberty, decreased calving interval and increased lifetime productivity in buffaloes will be available. 2. This technology can bring a huge impact on livestock management in Punjab.
66	223	Development, evaluation and promotion of milk replacer for buffalo calves	UVAS	(3 years) 2011-14	12.441	1. An efficient milk replacer developed locally is in use of domestic buffalo calf raisers. 2. An economical and efficient calf starter ration was developed which is in

						<p>commercial production and also in use of farmers at buffalo farms.</p> <ol style="list-style-type: none"> <li>3. Extension workers trained for the calf rearing skills, fulfilling the protocols of hygienic feeding and health monitoring.</li> <li>4. Comprehensive calf rearing facility has been established at B-Block of Ravi campus of UVAS.</li> </ol>
67	258	Enhancement of cost effective mutton production through genetically enhanced prolificacy management	UVAS	(4 years) 2011-15	12.988	<ol style="list-style-type: none"> <li>1. An increase of twinning rate from 20% to 35 % was achieved</li> <li>2. Second generation will have twinning rate of 50%</li> <li>3. An escalation to the tune of 66% in economic return from the sale of meet is achieved in third generation</li> </ol>
68	358	Development, Evaluation and production of herbal anticoccidial(s) for the control of coccidiosis in poultry	UAF	(4 years) 2011-15	10.127	<ol style="list-style-type: none"> <li>1. The anti-coccidial activity of various plants extract was evaluated through laboratory and field trails.</li> <li>2. In <i>in vitro</i> trail, all 16 plants extracts were found effective for their anti-coccidial potential</li> <li>3. In <i>in vivo</i> trails 5 selected plants namely Camellia sinensis, pinus radiata, Carica papaya Linum usitatissimum and aloe vera, found most effective in <i>in vitro</i> trails, were found effective for their anticoccidial potential</li> </ol>
69	582	Utilization of poultry litter and dead birds compost as livestock feed ingredient and agriculture fertilizer	UVAS	2015-19 (4 Years)	22.306	<ol style="list-style-type: none"> <li>1. Technology for Compost preparation from poultry litter and dead birds was developed</li> <li>2. Compost has some essential minerals important for animal nutrition for birds and large animals.</li> <li>3. Compost can also be used as manure for</li> </ol>

						crop production
70	948	Use of ICT in Marginal and Disadvantaged regions as an alternate strategy for agricultural technology transfer: Challenges and Oppertunities	UAF	2020 (1 Year)	1.013	<ol style="list-style-type: none"> <li>1. Developed strategy for capacity building of the farmers and other service providers regarding utilization of various ICT tools and Websites for better information delivery</li> <li>2. Mobile phone was found as best source of information for technology transfer</li> </ol>
71	930	Evaluating impact of subsidized inputs on the cost of cotton production in Punjab Province	UAF	2018 (9 month)	0.500	<ol style="list-style-type: none"> <li>1. In Bt cotton yield increase was more as compared to non Bt cotton by utilizing subsidy of the Govt.</li> <li>2. The per unit area yiel and other inputs.d increase was due to more use of fertilizer</li> </ol>
72	971	Policy paper on high value crops (Guava and Strawberry): Constraints and Oppertunities	UAF	2018-19	0.250	Study suggested that farmers should be informed about economic life of the guava orchards, marketing system should be strengthen, value addition industry of the guava should be establishes near production centers and agri. Extension wing should be strengthen.
73	970	Policy paper on cotton: The back bone of agricultural sector and textile industry	UAF	2017-18	0.172	<ol style="list-style-type: none"> <li>1. It was recommended that a comprehensive package should be adapted to mitigate climate risks at farm level including introduction of new heat and humidity tolerant varieties of Cotton and change of planting time.</li> <li>2. Proper legislation regarding timely availability of inputs, storage and availability of quality seed</li> </ol>
74	911	Diversification of cropping by promotion of Sohanjna (Moringa olifera), Caster bean, Barlay, Taramera (Eruca sativa), Mustard & Pearl Miller (Bajra) in lesser cholistan	RARI, AARI	2017-20	32.252	<ol style="list-style-type: none"> <li>1. Technology was developed to grow Sohanjna, Casterbean, Barley, Taramera, Mustard and Bajra on ridges in water deficient areas of lesser Cholistan.</li> <li>2. Varieties of wheat were identified to grow in water deficient conditions.</li> </ol>

						<ol style="list-style-type: none"> <li>3. Heat tolerant crops like Guar, Sesame, Taramera and millet were identified to increase the profitability of farmers of the area.</li> <li>4. It was identified that Australian Kikar and Sohanjna can be used as border crops.</li> </ol>
75	272	Improving Nitrogen Use Efficiency In Agriculture Using Urease Enzyme Inhibitors	UAF	2016-19	17.016	<ol style="list-style-type: none"> <li>1. Studies to increase the nitrogen efficiency on rice and wheat was carried out.</li> <li>2. Recommended dose of urea fertilizer and 2.5 % inhibitor gave maximum yield of Paddy i.e., 5590Kg/ha.</li> <li>3. In case of wheat 75% recommended dose of urea and inhibitor gave maximum yield.</li> </ol>
76	889	Management of Whitefly by Integrated Strategies and Development of Resistant Cotton Germplasm through Genetic Engineering	UAF	2017-20	39.671	<ol style="list-style-type: none"> <li>1. A comprehensive integrated strategy for the control of whitefly was developed.</li> <li>2. Identification of species/biotypes of whitefly present in Punjab was carried out.</li> <li>3. Micronutrient effect on plant physiology and association with whitefly was carried out.</li> <li>4. Effect of various pesticide against whitefly was studied in Lab and field conditions.</li> <li>5. Use of bio pesticides/microbial pesticide was studied.</li> <li>6. Agronomic practices associated with the control of whitefly were identified.</li> </ol>
77	888	A Comprehensive Integrated Scientific Approach for the Development of Sustainable Management Strategies of Pink Bollworm ( <i>Pectinophora Gossypiella</i> )	UAF	2017-20	36.195	<ol style="list-style-type: none"> <li>1. A comprehensive integrated strategy for the control of Pink Boll worm was developed.</li> <li>2. No alternate host of Pink boll worm was found in Punjab.</li> <li>3. A survey was conducted for</li> </ol>

						<p>morphological and molecular identification of species of Pink boll worm in Punjab. It was concluded that all samples belong to only one species <i>P. gossypiella</i>.</p> <ol style="list-style-type: none"> <li>Life history studies of Pink boll worm was carried out.</li> <li>Insecticidal resistance against pink bollworm was studied.</li> <li>Impact of various pesticide on crop physiology was studied.</li> </ol>
78	965	Characterization of <i>Dalbergia Sissoo</i> and <i>Dalbergia Latifolia</i> open pollinated seed progenies for dieback Tolerance”	UAF	(02 years) 2018-20	0.871	<ol style="list-style-type: none"> <li>Response of drought and salinity was studied for shisham dieback disease</li> <li>It was concluded that water stress and salinity increase the shisham dieback disease.</li> <li>The physiological response of stress on dieback disease of shisham was evaluated</li> </ol>
79	934	Agricultural Input Marketing in Pakistan: Implications for Food Security	UAF	2018-19	1.355	<p><b>Seed</b> In south Punjab growers mostly acquire seed from near by dealers in addition to their own seed. In central Punjab relatively more percentage of farmers used their own seed except for potato, maize and sorghum. In north Punjab the trend was mixed. Growers used their own seed and also procured from different sources</p> <p><b>Fertilizer</b></p> <ul style="list-style-type: none"> <li>As per survey 0.6% farmers purchased fertilizer from company outlet. Remaining 99.4% purchased fertilizer from the dealers. The reason being easy access to the dealers.</li> <li>The farmers also complained about the high prices of fertilizer</li> </ul>

