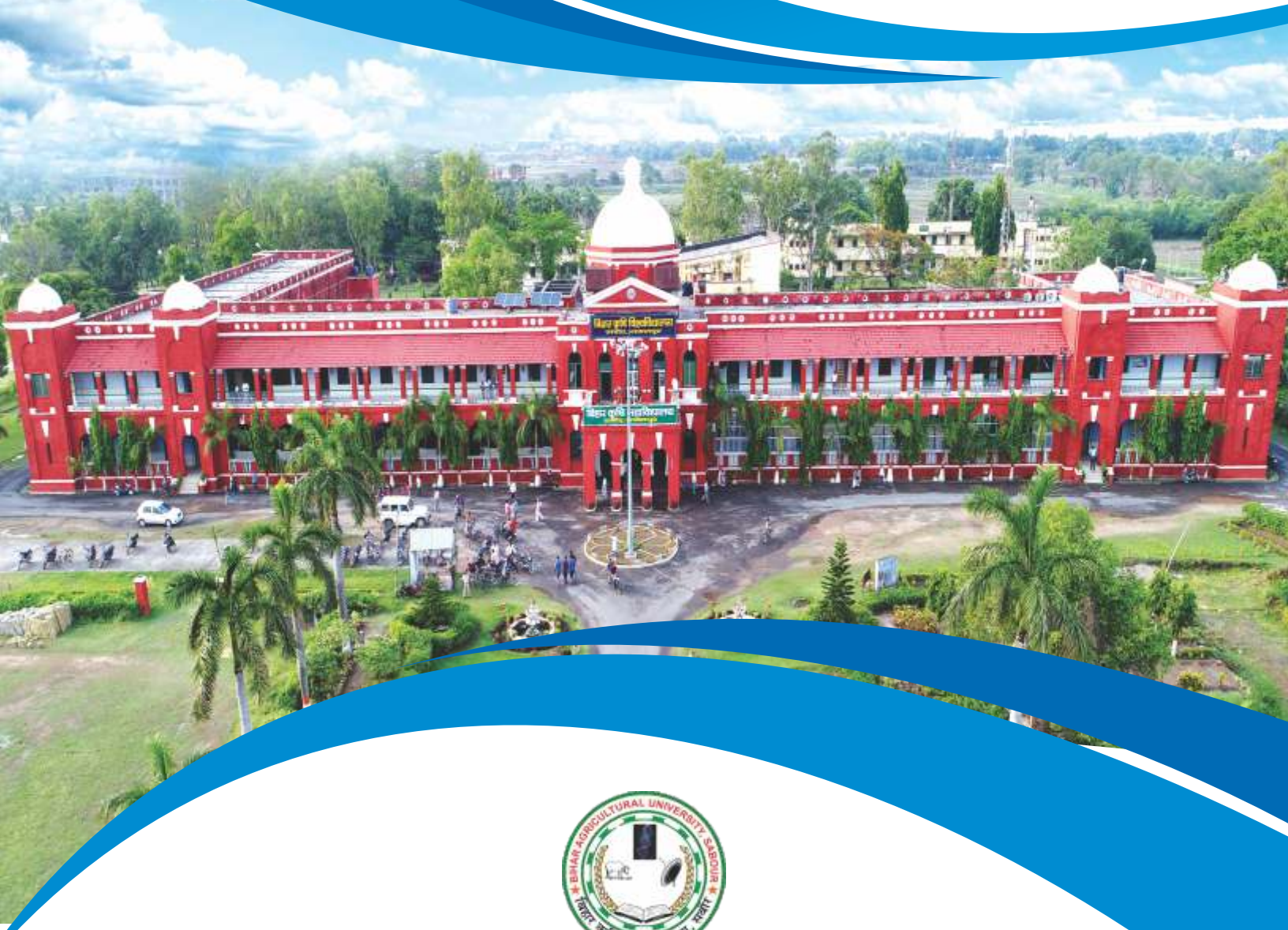
वार्षिक प्रतिवेदन
Annual Report
2016-17



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PREFACE

Agriculture is facing numerous challenges including enhancing the food production to feed burgeoning population under shrinking land resources coupled with uncertainties posed by the climate change. India through its sustained efforts has achieved remarkable success in food grain production. Bihar being largely an agrarian state has huge potential to address the food and nutritional needs of the country. Bihar Agricultural University is only state agricultural university of Bihar state having a great responsibility of helping farmers to enhance the agricultural productivity by providing suitable farm technologies.

For developing quality human resources, the university is carrying out undergraduate/postgraduate & doctoral programmes through its eight constituent colleges. In pursuit of imparting quality education along with maximum practical exposure, university has adopted academic automation system and also implemented the V Deans committee recommendations from the year 2016-17. A total of 354 undergraduate, 93 postgraduate and 23 Ph.D students have been enrolled at various constituent colleges during the academic year 2016-17 and 183 students awarded degrees during the convocation held on 6th February, 2017. Among the various SAUs, central and deemed universities, BAU has obtained 24th rank within a span of seven years of its inception indicating the quality of teaching, research and extension.

The university has made a considerable progress in the field of research through its multi-layered research approach comprising vast networking of different colleges and regional research stations in 3 different agro ecological zones of the state. A total of 206 research projects funded by state, national and international funding agencies were carried out during the year 2016-17. University in its short span has developed and released various important varieties of paddy (Sabour Surbhit, Sabour Shree, Sabour Ardhjal & Sabour Deep), wheat (Sabour Samridhi, Sabour Shrestha & Sabour Nirjal), cauliflower (Sabour Agrim) and many more technologies which are performing well in diverse climatic conditions. The university has organized an international symposium on Lychee, Longan and other Sapindaceae fruits and National Conference on Bringing Self Sufficiency in Pulses for Eastern India along with various workshops and training programmes besides its routine programmes.

Extension Education is an important wing of the university to connect to the grassroots. The university thrives to reach maximum number of farmers through its various initiatives viz., *Kisan Chaupal, Kisan gyan rath*, etc. During 2016-17 university has reached farmers for the application of agricultural technologies through various programmes like Front Line Demonstrations (12,965), On Farm Trials (183), cluster FLDs (4024) etc. Apart from that, the university has also conducted programmes viz., Pre-*Rabi* and *Kharif Samellan* (12,891), World Soil day, *Jai Jawan Jai Kisan* week, *Parthenium* Awareness week etc.

University through its electronic media and production centre has developed 30 short films on agriculture an allied sector for effective dissemination of technology. During the year 2016-17, 435 videoconferences were conducted in which 23,915 farmers participated. Besides, university has also provided 3,361 advisories through mobile messaging service. Training courses sponsored by BAMETI, ATMA, NIAM, MANAGE, NABARAD, CIMMYT were also conducted by the university for farmers, farmwomen and extension functionaries.

This annual report presents various developmental activities and achievements of the university during the year 2016-17. I am confident that the report would increase the visibility of the university and its contribution at national level and thereby, the university would receive an arm of further support from various national and international organizations for the upliftment of farming community of Bihar.

I acknowledge the effort of the deans, directors, registrar, comptroller, principals, chairmen/heads of the departments, Scientists and other senior officials of the university in providing the required information well in time. I appreciate the efforts med by editorial team to compile, edit and bring out the report in time.

(Ajoy Kumar Singh)

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कार्यकारिणी सारांश

05 अगस्त, 2010 को स्थापित बिहार कृषि विश्वविद्यालय, सबौर ने अपने स्थापना के 7 वर्ष पूर्ण कर लिये हैं। 2016–17 में विश्वविद्यालय द्वारा अर्जित की गई महत्वपूर्ण उपलब्धियो को संक्षेप में नीचे दी गई हैं।