						<p><b>Pesticide</b></p> <ul style="list-style-type: none"> <li>• Only 1.4% growers purchased pesticide from the company directly. Remaining 98.6% purchased from the local dealers.</li> <li>• About 50% farmers were satisfied with the quality of pesticides.</li> </ul> <p><b>Agricultural Credit</b></p> <p>Only 23% sample farmers availed agri credit. 40% farmers did not avail the credit. 12% were willing to get credit but did not find the credit facility and 6% avoided the credit due to high mark up.</p>
80	932	CRISPR/Cas9 based virus resistance in cotton	UAF	2018-19	0.907	<ol style="list-style-type: none"> <li>1. 10 plates of transgenic callus and regenerated DsRED plants has been prepared</li> <li>2. Shoots were successfully regenerated from the callus</li> <li>3. Due to regeneration of cotton via embryogenesis , it was reported that even chimeric calli were considered as transgene positive and express foreign gene.</li> </ol>
81	943	Metagenomics of Mosquitoe Vectors and Abundance of Mosquito-borne Pathogens in different Agro-Geoclimatic areas of Punjab, Pakistan	UAF	2018-19	2.078	<ol style="list-style-type: none"> <li>1. Data of mosquitoes from 6 districts was collected.</li> <li>2. The results shows that the abundance of mosquitoes increased with temperature from 25-33C, rainfall 0-50mm and relative humidity 40-70%</li> <li>3. The expression level of <math>\beta</math>-tubulin and CS-I has indirect relationship with the dose of dsRNA. The expression level of both the candidate genes decreased with the increase in exposure of mosquitoes to</li> </ol>

						dsRNA 4. Data regarding identification of mosquitoes and mosquitoes born pathogens have been compiled.
82	956	Microbial based Pest management Program for Tephritid Fruit flies	UAF	2018-20	4.420	The study indicates that tree canopy application of entomopathogenic fungi and nematodes could be added in integrated pest management programme (IPM) for the successful control of fruit flies complexes in Pakistan
83	938	Identification of Drought responsive genes through Transcriptional profiling of drought responses in Chickpea ( <i>Cicer arietinum</i> L.)	UAF	2018-19	0.450	<ol style="list-style-type: none"> <li>37 Dof genes were identified in chickpea. All the identified genes were given the new names.</li> <li>The sequences of forward and reverse primers of all the 37 Dof genes were designed.</li> <li>Biochemical profiling of drought responses of chickpea under drought stress conditions have been completed</li> </ol>
84	960	Efficient Management of fruit flies ( <i>Bactocera</i> spp.) by nano based pheromone trap technique	UAF	2018-20	5.660	Nano particle based pheromone traps have been prepared using pheromones, Zingerone, raspberry ketones, methyl eugenol and 4-ethyl benzoate.
85	453	Use of Distillery Waste Product as a Growth Promoter in early weaned Male Calves	UVAS	2016-18	7.580	<ol style="list-style-type: none"> <li>The growth and health of male Buffalo and cattle Calves was increased by 33% in body weight by the use of yeast cell wall isolated from distillery waste of sugar industry.</li> <li>Environment clean practice was introduced by bringing the use of Distillery waste product of sugar industry.</li> <li>Mortality rate was also reduced by the feeding of this product.</li> <li>The incidence of stomach and respiratory diseases were also reduced.</li> </ol>

86	961	Increasing soybean adaptability, yield and oil content by conventional plant breeding and genetic improvement practices	UAF	2018-20	6.386	<ol style="list-style-type: none"> <li>1. Acquisition of 500 soybean genotypes from USDA soybean</li> <li>2. Seed multiplication under confined conditions</li> <li>3. Identification of 150 lines suitable for cultivation in different areas of Pakistan <ul style="list-style-type: none"> <li>• Optimization of production technology</li> <li>• Nutritional profiling of soybean</li> <li>• Development of seed storage facility</li> </ul> </li> </ol>
87	963	Development of solar assisted multi-crop dryers and energy efficient storage structures for value addition and food security	UAF	2018-19	5.383	<ol style="list-style-type: none"> <li>1. A grain dryer have been developed and tested using maize as sample material and successful results achieved. Where grain were dried up to 14% moisture.</li> <li>2. In this dryer a new technology diagonal air flow concept was introduced</li> <li>3. A cold room for storage of fruits and vegetable shave been designed which can maintain the temperature for desired period</li> </ol>
88	954	Integrated management of guava ( <i>Psidium guajava</i> L.) dieback in Pakistan	UAF	2018-20	4.829	<ol style="list-style-type: none"> <li>1. Each strain of guava was found susceptible to dieback disease.</li> <li>2. Golden Gola was the most susceptible to the disease.</li> <li>3. The highest disease incidence was found in high density plot.</li> <li>4. During imtercropping experiment, Disease incident was high where mango and citrus were sown with guava.</li> <li>5. The disease incident was high in non sanitized plots.</li> </ol>
89	949	Youth And Gender Mainstreaming In Agricultural Activities Through Need Based Capacity Building In Punjab and	UAF	2018-19	1.533	<ol style="list-style-type: none"> <li>1. The main recommendation of the study is to create a good environment. Women and youth should be able to control sources such as capital, land and agri products.</li> </ol>

		KPK				2. In order to involve the women and youth in agricultural activities their short trainings must be arranged
90	972	Policy paper on oil seed crops (rapeseed and Mustard) problems and prospects	Institute of agricultural and Resource Economics, UAF			<ol style="list-style-type: none"> <li>1. High per acre cost and low net return are the main factors causing the declining trend in rapeseed and Mustard cultivation.</li> <li>2. Study showed the following solutions of the problems identified: <ul style="list-style-type: none"> <li>• Large and educated farmers can be motivated to cultivate the rapeseed and Mustard crops.</li> <li>• To assist the rapeseed and Mustard farmers either by providing credit or facilitate them through subsidy.</li> <li>• Need to enhance capacity building of agri-extension workers about rapeseed and Mustard production technology so that they can disseminate proper technology and knowledge to the farmers.</li> <li>• Need to search out low cost of land preparation technology for rapeseed and Mustard growers.</li> <li>• Need to strengthen the marketing by improving the mode of payment from market to farmers.</li> </ul> </li> </ol>
91	969	Commodity analysis of selected vegetables i.e. onion, chillies, potato and Tomatos	Institute of agricultural and Resource Economics, UAF			<ol style="list-style-type: none"> <li>1. Results showed that dynamics of climate variability including unpredicted rainfall and temperature shocks have adverse effects on the production and marketing of onion, chilies, potato and Tomatos.</li> <li>2. The results of economics of production of these vegetables showed that profitability is low.</li> <li>3. Based on the results following recommendation were made</li> </ol>

						<ul style="list-style-type: none"> <li>○ A comprehensive adaptation package should be adapted to mitigate climate risks at farm level including: Introducing new heat humidity resistant varieties. Changing plantation time</li> <li>○ There is a strong need to correct the imperfections in both input and output markets through: <ul style="list-style-type: none"> <li>a. Proper legislation regarding timely availability of the quality seeds, inputs, storage and transportation facility.</li> <li>b. Efficient implementation through concerned departments.</li> <li>c. Regular monitoring.</li> </ul> </li> <li>4. Value chain analysis for all the crops be conducted and the industry should be encouraged to develop value chains for each vegetable.</li> </ul>
92	944	Variable rate Agro-chemical Application System in Citrus Orchards using on-the-go sensor	Department of Farm Machinery and Power, UAF	2 year (2018-2020)	0.8512	<ol style="list-style-type: none"> <li>1. A full scale variable rate sprayer (VRS) prototype having 500 litre tank capacity with infra-red (IR) sensors, 8 nozzles (4 on each side of the boom by 2 sensors), 4 solenoid valves, one safety valve, one high pressure pump, computer interface, and along with other accessories was indigenously developed and tested in the laboratory and citrus fields, which showed excellent performance.</li> <li>2. The technology was demonstrated to various farmers and stake holders in collaboration with industrial partners.</li> <li>3. Muhammad Shafi Agricultural Spray Engineering is manufacturing and selling the units to farmers which are working successfully.</li> </ol>

						<ol style="list-style-type: none"> <li>4. VRS can be used on small, medium, and large size trees by reducing the 20 to 50 % saving in spray cost.</li> <li>5. VRS will help in reducing the environmental pollution and also help in reducing the toxicity of pesticides in fruits.</li> <li>6. There will be no MRL issue in our exported commodity.</li> </ol>
93	967	Policy prospective regarding value chain in Marketing issues of Apricot and Apple	Institute of agricultural and Resource Economics, UAF	2018-2019	0..595	<ol style="list-style-type: none"> <li>1. Project findings showed that area under apricot and apple production have significant positive impact on decreasing the poverty level of the household.</li> <li>2. On the basis of results and problem found, recommendations to improve the performance of apricot and apple industry are following: <ol style="list-style-type: none"> <li>a. There is need to introduce, propagate, and distribute high yielding, and drought and disease resistant varieties of apricot and apple.</li> <li>b. Govt. should provide the cold chain to frit producers in order to reduce the post-harvest losses.</li> <li>c. There should be accentual infrastructure facilities like roads, cold storage and processing machinery.</li> <li>d. Training of on-farm processing skills of apricot and apple growers.</li> <li>e. There is need of market security in the sense of price stability and access to market.</li> <li>f. Financial assistance to improve</li> </ol> </li> </ol>

						processing, packaging and marketing. g. Special incentive and support might be given to the transport of these high value and perishable fruits.
94	937	Genetic improvement of Sorghum as Biofuel Feedstock using high throughput phenomics and genetic approaches	Centre of Agriculture I Biochemistry and Biotechnology, UAF	2 year (2018-2020)	2.498	<ol style="list-style-type: none"> <li>1. 1200 USDA Sorghum accessions were procured and seed multiplication was completed for further studies.</li> <li>2. From these 1200 accession 300 were selected for biofuel and biomass related traits.</li> <li>3. From these 300 accessions 24 promising energy sorghum types were selected.</li> <li>4. These 24 selected accessions were morphologically characterized for biomass-related traits followed by DNA finger printing.</li> <li>5. Five sorghum accessions were selected based upon best performance for biomass related traits such as number of leaves, plant height and fresh biomass.</li> <li>6. These accessions have potential utility in sorghum breeding program in all over Pakistan especially at fodder Research Institute, Sargodha.</li> </ol>
95	939	Prediction of Sustainable Soil and Crop Management Practices Under Climate Change Scenarios in Upland of Baluchistan	Department of Agronomy, UAF	(4 years) 2015-93		<ol style="list-style-type: none"> <li>1. In this study different tillage practices such as a) conventional tillage, b) Chisel plough, c) Zero tillage, d) under sorghum-wheat and fallow-wheat were compared.</li> <li>2. The study concluded that conservation tillage especially reduced tillage (chiseling) crop management have potential to improve the soil health and</li> </ol>

						economic benefits while providing sufficient yield in dryland farming system of Pakistan
96	940	Climate smart Wheat: development of heat and drought tolerant wheat for Pakistan	Centre of Agriculture I Biochemistry and Biotechnology, UAF	2 year (2018-2020)	2.699	<ol style="list-style-type: none"> <li>1. 1000 wheat genotypes were imported from CIMMYT, Mexico.</li> <li>2. To screen heat and drought tolerant-related traits multi locational trials at UAF, and Regional Agricultural Research Institute (RARI), Bahawalpur were planted for local wheat germplasm.</li> <li>3. All selected genotypes including Pakistan (200) and CIMMYT genotypes (1000) were planted in the field for further screening.</li> <li>4. On the basis of screening data 20 local and 350 CIMMYT lines have been selected that have genes for drought and heat tolerance and these lines are under study for developing the varieties.</li> </ol>
97	941	Implementing climate-smart dry chain technology for improving livelihood of the maize farming community in Pakistan	Department of Agronomy, UAF	1 year (2018-2018)	1.244	<p>In this project following improved technology and fundamental knowledge were disseminated the to all stake holders:</p> <ol style="list-style-type: none"> <li>1. High moisture /humidity is the primary cause of value loss of seed and commodities throughout the supply chain.</li> <li>2. Higher moisture content are responsible for insect pest attack and aflatoxin contamination.</li> <li>3. Seed stored in hermetic bag at low moisture content (&lt;12%) preserve the seed quality.</li> <li>4. Implementing the dry chain technology through artificial drying in autumn season and climate smart drying during spring season followed by hermetic storage</li> </ol>

						maintain maize seed quality for next growing season.
98	945	Sensor based precision irrigation system for improving water productivity of cereal crops	CAS-AFS, UAF	2018	0.784	<ol style="list-style-type: none"> <li>1. In this project, wireless sensor network of moisture sensors was developed and evaluated under different irrigations systems such as Drip, sprinkler, and border irrigation systems.</li> <li>2. Results showed that this sensor based precision irrigation system: <ol style="list-style-type: none"> <li>a. Improve the labor efficiency, water productivity, and water use efficiency in cereals (i.e. wheat and maize).</li> <li>b. Saved water about 55% in case of drip irrigation and 42% in case of sprinkler irrigation system.</li> </ol> </li> </ol>
99	947	Designing and implementing the irrigation management information system using cellular communication networks in selected area of Punjab	UAF	2 year (2018-2019)	0.5376	<ol style="list-style-type: none"> <li>1. The proposed research was started in Faisalabad district as a pilot project.</li> <li>2. Whole study area was divided into different zone according to soil type and climate change.</li> <li>3. Rainfall was calculated (mm/h) by using telecommunication towers and signal data.</li> <li>4. Reference evapotranspiration was measured.</li> <li>5. A spread sheet as in initial version of irrigation management information was developed to send the information regarding irrigation guidelines to the registered farmers.</li> </ol>
100	903	Diagnostic survey to ascertain ecological reasons of aphid attack on wheat in different ecological zones.	Pest Warning and Quality Control of Pesticides, Punjab,	1 month (1/4/2017 to 1/5/2017)	0.5	<p>From this diagnostic survey it has been deduced that :</p> <ol style="list-style-type: none"> <li>1. There is significant difference in the aphid attack on wheat crop in different ecological zones I.e. barani, rice, and cotton zone. There is more aphid attack in</li> </ol>