- विश्वविद्यालय में संचालित विभिन्न संकाय यथा कृषि, पशु चिकित्सा एवं दुग्ध विज्ञान प्रौद्योगिकी के अन्तर्गत स्नातक एवं स्नातकोत्तर की उपाधियाँ प्रदान की जाती है। स्नातकोत्तर की उपाधियाँ कृषि विज्ञान के 14 विषयों, पशु चिकित्सा विज्ञान के 13 विषयों तथा दुग्ध विज्ञान प्रौद्योगिकी के एक विषय में तथा विद्या वाचस्पति (Ph.D) की उपाधि कृषि संकाय के 06 विषयों एवं पशु चिकित्सा विज्ञान के 05 विषयों (कुल 34 सीटों) में प्रदान की जाती है।
- दिनांक 3 फरवरी 2017 को विश्वविद्यालय का तीसरा दीक्षांत समारोह आयोजित किया गया जिसमें श्री रामनाथ कोविन्द, महामहिम राज्यपाल, बिहार की गरिमामयी उपस्थिति में कुल 128 स्नातक एवं 55 स्नातकोत्तर विद्यार्थियों को उपाधियाँ प्रदान की गई।
- विश्वविद्यालय मे शोध के पाँच (5) मुख्य कार्यक्रमों यथाः (1) फसल सुधार, (2) प्राकृतिक संसाधन प्रबंधन, (3) फसल सुरक्षा, (4) उत्पाद विकास एवं विपणन, (5) सामाजिक विज्ञान एवं (6) पशु विज्ञान के माध्यम से कुल 222 परियोजनाये चल रही है, जिसमें 122 राज्य, 38 राष्ट्रीय एवं 12 अर्न्तराष्ट्रीय वित्त पोषित परियोजनायें है।
- फसल सुधार कार्यक्रम के अन्तर्गत, चिन्हित लक्ष्यों को प्राप्त करने हेतु पारम्परिक एवं आणविक उपकरणों का उपयोग, धान्य, दलहन, तिलहन, रेशेदार फसलें, सब्जियों, फलों एवं सजावटी पौधों पर शुरू किया गया। विश्वविद्यालय की धान प्रशाखा अभिजात (ईलाइट) प्रजनन लाईनो का अन्तरविभागीय एवं तीन स्तरीय बहुस्थानीय परिक्षण करती है। इसके अलावा धान उत्पादकता में सुधार हेतु बिहार के सभी धान पारिस्थितिक तंत्रों में धान के सुधार हेतु गतिविधियाँ करती है।
- जलवायु की मांग के अनुरूप बिहार के विभिन्न जलवायु क्षेत्रों एवं धान उगाने वाली परिस्थितियों में लगातार ज्यादा उपज देने वाली अभिजात लाईनों की पहचान के अलावा, अनाज की गुणवत्ता, बायो–फोर्टिफिकेसन और मुख्य जैव एवं अजैव तनाव के सुधार हेतु पारम्परिक आनुवंशिक क्षमता एवं आणविक प्रजनन के माध्यम से आनुवंशिक क्षमता को बढ़ाया गया। बी0 ए0 यू0 एवं आई0 ए0 आर0 आई0 की सहयोगात्मक परियोजना यथा ''एशिया एवं दक्षिण अफ्रीका हेतु तनाव शहनशील धान'' के अन्तर्गत कुल 23 प्रयोग जिसमें 13 बहु–स्थानीय प्रयोग को अगात, मध्यम एवं देर से पकने वाले जीनोटाईप जिनमें सूखा, सूखा एवं डूबने के प्रति सहनशीलता हेतु परखा गया।
- भागलपुर का गौरव – ''कतरनी चावल'' एवं अन्य स्थानीय किस्में जिनमें सुगन्ध एवं छोटे दाने का गुण हो, का प्रयोग कतरनी चावल के पौधों की लम्बाई में सुधार, प्रकाश असंवेदनशीलता एवं ज्यादा उपज हेतु किया जा रहा है।
- प्राकृतिक संसाधन के रूप में जल की महत्ता को ध्यान में रखते हुए ऐरोबिक एवं धान की सीधी बुवाई हेतु राज्य के कम वर्षा वाले क्षेत्रों हेतु उपयुक्त जीनोटाईप पर कार्य शुरू किया गया है।
- गेहूँ सुधार कार्यक्रम के अन्तर्गत, विभिन्न जीनोटाईप को समय तथा देर से बुवाई वाली स्थिति हेतु मूल्यांकित किया गया इसके अलावा उर्वरक के प्रति उत्तरदायी जीनोटाईप को अधिकाधिक उपज हेतु मूल्यांकित किया गया। विभिन्न बीमारियों जैसे स्पाट ब्लाच के प्रति प्रतिरोधक प्रभेद हेतु गेहूँ पर कार्य शुरू किया। वर्षाधारित क्षेत्रों के लिए गेहूँ की एक श्रेष्ठ किस्म ''सबौर निर्जल'' विकसित की गई है जिसकी उपज क्षमता 25 से 30 क्विंटल प्रति हेक्टेयर है।
- मक्का सुधार कार्यक्रम के अर्न्तगत प्रजनन एवं बीज उत्पादन, लघु अवधि के संकर या संकुल प्रभेद सहित विशिष्ट मक्का पर कार्य किया गया है। खरीफ मौसम हेतु लघु अवधि के संकर मक्का के विकास हेतु प्रयास किये गये। इनब्रेड लाईनो के विकास एवं मूल्यांकन, स्थानीय प्रयोगों का मूल्यांकन, बहु–स्थानीय प्रयोग,