			Lahore			<p>barani and rice zone than cotton zone.</p> <ol style="list-style-type: none"> <li>2. Different dates of sowing of wheat crop do affect the aphid attack and crop sown on 6<sup>th</sup> November faced maximum attack.</li> <li>3. There is no any resistant and susceptible wheat varieties for aphid.</li> <li>4. Fertilizer do not have any strong connection with aphid attack.</li> <li>5. Metrological factors especially maximum temperature have very significant impact on aphid populations</li> </ol>
101	896	Analytical studies to determine the deteriorating factors affecting the export quality of Kinnow/mandarin fruit	Institute of food sciences and nutrition, UOS			<p>In the surveyed Tehsils (Sargodha, Bhalwal, and Kotmomin) following observations have been recorded which are the main causes of affecting the export quality of Kinnow/mandarin fruit:</p> <ol style="list-style-type: none"> <li>1. Inadequate, imbalance and improper time of both organic and in-organic fertilizer application.</li> <li>2. FYM was not applied in the month of December which is a proper time of its application.</li> <li>3. Deficiency of canal water.</li> <li>4. Use of un-certified nurseries.</li> <li>5. Poor orchard sanitation invite various insect pests, fungal and bacterial diseases.</li> <li>6. Attack of different diseases and insects in all kinnow orchards.</li> <li>7. Poor rain fall have effects on the quality of fruits.</li> <li>8. High temperature during July to March caused the reduction in fruit size.</li> <li>9. Dropping of fruit is enhanced to 5% more in Sargodha, 6% in Bhalwal and 4% in Kotmomin due to poor rain fall, nutrient</li> </ol>

						<p>deficiency, poor sanitation, insect pest attack etc.</p> <p>10. Results of this study reveals that change in climate and weather pattern have noticeable effects and decreasing the production capabilities of citrus potential areas.</p>
102	916	Development and commercialization of tomato hybrids and varieties suitable for sowing in tunnels and open field of Punjab	VRI, AARI	5 years (2017-2021)	29.113	<ol style="list-style-type: none"> <li>1. One indeterminate tomato hybrid namely <b>Sahar F1</b> suitable for tunnel during autumn season was approved for general cultivation in the year 2021.</li> <li>2. One determinate tomato hybrid namely <b>LTH-324</b> suitable for low tunnel and open fields cultivation was developed and its approval case has been submitted to Punjab Seed Council.</li> <li>3. Pre-basic seed of two approved determinate tomato varieties namely Nadir and Naqeeb was produced for general cultivation.</li> <li>4. Tomato production guide was published to educate the farming community.</li> <li>5. Introduction and demonstration of tomato Autumn season production for earlier availability in Punjab.</li> <li>6. Increase in farm income on account of early production.</li> <li>7. Availability of local tomato during scarcity period (Dec.– Mar.) in Punjab.</li> <li>8. Reduction in transport cost due to production near consumption centers in Punjab.</li> <li>9. Reduction in import bill incurred on</li> </ol>

						<p>tomato seed.</p> <p>10. Reduction in import bill incurred on fresh tomato fruits due to earlier fruit availability.</p> <p>11. A combined total of 7 kg seed (sufficient for 140 Acres) of indeterminate tomato hybrids was produced and marketed by Vegetable Research Institute, Faisalabad during last 7 years (2015-21).</p>
103	16	Genetic improvement of groundnut for herbicide and disease resistance	ABRI, AARI	2009-12 (3 years)	26.230	<p>1. Genetic diversity of 95 groundnut genotypes was analysed by the use of 277 SSR primer pairs.</p> <p>2. Eighty two genotypes were screened for Cercospora leaf spot disease of groundnut, and control of this disease through fungicide was identified.</p> <p>3. Cercospora tolerant filial generatioins were developed to develop cercospora toerlnt variety of groundnut.</p>
104	968	Farm to market policy options for the promotion of chickpea in Punjab, Pakistan	UAF	2018-19 (21 months)		<p>1. Study concluded that chickpea can become more profitable crop if farmers managerial skills are improved, and investment be made to develop high yielding varieties.</p> <p>2. Market price fluctuation is the major constraint faced by farmers. Support price mechanism can address this issue.</p> <p>3. Investment in marketing information can enhance market efficiency.</p>
105	964	Genotyping and development of heat stress tolerant cotton	UAF	2018-20 (2 years)	4.855	<p>1. On the basis of physiological, morphological and biochemical assey 2</p>

		germplasm with enhanced quality traits				heat tolerant genotypes of cotton were identified from 154 cotton germplasm. 2. Information regarding genetic control , biochemical, physiological and morphological alysis of heat tolerance was carried out which will be used to develop heat tolerant varieties of cotton
106	958	Development of drought and heat tolerant germplasm by dynamic assembly of leaf surface structural traits to self-irrigate with fog water	MNSUA, Multan	2018-19 (18 months)	7.679	1. Twenty five genotypes of wheat having high yield potential in drought stress condions were identified out of the 1796 genotypes. 2. To identify drought tolerance noval leaf characters including fog/gaseous water capturing, leaf rolling, leaf erectness, prickly hairs and grove type were used. 3. The selected drought tolerant lines were hybridized to develop breeding material for further research.
107	195	Development, evaluation and promoting of cost effective and low polluting floating fish feed for enhancing the productivity of <i>Labeo rohita</i> (Rohu fish)	UAF	2014-17 (4 years)	19.813	1. Cost effective fish feed (comprising of sunflower meal, soyabean meal, corn gluten and canola meal) was developed for Rahu fish which will replave costly fish meal. 2. This project concluded that up to 50-75% fish meal can be replaced by economical plant protein source 3. Newly developed meal will tackle the problem of anti-nutritive factor (phtiv acid) in plant protein based fish meal. 4. Selected fish feed (floating pellets) on commercial scale were produced to facilitate commercialization of this feed.
108	952	Resistance gene analogues based molecular identification of	UAF	2018-19 (2 Years)		1. Screening of shisham germplasm for the identification of resistant source of <i>D.</i>

		dieback disease resistance in Shisham ( <i>Dalbergia sissoo</i> )				<p><i>Sissoo</i> against die back disease was carried out.</p> <ol style="list-style-type: none"> <li>Markers were identified for screening of the germplasm at molecular level</li> <li>The causal agent of shisham dieback disease were identified, along with variability and epidemiology understanding of the disease.</li> <li>Management of the disease was also formulated</li> </ol>
109	191	Genetic improvement of cotton for herbicide and bollworm resistance	CEMB, Univ of Punjab, Lahore	2010-17 (5 years)	28.325	<ol style="list-style-type: none"> <li>In 4 cotton varieties ( VH 281, VH 289, VH 290, MNH 786) bollworms and glyphosate herbicide tolerance was introduced by the incorporation of CEMB-Bt and GT Gene via agrobacterium.</li> <li>Poiet scale transgenic plants of these 4 varieties were produced.</li> <li>Confirmation of introduced genes by molecular analysis and bioassay was carried out.</li> <li>Biosafety assessment of introduced genes ( CEMB-Bt and GT Gene) was completed</li> </ol>
110	950	Developing climate resilient plants based recombinant subunit vaccine against foot and mouth disease virus.	UAF	2018-20 (2 years)	6.137	<ol style="list-style-type: none"> <li>Genes of FMDV were synthesized and cloned under UTRs along with a marker gene in the tobacco leaves and Berseem cotyledons.</li> <li>Transgenic plants of tobacco were developed and analysed for the presence of genes in its genome.</li> <li>Amplified DNA fragments for the corresponding size was confirmed the integration of transgenes into the genome.</li> <li>The confirmed plants were shifted to pots</li> </ol>

						for the development of seed.
111	945	Sensor based Precision irrigation system for improving water productivity of cereal crops	UAF	2016-18 (2 year)	0.784	<ol style="list-style-type: none"> <li>1. Computer aided Design (CAD) of three irrigation systems (Drip, Sprinkler, &amp; Surface) were developed.</li> <li>2. Automization of sensor integrated with GS technology has been done. website platform for collection of sensor based data has been developed.</li> <li>3. Wheat and Maize crops for two seasons (2017-18 and 2018-19) had been sown and irrigated using sensor base moisture data in all all three irrigation systems (Drip, Sprinkler, &amp; Surface).</li> <li>4. Water productivity of irrigation system using sensor base moisture data had been increased.</li> </ol>
112	445	Redisgning, Fabrication and adaptation of a Self-Propelled Sugarcane Stripper for Improving Labor productivity and Sugar Recovery	UAF	2015-18 (3 year)	8.785	<ol style="list-style-type: none"> <li>1. Self-Propelled Sugarcane Stripper was developed.</li> <li>2. Performance of machine was tested at UAF, AMRI, AARI, Faislabad and at Farmers field and functioning of machine was found satisfactory.</li> </ol>
113	962	Screening of Exotic and local accessions for the development of forage and seed production technology of Alfalfa.	AARI	2016-17 (2 year)	6.607	<ol style="list-style-type: none"> <li>1. 165 Exotic lines from USDA and 32 local lines of Alfalfa from NARC were collected for screening.</li> <li>2. Collected lines were tested against diseases of stem and crown rot and phytophthora root rot, 6 were found moderately resistant against stem and crown rot disease and 116 were found moderately resistant against phytophthora root rot disease.</li> <li>3. From collected germplasm, 44 advance lines were selected for further trials.</li> </ol>
114	942	Modelling approaches for	PMAS-	2019-21	3.337	1. Data of wheat and groundnut crop at

		assessing the impact of climate change adaptation/management strategies under rainfed condition	Arid agriculture University Rawalpindi	(3 year)		different locations was recorded at different stages of the crop growth and development. 2. Management strategy of above mentioned crops under climate change scenario under rainfed conditions was developed.
115	437	Development of Bio-Pesticide for the control of soil borne disease of Tomatoes and Chillies caused by Pythium and Phytophthora spp.	PMAS- Arid agriculture University Rawalpindi	2015-19 (4 year)	29.916	1. 593 samples of tomato, chillies, and soil were collected for the purification of Pythium and Phytophthora spp. 2. More than 10 Pythium isolated and 2 Phytophthora isolates were confirmed by their genomic profiling from NCBI. 3. Four new Pythium isolates were reported from Pakistan. 4. Bio-pesticides for seed treatment against soil borne diseases were successfully prepared and tested and results were found satisfactory.
116	899	Feasibility of Growing Organic Cotton in Potowar area	BARI, Chakwal	2017 (1 year)	0.500	1. Keeping in view of environment and health friendly organic cotton was produced at different areas of Potowar. 2. The response of farmers towards cotton was not encouraging and consequently low yield was obtained at most of the locations. 3. It is therefore suggested on the basis of project implementation that cotton may not be included in cropping pattern of Potowar areas as the area is comparatively more suitable for high value crops (HVC) including fruits and vegetables.
117	610	Bovine Theileriosis: Its molecular epidemiology and trials of recombinant vaccine	UVAS	2018-19 (2 years)	18.118	1. A recombinant vaccine against theileriosis disease was prepared 2. It is safe, reliable and potent to protect against theileriosis in cattle and buffaloes in Pakistan.

118	600	Development of short duration sunflower hybrids with better yield	ORI, AARI	2015-20 (5 years)	31.767	<ol style="list-style-type: none"> <li>1. Two hybrids namely FH-648 and FH-675 have been developed and approved by PSC for general cultivation in Punjab</li> <li>2. Both the hybrids have also been recommended by VEC and approved by FSC&amp;RD for general cultivation within Pakistan.</li> <li>3. Case of both the hybrids has also been submitted to FSC&amp;RD for registration under Plant Breeders Rights Act.</li> </ol>
119	638	Development of inactivated polyvalent for the control of mastitis in dairy cattle	UVAS	2017-19 (2 years)	10.905	<ol style="list-style-type: none"> <li>1. No mastitis vaccine is currently being imported nor available locally.</li> <li>2. Project has successfully produced 04 different vaccines for control of mastitis in bovine animals besides against 04 different bacterial strains.</li> <li>3. Directorate of ORIC is working on its commercialization in collaboration with Veterinary Research Institute (VRI), Lahore.</li> </ol>
120	1014	Evaluating the Utilization of Camel Milk as Food Source in Cholistan and its Socioeconomic Impact on Camel Herders	UAF.	2018-19 (1 year)	0.500	<p>Survey study was conducted which contains current status of camel milk production and marketing system and its socioeconomic impacts on the lives of the owners of the camel herds. Main features of the report are:</p> <ol style="list-style-type: none"> <li>a) Many people in the study area are not well connected with marketing system and their incomes leading towards food insecurity, poverty and social unrest.</li> <li>b) Squeezing of grazing lands is one of the major problems for camel production system.</li> <li>c) There is tendency of international buyers to purchase best potential animals from the area leading towards germplasm</li> </ol>

						<p>drainage in the area.</p> <p>d) A sum of 120,000 liters of camel milk can be available if properly channelized.</p> <p>e) There is a potential of value addition by making different products like kurth, sorain, ice cream, chocolates and other products.</p> <p>f) Fresh camel milk can be pasteurized, chilled and packed for sale at big stores.</p> <p>g) In collaboration with WHO, camel milk products can be made available for the school goings to fight with malnutrition on one hand and to support camel herders on the other.</p> <p>h) There is a great potential to develop Mareecha camel husbandry due to its high demand for racing domestically as well as internationally.</p> <p>i) Camel husbandry can be a rich source of meat export to the Gulf countries.</p>
121	936	Transgenic Approaches for the development of drought and salt tolerance in Wheat	UAF	2018 (1 year)	1.578	<ol style="list-style-type: none"> <li>1. single and double gene cassettes harboring <i>HvNHX1</i> and <i>IPT</i> genes were developed in plant expression vector pSB-219</li> <li>2. <i>Agrobacterium-mediated</i> transformation of wheat calli was done.</li> <li>3. Six events for each single gene cassette and ten events for double gene cassette were obtained.</li> <li>4. The best lines for each cassette were selected on the basis of PCR, BASTA and Real-Time PCR. The T<sub>2</sub> seeds from the transgenic lines have been obtained.</li> <li>5. the agronomic traits of the transgenics have been evaluated at the lab level.</li> </ol>