भूभागीय परीक्षण, एशिया में परीक्षण हेतु गर्मी के प्रति सहनशील मक्का, फास्ट ट्रैक परीक्षण एवं राज्यीय मक्का परीक्षण इत्यादि पर कार्य चल रहा है। उत्पादन एवं उत्पादकता हेतु दलहनी फसलों जैसे चना, अरहर, मूँग इत्यादि में सुधार कार्य किया गया है। इसके अतिरिक्त शीत एवं जलमग्न सहिष्णु अरहर के जीनोटाईप का कार्य प्रगति पर है। देशी एवं काबुली चने के सुधार कार्यक्रम हेतु ए0आई0सी0आर0पी0 के अन्तर्गत विभिन्न प्रयोग किये गये हैं।

- रेशेवाली फसलों में रेशे की उत्पादकता, गुणवत्ता और पौधों की उँचाई में सुधार हेतु विभिन्न प्रयोग जूट **(कारकोरस केपसुलेरिस एवं सी0 ओलीटोरियस)** फसल पर किया गया है।
- तिलहनी फसलों के उन्नयन कार्यक्रम के अन्तर्गत, तीसी प्रजनन ए0आइ0सी0आर0पी0 / राज्यीय प्रयोगों के माध्यम से मुख्यतः सिंचित, वर्षाधारित एवं उटेरा दशाओं हेतु प्रभेदों के विकास पर केन्द्रित है। जबकि सरसो प्रजनन देर से बोयी जाने वाली एवं समय से सिंचित दशाओं में बोयी जाने वाली प्रभेदों के विकास के साथ–साथ वाइड क्रॉसिंग के माध्यम से जीन–पूल के विस्तार से संबंधित है।
- सब्जियों एवं फूलों की उपज, गुणवत्ता एवं भंडारणीय मापदंडों में महत्वपूर्ण सुधार लाने हेतु, प्रजनन कार्यक्रमों को टमाटर, बैंगन, लहसुन, लौकी एवं फूलगोभी में क्रियान्वित किया गया है।
- प्राकृतिक संसाधन प्रबंधन (एन0 आर0 एम0) कार्यक्रम का उद्देश्य उच्च कृषि उत्पादकता, लाभप्रदता और पर्यावरणीय स्थिरता के लिए प्राकृतिक संसाधनों का कुशल उपयोग करना है। एन० आर० एम० अनुसंधान समूह व्यापक विश्लेषण के माध्यम से राज्यीय सामाजिक एवं आर्थिक मुद्दो को नेविगेट करने हेतु प्रयासरत है।
- सस्टेनेबल सघनीकरण और विविधिकरण करने हेतु धान आधारित फसल प्रणाली जैसे संकर धान – मक्का+आलू – ज्वार+लोबिया (चारा) और भुट्टे हेतु तथा सब्जी आधारित फसल प्रणाली जैसे प्याज–प्याज लौकी और भिण्डी–फूलगोभी–लौकी विकसित की गई है।
- ''एकीकृत कृषि प्रणाली'' मॉडल को विभिन्न घटकों जैसे क्षेत्रीय फसलें, चारा, सब्जियाँ, डेयरी, मछलीपालन, बकरी पालन, बत्तखपालन और फल इत्यादि के साथ विकसित कर आजीविका सुरक्षा हेतु मूल्यांकित किया गया। ''फार्मर फर्स्ट'' कार्यक्रम के अंतर्गत समन्वित खरपतवार प्रबंधन में रासायनिक खरपतवारनाशियों का धान की सीधी बुवाई में बढ़वार एवं उपज पर प्रभाव का अध्ययन किया गया।