						6. The field evaluation of the transgenics needs to be performed based on the availability of funds and approval of NBC.
122	1054	Farmer's perceptions and Economic assessment of Recent Policy Interventions for Expanding Canola Production in Punjab-Pakistan	UAF	2018 (6 months)	0.500	<ol style="list-style-type: none"> <li>1. 82% of the farmers involved in canola cultivation due to subsidy policy intervention by the Govt.</li> <li>2. 56.8% of the farmers responded that subsidy program is necessary for enhancing canola cultivation in Punjab.</li> <li>3. 93.5% of the farmers were strongly agreed with effectiveness of the subsidy program for enhancing canola cultivation.</li> <li>4. Economic assessment illustrated that canola cultivation was found to be more profitable than competing crops in the project area.</li> <li>5. Output side intervention – purchasing canola from farmers – played a more robust role in influencing the farmers' behavior for successive year cultivation of canola.</li> <li>6. All these interventions positively influenced canola cultivation, the area under canola, the unit price received, and farmers' income.</li> </ol>
123	953	Development of DNA based markers for Identification and Improving Food Safety of Meat and Meat Products	Govt. College women Univ. F.abad	2018-19 (2 years)	5.184	Developed mtDNA based laboratory procedure using sequence analysis, PCR-RFLP and allele specific PCR to identify raw meat species (Goat, Cow, Sheep, Dog, Horse, Pig and Donkey).
124	426	Development of Transgenic Cotton with Multiple Genes Resistant to Cotton Leaf Curl Virus	NIBGE	2011-16 (5 years)	23.233	Developed 3 transgenic cotton lines having triple gene construct for the control of bollworms, armyworm and weeds.

125	957	Improving fruit quality and reducing postharvest losses on strawberry fruits	MNSUAM	2018-19	6.155	<ol style="list-style-type: none"> <li>1. Quality of full ripened fruit is best for consumption and full ripened fruit gives maximum of 10 days shelf life.</li> <li>2. Fruit of medium size has best quality after harvest, that can survive to maximum number of days as compared to small and large fruit.</li> <li>3. Polythene packing is best that can be used to store fruit up to 10 days.</li> <li>4. Medium sized fruit gives maximum marketable fruit in overall postharvest supply chain</li> </ol>
126	610	Development and dissemination of recombinant vaccine against bovine theileriosis	UVAS	2 Years (2018-20)	18.118	<ol style="list-style-type: none"> <li>1. Through PCR and sequencing it was proved that the collected blood samples were of <i>Theileria annulata</i> positive and then local theilerial parasites were propagated <i>in vitro</i> and <i>in vivo</i>.</li> <li>2. Cloning of TaSP and SPAG genes were done successfully.</li> <li>3. <i>Pichia pastoris</i> competent cells were transformed but only recombinant protein of TaSP was expressed successfully.</li> <li>4. The results of this project also proved that rec-TaSP has antigenicity and immunogenicity and thus rec-TaSP was candidate of vaccine against theileriosis in our animal vaccine trials and experimentations.</li> <li>5. Prototype vaccine against theileriosis is ready for commercialization after approval from DRAP.</li> </ol>