- ''क्रॉप सिमूलेशन'' मॉडलिंग के माध्यम से कृषि तकनीकियों का अनुकूलन एवं फसलों पर जलवायु परिवर्तन के प्रभाव का विश्लेषण किया गया। धान–गेहूँ फसल प्रणाली में पारम्परिक नाइट्रोजन प्रबंधन का मूल्यांकन किया गया।
- धान एवं मक्का आधारित फसल प्रणालियों में संसाधन संरक्षण प्रौद्योगिकी (आर0 सी0 टी0), संरक्षित कृषि और मृदा कार्बन डायनामिक्स को गहनता से अध्ययन किया गया है।
- प्रभावी फसल विशेष जैव उर्वरक कार्यक्रम की तैयारी के लिए प्रभावी माइक्रोबियल आइसोलेट की पहचान अंतिम चरण में है।
- प्राकृतिक संसाधनों के अध्ययन एवं उनके कुशल उपयोग हेतु सुदूर संवेदन एवं जी आई एस तकनीकों का प्रयोग किया गया। मिट्टी की गुणवत्ता, कार्बन डायनामिक्स और जैविक पदार्थ डायनामिक्स का लम्बी अवधि वाले धान आधारित विविध फसल प्रणाली में मूल्यांकन किया गया है।
- आर्सनिक एवं फ्लोराइड प्रदूषण हेतु मिटिगेशन विकल्प पर कार्य किया गया। नैनो टेक्नोलॉजी जैसे नये आयामों को विश्वविद्यालय के शोध कार्यक्रम में समावेशित किया गया। फास्फोरस उपयोग दक्षता (पी यू ई) बढ़ाने हेतु बहुपोषक नैनों–क्ले पॉलीमर, समग्र उर्वरक और आंशिक रूप से अम्लीकृत नैनो–रॉक फास्फेट का विकास, विभिन्न फफूंद रोगजनकों पर नैनो–मेटेरियल के प्रभाव पर अध्ययन और फलों की भंडारण अवधि को बढ़ाने के लिए नैनो–टेक्नोलॉजी में कार्य की शुरूआत की गई है।
- फसल सुरक्षा हेतु सर्वे एवं सर्वीलान्स कार्यक्रम के अन्तर्गत बिहार में प्रमुख कीटों एवं बीमारियों एवं उनके

एकीकृत प्रबंधन में महत्वपूर्ण कार्य किये गये। कीट–शत्रु एवं बीमारियों के प्रबंधन हेतु वैज्ञानिकगण विभिन्न योजनाओं और बेहतर विकल्पों पर कार्यरत हैं। भविष्य में प्रकट होने वाली समस्याओं के समाधान हेतु, फसल सुरक्षा समूह ने अपनी परिचालन क्षमताओं को बढ़ाया और अनुसंधान कार्यक्रम कार्यक्रमों को मजबूत करते हुए किसानों एवं हितकारकों के लिए सेवाओं का उच्चतम संभव स्तर बनाये रखा।

- विभिन्न सब्जियों जैसे बैंगन, मिर्च, आलू, टमाटर, और भिण्डी के कीड़ों एवं बीमारियों का सर्वेक्षण किया गया तथा फोमोसिस ब्लाईट, लेट ब्लाईट और लीफ कर्ल बीमारियाँ एवं बैंगन का फल बेधक और डायमण्ड बैक मॉथ (Diamond back moth) कीट ज्यादातर पाये गए।
- किसानों को लाभान्वित करने हेतु अन्य नाशीजीव प्रबंधन रणनीतियों का धान्य, दलहन, सब्जियों, फलों, पान और जूट इत्यादि फसलों में माननीकरण किया गया। विषाणुजनित रोगों में टमाटर में लीफ कर्ल वायरस का प्रकोप ज्यादा देखा गया है।
- धान के बैक्टीरियल लीफ ब्लाइट का वायरूलेन्स स्पैक्ट्रस अध्ययन किया गया इसके साथ–साथ आशाजनक (प्रोमिसिंग) नर्सरी की स्क्रीनिंग भी की गयी है।
- विभागीय वैज्ञानिकगण फलों एवं सब्जियों के संरक्षण हेतु आधुनिक तकनीकियों पर शोधरत है।
- उत्पाद विकास एवं विपणन अनुसंधान समूह के अन्तर्गत खाद्य विज्ञान एवं प्रौद्योगिकी विभाग विभिन्न उत्पादों एवं फसलोत्तर गुणवत्ता संरक्षण और उन्नयन की तकनीकियों पर कार्यरत हैं। विभाग द्वारा नाइट्रिक ऑक्साइड और बेनजाइल अमीनो प्यूरीन के प्रयोग से परवल का पर्यावरण हितैषी (ईको फ्रेन्डली) संरक्षण का कार्य किया गया। ये दोनो रसायन जी आर ए एस यौगिक है तथा इनका गुणवत्ता एवं पर्यावरण पर कोई हानिकारक प्रभाव नहीं है।
- गुणवत्ता संरक्षण हेतु लीची सल्फरिंग एक व्यवसायिक तरीका है परन्तु स्वास्थ्य पर पड़नेवाले प्रभाव के कारण इसका अत्यधिक प्रयोग स्वीकारीय नहीं है। इसके लिए एक ऐसी मित्रवत तकनीक का विकास किया गया जिसमें पैकेजिंग के दौरान सल्फर सीधे तौर पर फलों के सम्पर्क में नहीं आती। इस तकनीक के परिणाम काफी अच्छे है तथा इसको व्यावसायिक स्तर पर परखने की आवश्यकता है। धान्य, दलहन एवं फलों के विभिन्न सम्मिश्रण से बेक एवं एक्सट्रडिड उत्पाद बनाये गये। इसका उत्तम सम्मिश्रण मक्का (80 प्रतिशत), चावल (10 प्रतिशत) तथा चना (10 प्रतिशत) के मिश्रण से बनाया गया जिसकी संरचना एवं भौतिक गुणवत्ता अच्छी है। यह उत्पाद ग्लूटेन मुक्त है तथा ग्लूटेन एलरजिक लोगो द्वारा उपयोग में लाया जा सकता है।
- कृषि अभियंत्रण माँग के अनुरूप फार्म मशीनेरी तथा फसलोत्तर प्रौद्योगिकी के विकास एवं परिष्कार में कार्यरत है। इस विभाग द्वारा विभिन्न मशीनों जैसे सेल्फ–प्रोपेल्ड सेकेण्डरी टीलेज मशीन, मानक एवं पावर चालित मक्का एवं धान थ्रेसर, इत्यादि का डिजाइन बना के उसको विकसित किया गया है।
- समान किसान सोशल साइस समूह के अन्तर्गत विविध प्रकार की परियोजनाए यथा सूचना एवं प्रौद्योगिकी के कृषि क्षेत्र में विभिन्न पहलू (सहायोगात्मक विडियो उत्पादन, कृषि विज्ञान केन्दों के बीच विडियो कॉन्फ्रेंसिंग, डिजिटल स्टोरी और तकनीकी फिल्मों का यू–ट्यूब पर अपलोड), ब्रांडिंग स्ट्रेटीजी की संरचना एवं विकास, उन्नत कार्यक्रमों का प्रभाव, उत्पादन व्यवस्था की बाधाओं का निराकरण, शोध एवं प्रसार की सिफारिश के अनुक्षेत्र का विकास, धारणीय कृषि क्षेत्र तकनीकों को अपनाने हेतु किसानो को प्रेरित करना, किसानो के व्यवहार की मॉडलिग करना, कृषि शिक्षा की निगरानी एवं मूल्यांकन हेतु सूचकों की पहचान एवं माननीकरण, इत्यादि क्रियान्वित हो रही है।
- कृषि अर्थशास्त्र के क्षेत्र में, किसानो को बाजार से जोड़ने के लिए बाजार का मानचित्रण, उर्वरक सब्सिडी का प्रभाव तथा प्याज के उत्पादन एवं विपणन पर अध्ययन किया गया। ''उर्वरक सब्सिडी का बिहार राज्य मे प्रभाव'' विषयक परियोजना के अन्तर्गत नीति निर्धारण हेतु सिफारिशे दी गयी।
- प्रसार शिक्षा निदेशालय, कृषि तकनीकों के त्वरित हस्तान्तरण के लिये तकनीकी मार्गदर्शन प्रदान करता है