127	650	Development, Evaluation and Promotion of Straw Based Pelleted TMR for Enhancing Quality Mutton Production.	UVAS	4 Years (2017-2021)	27.791	<ol style="list-style-type: none"> <li>1. Three (03) types of Pelleted Total Mixed Ration (TMR) i.e. Wheat straw, Rhodes grass and Oat straw were successfully developed / prepared for sheep and goat fattening.</li> <li>2. The project successfully demonstrated the sheep and goat fattening in the farmers field without any grazing or forage feeding .</li> <li>3. A successful field trial was conducted at 10 different farms in Punjab using 15% wheat straw + 85% concentrate based TMR pellets.</li> <li>4. The finding of this project is that an Average Daily Gain (ADG) of <math>\geq 200</math> gm in goats and <math>\geq 250</math> gm in sheep can be successfully achieved by the use of these TMR,s which is comparable to the growth potential of international breeds.</li> <li>5. An Urdu booklet is developed and shared with farmers and different social media groups.</li> <li>6. The technology developed (Pelleted TMR for sheep and goat fattening) was successfully transferred to the industry.</li> <li>7. Two feed Mills i.e Solve, Agri. Pak Pvt Ltd. Patooki &amp; AMG Thi Union Feeds Multan Road, Lahore have installed &amp; started the commercial production of TMR to farmers.</li> </ol>
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128	576	Enhancing growth and productive performance in native Aseel chickens employing integrated selective breeding and identification of growth markers for poverty alleviation in rural areas	UVAS	4.0 Years (January 2016- June, 2020)	26.210	<ol style="list-style-type: none"> <li>1. A poultry hatchery with an incubation capacity of 5600 chicken eggs (in a single run) and a storage capacity of up to 10,000 chicken hatching eggs has been established at UVAS, Ravi Campus through this project.</li> <li>2. The body weight (BW) of Lakha and Sindhi Aseel chicken was enhanced to 1322g and 1386g from 750g and FCR was improved to 2.80 and 2.89 respectively at 12wk of age.</li> <li>3. In case of molecular studies, SNP markers in some candidate genes (IGF-1, IGF-II, PRKAG-3, OCX-32, DRD-2, Mx-1, ROBO-2, GDF8, and PITX-1), associated with body weight, weight gain, FCR, egg production, egg quality and antibody titer against the Newcastle disease and Avian Influenza were found in Aseel chickens.</li> <li>4. This genetically improved stock of Aseel can be further utilized by crossing them with some other heavy breeds of chicken like Black Australorp and Rhode Island in order to produce a hybrid slow-growing meat-type chicken which would not only have good production performance but also exhibit high robustness and thermotolerance. It is also likely that if sufficient local production level is achieved this hybrid chicken can be exported to some neighboring countries. Likewise, many companies in western countries are producing and exporting the slow-growing meat-type chickens.</li> </ol>
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					<p>5. Due to significant share of Aseel blood these birds can be rear without environmentally controlled houses (ECHs), and with minimal usage of medicines and vaccines. All this would lead to reduce the cost of production and also the production of organic chicken at economical prices.</p> <p>6. Additionally, due to the presence of colored plumage and pea comb these birds would look like Desi chicken and would be preferred by the local consumers.</p>
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129	1008	Evaluation of Antimicrobial Potential of citrus fruit waste for sustainable and socially acceptable poultry production in Pakistan	UVAS	1 Years (2019-20)	5.0	<ol style="list-style-type: none"> <li>1. Developed and explore natural, economical and effective antimicrobial agents without side effects from waste material of citrus processing industry.</li> <li>2. Deployment of five (05) different extraction techniques. i) solvent extraction, ii) decoction, iii) hot water extraction, iv) ultrasonication, and v) steam-distillation,</li> <li>3. Steam distillation extraction technique was found and proved efficient, economical and green way of extraction for citrus waste on the basis of antimicrobial potentials.</li> <li>4. Exploration of citrus fruit waste proved a natural alternative to synthetic antimicrobial preparation/feed additive for poultry production in Pakistan with value added prospective.</li> <li>5. It was a pilot project, and on the basis of this project the devised green extraction protocols can be applicable for extraction of bioactive components from other agro industrial waste as well.</li> </ol>
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130	685	Development of Indigenous Inactivated Equine Influenza (EI) Vaccine and Comparative Efficacy Study Versus Imported Vaccines	UVAS, Lahore	3 Years (2018 - 2021)	9.017	<ol style="list-style-type: none"> <li>1. Surveillance of Equine influenza in three randomly selected districts in Punjab was done. Outbreak investigation, active case finding and cross-sectional survey study was conducted, positive samples were plotted on digital maps using GIS mapping.</li> <li>2. Inactivated Equine Influenza (EI) vaccine comprising local isolated virus was prepared. Montanide IMS 3012 ready to dilute adjuvant was used for vaccine preparation. Prepared vaccine was tested in guinea pigs and donkeys showed effective immune response</li> <li>3. Locally develop inactivated vaccine potency was compared with internationally available Bioequin vaccine. Results showed that both indigenous and imported vaccine had same response after administration of booster dose and virus challenge studies</li> <li>4. Results were shared with VRI, Lahore, LPRI, Okara and two private pharmaceutical companies dealing in biologics of livestock. VRI has maintained the seed of virus and they are committed to prepare vaccine on need basis. Whereas the private companies appreciated and acknowledged the indigenous prepared equine influenza vaccine and are willing to take up the product as per market demand.</li> </ol>
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131	1001	Assessment of Antibiotics, Steroids and Hormonal Risk Factors in Poultry Meat and Eggs in Punjab	UVAS	3 Years (2018-20)	37.325	<ol style="list-style-type: none"> <li>1. It was proved that the growth hormones (testosterone, estrogen &amp; progesterone) were not being fed to broilers. However, some antibiotics are being fed to the birds consistently throughout the surveyed districts of Punjab which can produce the drug residues in poultry meat.</li> <li>2. Results of project proved that residual concentration of hormones and antibiotics was found below the MRL values set by International standards of different organizations like WHO.</li> <li>3. It was further proved that steroid hormones and therapeutic antibiotics didn't improve the growth and production rates in broilers and layers but only increased the input costs. Even, some of the treatments of hormones and antibiotics adversely affected the growth and production performance in broilers and layer birds.</li> <li>4. The results of this project, nullified the myth regarding the use of steroid hormones &amp; therapeutic antibiotics in poultry to obtain high growth and production rates.</li> </ol>
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132	599	Pre- and post-harvest management of aflatoxin contamination in groundnut	BARI, Chakwal	4 Years (From 01-09-2017 to 31-08-2021)	28.465	<ol style="list-style-type: none"> <li>1. It was concluded that by soil amendment with gypsum, farm yard manure (FYM) and cereal crop residue (CCR) in single or in combination decreased aflatoxin contamination up to 70% in groundnut kernel.</li> <li>2. It was also concluded that aflatoxin from groundnut kernel decreased up to 80% when aflatoxin contaminated groundnut kernel dipped in fresh lemon juice followed by heating for ten minutes. This method is recommended for use in confectionery products to reduce aflatoxin in permissible level.</li> <li>3. For long term storage of groundnut cotton and paper made bags proved better than aluminum and polythene bags to minimize aflatoxin contamination.</li> <li>4. Application of foliar fungicides have no impact to reduce aflatoxin contamination in groundnut.</li> </ol>
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133	929	Phenotypic and genotypic exploration of worldwide carrot ( <i>Daucus carota</i> L.) Germplasm to enhance its value-added application in Pakistan	LCWU- Lahore VRI- AARI & Post-harvest Research Institute, AARI Faisalabad	3 Years (From 01-05-2018 to 30-06-2021)	5.6 Million	<ol style="list-style-type: none"> <li>1. Acquired carrot germplasm of 400 accessions from United State Department of Agriculture (USDA). This precious germplasm is being used in the carrot hybridization program for the development of high nutritional value carrot varieties acclimatized to local environment.</li> <li>2. Two pairs of male sterile lines (A lines) along with their respective maintainer (B line) have been identified from the exotic germplasm that is being used for development of carrot hybrid varieties locally.</li> <li>3. Identified red core, white core and orange color carrot line with marketable root size.</li> <li>4. Three carrot products i.e., carrot and orange mix juice, jam and candies were developed being rich in <math>\beta</math>-carotene &amp; high antioxidants enzymes.</li> </ol>
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134	1093	Development of bioherbicides containing allelopathic bacteria for weeds suppression in direct-seeded rice	Institute of Soil and Environmental Sciences, University of Agriculture Faisalabad	36 Months (From 01-07-2019 to 30-06-2022)	5.992 Million	<ol style="list-style-type: none"> <li>1. Allelopathic bacteria have been isolated from rhizosphere of rice and its associated weeds i.e, "Ghora Ghas" and "Madhana Ghas". Screened allelopathic isolates were positive for cyanide and E. Coli antimetabolite production. The selected strains also exhibited plant growth promoting characteristics, thus ensuring dual nature to act as biofertilizer and bioherbicide. Molecular identification revealed that all the isolates belonged to Pseudomonas spp.</li> <li>2. It was concluded that use of allelopathic strains and 50% herbicide level, reduced the weed density of Ghora ghas up to 28% and 27% for Madhana ghas under different field trials.</li> <li>3. A significant increase in number of tillers (16-24%) per plant and grain yield (10-19%) of weed-infested rice was recorded by the use of selected allelopathic strains with 50% herbicides as compared to control.</li> <li>4. Promising results from this pilot-scale study motivate the scientist to extensively evaluate and fine-tune the bioherbicide (containing bacterial consortium) for different agro-ecological zones, for several weeds of other cereals and legumes before commercialization.</li> </ol>
135	904	Nutrition enhancement of crops, fruits, vegetables and their products under climate change scenario	Ayub Agricultural Research Institute, Faisalabad	5 Years (01.11.2017 to 31.10.2022)	349.8	<p><b>1. Wheat Research Institute, Faisalabad:</b></p> <ul style="list-style-type: none"> <li>• Sixty eight (68) genotypes having high zinc and iron contents were acquired from CIMMYT, Mexico.</li> <li>• One advance line V-17086 having Zn 41.0</li> </ul>