जो किसानों एवं युवाओं में नेतृत्व विकास, कृषि प्रौद्योगिकियों के उचित प्रसार हेतु कृषि उद्यमियों को बढ़ावा देना, युवाओं को कृषि में आकर्षित के लिये प्रयासरत है।

- विश्वविद्यालय के कृषि विज्ञान केन्द्रों ने कृषि तकनीकियों के प्रयोगों में महत्वपूर्ण भूमिका निभाई है। कुल 12,965 अग्रिम पंक्ति प्रदर्शन (एफ०एल०डी०) जिसमें 1,851 धान्य फसलों, 70 तिलहन फसलों में 356 दलहन फसलों, 1,543 सब्जियों, 195 चारा फसलों, 1,960 अन्य फसलों, 1,906 उद्यान फसलों/तकनीकों, 287 उपकरणों, 4,514 पशुधन और 279 महिला सशक्तिकरण की तकनीकों का प्रदर्शन किया गया है। इसके अलावा, विभिन्न फसलों एवं पहलूओं पर कुल 183 ऑन फार्म ट्रायल्स (ओ०एफ०टी०) और 4,024 समूह प्रथम पंक्ति प्रदर्शन भी कृषि विज्ञान केन्द्रों द्वारा किये गये है।
- कृषि विज्ञान केन्द्रों द्वारा पूर्व रबी एवं खरीफ सम्मेलन का आयोजन किया गया जिसमे कुल 12,891 किसानों ने भाग लिया। इसके अलावा वैज्ञानिक सलाहकार कमेटी की बैठक सभी 20 के०वी०के० में आयोजित की गई हैं जिसमे 977 प्रतिभागी शामिल हुए।
- प्रौद्योगिकी प्रदर्शन हेतु औरंगाबाद, सुपौल, जहानाबाद और बांका के कृषि विज्ञान केन्द्रों में एन०आई०सी०आर०ए० (NICRA) परियोजना का परिचालन किया गया।
- पी०पी०वी० एण्ड एफ०आर०ए० (PPV & FRA), 2001 के कार्यक्रम को कुल 7 कृषि विज्ञान केन्द्रों यथा सबौर, औरंगाबाद, बांका, कटिहार, किशनगंज, मुंगेर और पूर्णिया में कार्यक्रम आयोजित किया गया है, जिसमे 1,785 किसानो ने भाग लिया।
- *विश्व मृदा दिवस, जय जवान जय किसान सप्ताह और पार्थोनियम जागरूकता सप्ताह* का आयोजन विभिन्न कृषि विज्ञान केन्द्रों में किया गया जिनमे क्रमशः 7,215, 3,464 और 2,493 किसानों ने भाग लिया। *प्रधानमंत्री फसल बीमा योजना जागरूकता कार्यक्रम* के अन्तर्गत कुल 17,010 किसानों को जागरूक किया गया।
- गांवो की समृद्ध परंपरा को पुनर्जीवित करने हेतु *''किसान चौपाल''* एक अभिनव कदम है तथा यह कार्यक्रम अब पाँच साल पूरे कर चुका है। गत वर्ष (2016–17) में इस कार्यक्रम के माध्यम से कुल 67,132 किसान और 4,721 प्रसार कार्यकर्ता लाभान्वित हुए हैं।