					<p>mg kg<sup>-1</sup> and Fe 45.2 mg kg<sup>-1</sup> contents completed two years of testing in NUWYT.</p> <ul style="list-style-type: none"> <li>• Standardized the method &amp; doses of Zn &amp; Fe for foliar application for maximum accumulation of zinc and iron contents in grains.</li> </ul> <p><b>2. Barani Agricultural Research Institute, Chakwal:</b></p> <ul style="list-style-type: none"> <li>• Screened ten nutrient efficient and high yielded lines of wheat.</li> <li>• Three nutrient efficient high yielding lines tolerant to drought &amp; diseases were developed for the development of future nutrient enriched wheat varieties.</li> </ul> <p><b>3. Regional Agricultural Research Institute, Bahawalpur:</b></p> <ul style="list-style-type: none"> <li>• Developed wheat variety Nawab-21 for general cultivation in Punjab during the year 2021.</li> <li>• One advance wheat line BF-1807 completed 2 years of testing in National Uniform Wheat Yield Trials and DUS studies.</li> </ul> <p><b>4. Oilseeds Research Institute, Faisalabad:</b></p> <ul style="list-style-type: none"> <li>• Screened 166 Canola lines/strains/varieties for Omega-3 fatty acid through NIR and 5.01% -13.30% Omega-3 range was observed.</li> <li>• 150 Sunflower inbred lines/hybrid were</li> </ul>
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					<p>screened for Omega-9 fatty acid 11.16% - 70.22% range was observed through NIR.</p> <ul style="list-style-type: none"> <li>• One high Omega-3 Canola variety “Rachna Canola” and one Sunflower hybrid having high omega-9 “ORISUN-701” have been approved by Punjab Seeds Council during 2021.</li> </ul> <p><b>5. Rice Research Institute, Kala Shah Kaku:</b></p> <ul style="list-style-type: none"> <li>• Developed &amp; approved two rice varieties Super Basmati 2019 and PK 2021 aromatic with improved Fe &amp; Zn contents during 2019 &amp; 2021.</li> <li>• Spot examination of 2 advance rice lines PK 10029 &amp; SDSR 1 was conducted during 2022.</li> <li>• Twelve (12) advance rice lines with improved iron (Fe) and zinc (Zn) were developed/selected further use in breeding programme .</li> </ul> <p><b>6. Maize and Millets Research Institute (MMRI), Sahiwal &amp; Maize Research Station (MRS), Faisalabad:</b></p> <ul style="list-style-type: none"> <li>• Three maize hybrids developed at MMRI (MNH-06, MNH-20 &amp; MNH-56) and two maize hybrids developed at MRS (FH-1884 and FH 1954) were tested in DUS and NUYT during 2022.</li> </ul> <p><b>7. Mango Research Institute, Multan:</b></p> <ul style="list-style-type: none"> <li>• A total of 2175 soil samples, 1008 leaf samples and 558 fruit samples were</li> </ul>
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						<p>evaluated for commercial varieties.</p> <p><b>8. Agronomic Research Institute, Faisalabad:</b></p> <ul style="list-style-type: none"> <li>• Significant improvement for Fe, Zn and B content in grains of wheat, chickpea, canola, mungbean and in tomato done successfully.</li> </ul> <p><b>9. Citrus Research Institute, Sargodha:</b></p> <ul style="list-style-type: none"> <li>• Best storage stability was achieved in kinnow waxed enriched with Potassium Sorbate 6% packed in corrugated cartons) during 90 days storage study at constant climate chamber.</li> </ul> <p><b>10. Biochemistry Section, Post-Harvest Research Centre:</b></p> <ul style="list-style-type: none"> <li>• 3354 samples received and analyzed for their proximate quality parameters under the project.</li> </ul>
136	909	Identification of post-emergent herbicides and Development of herbicide tolerant genotypes.	Pulses Research Institute Faisalabad	5 years (From 01-10-2017 to 30-06-2022)	27.498 Million	<ul style="list-style-type: none"> <li>• 763 genotypes were screened against more than 20 available post-emergent weedicides at different doses.</li> <li>• Four genotypes of Desi Chickpea D-10004, D-05002, D-16004 and D-17026 showed tolerance against Flumetsulam (FTN), carfentraone and Isoproturone while sixteen genotypes D-16019, D-06004, D-89129, D- 90222, D-93275, D-94038, D-96022, K-16025, K-16026, K-16027, K-204015, K-204016, K-96030, K-70008, K-01126 and K-01136 are moderate tolerant.</li> <li>• Desi chickpea line D-05002 and Kabuli</li> </ul>

						<p>chickpea genotype K-16025 produced highest grain yield of 2777 kg/ha and 2166 kg/ha respectively in advance and micro yield trials.</p> <ul style="list-style-type: none"> <li>• The tolerant lines are being successfully used in regular breeding programme for the development of herbicide tolerant cultivars of chickpea.</li> <li>• Usages of post emergence herbicide Flumetsulam (FTN) @ 30 g/acre proved effective for the control of weeds and now it is also available in the local market with the name of cardinal from Kanzoo Company.</li> </ul>
137	910	Development of Weedicide Tolerant Lentil Germplasm and Identification of Different Weedicides for Weed Control in Lentil	Pulses Research Institute, AARI Faisalabad	5 Years (From 01-10-2017 to 30-09-2022)	16.551 Million	<ul style="list-style-type: none"> <li>• More than 300 lentil genotypes were screened against more than 30 available post emergent herbicides at several doses.</li> <li>• On the basis of weedicide screening trials PLL-11513 is selected as tolerant genotype against narrow and broad leaves weedicides viz, Flumetsulam, Carfentrazone and Oxyflorofen.</li> <li>• Forty two (42) different cross combinations were attempted to develop the weedicide resistant lentil varieties. These crosses are in evaluation of different filial generation i.e. upto F6 generation</li> <li>• Selected &amp; recommended 3 post emergent effective herbicides Carfentrazone(AIMS), Flumetsulam (FTN) and Oxyflorofen selected. The recommend doses of Flumetsulam (FTN) &amp; Carfentrazone is 20g/acre and for Oxyflorofen is 100ml/ac.</li> </ul>

138	1057	Development of innovative techniques for plant multiplication, canopy management and value-addition of promising ber ( <i>Ziziphus mauritiana</i> ) varieties	Muhammad Nawaz Shareef University of Agriculture, Multan University of Agriculture, Faisalabad	3 Years (From 01-05-2019 to 31-04-2022)	9.4 Million	<ul style="list-style-type: none"> <li>• Developed novel ber products successfully such as jujube jam, jujube jelly, Jujube pickle, jujube syrup, jujube preserve, dehydrated jujube, candied jujube and jujube tea.</li> <li>• Three new cultivars were collected and added in GPU.</li> <li>• One China cultivar and some Spine less cultivar were also imported and transplanted at MNS University farm.</li> <li>• Different cultivars were grafted on rootstock of China to develop new cultivars of ber.</li> <li>• MOU was signed with departmental store for commercialization of ber products including dehydrated ber and ber pickle.</li> <li>• Published recipe booklet on ber for general public and interested future collaborator and stakeholders.</li> <li>• Developed Ber orchard successfully in Saline land of Jalalpur Peerwala.</li> </ul>
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139	532	Development of Short Duration, High Yielding and Disease resistant Mungbean Cultivars for Rice-Wheat cropping System	Pulses Research Institute Faisalabad	5 years (From 01-6-2015 to 31-05-220)	30.440 Million	<ul style="list-style-type: none"> <li>• An elite Mungbean line MPP 15024 developed in this project, was approved with the name NIAB-PRI Mung by Punjab Seed Council in its 56th meeting (March 24, 2023) for general cultivation in the Punjab province.</li> <li>• This variety NIAB-PRI Mung matures in 60 days as compared to normal maturity period of 75-80 days of existing cultivars and ideally fit in Rice-wheat cropping pattern as a catch crop. This mungbean variety is also equally good as normal crop in summer season which reflects its wider adaptability.</li> <li>• Various mutants and recombinants were also developed and have been included in existing Breeding programs for the development of new mungbean varieties in future.</li> </ul>
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