- कृषि विज्ञान केन्द्रों एवं महाविद्यालयों की मदद से मृदा स्वास्थ्य कार्ड योजना के अंतर्गत कुल 18,481 मिट्टी के नमूनों का विश्लेषण कर किसानों को मृदा स्वास्थ उपलब्ध कराया गया है। ये नमूनें कुल 1,073 गांवों के 15,773 किसानो के खेतों से प्राप्त किये गये।
- ''कौशल विकास के माध्यम से कृषि विकास'' विषय पर किसान मेला का आयोजन किया गया, जिसका उद्घाटन डॉ0 ए0 के0 सिंह, उपमहानिदेशक (प्रसार शिक्षा), भा. कृ. अनु. परि., नई दिल्ली द्वारा किया गया। इस किसान मेले में 24,000 किसानो एवं प्रसार कार्यकर्ताओं ने भाग लिया।
- प्रौद्योगिकियों के प्रभावी प्रसार हेतु विश्वविद्यालय ने इलेक्ट्रॉनिक मीडिया और प्रोडक्शन सेन्टर के माध्यम से कुल कृषि एवं सम्बद्ध क्षेत्रों में 30 लघु फिल्मों का निर्माण किया। सभी कृषि विज्ञान केन्द्रों को विडियो कॉन्फ्रेंन्सिंग से अच्छी तरह जुड़े हैं। वर्ष 2016–17 के दौरान कुल 435 विडियो कॉन्फ्रेंन्सिंग की गई जिसमें 23,915 किसानों ने भाग लिया। इसके अतिरिक्त, विश्वविद्यालय ने मोबाइल मैसेजिंग के जरिए कुल 3,361 सलाह जारी कर कुल 61,61,451 किसानों को लाभान्वित किया। इसके साथ–साथ कृषि एवं सम्बद्ध समस्याओं पर कुल 2,275 कॉल और 256 व्हाट्सएप्प के माध्यम से किसानो की समस्याओं का जबाव दिया गया।
- बामेती, आत्मा, नियाम, मैनेज, नाबार्ड, सीमिट और अन्य संस्थाओं द्वारा प्रायोजित कुल 24 प्रशिक्षण कार्यक्रम आयोजित कर 1,039 किसानों, महिला किसान एवं प्रसार कार्यकर्ताओं को प्रशिक्षित किया गया।
- इसके अतिरिक्त कृषि विज्ञान केन्द्रों द्वारा कुल 3,957 विभिन्न प्रकार के कोर्स के माध्यम से 90,450 पुरूषों एवं 27,854 महिलाओं को प्रशिक्षित किया गया। ताड़ एवं ताड़ उत्पादों पर कुल 13 प्रशिक्षण कार्यक्रम एवं उक्त

विषय पर मास्टर ट्रेनर को प्रशिक्षित करने हेतु कुल 12 प्रशिक्षण कार्यक्रम आयोजित कर क्रमशः 2,319 और 172 प्रतिभागियों को प्रशिक्षित किया गया।

- वर्ष 2016–17 के दौरान, विश्वविद्यालय द्वारा धान्य, दलहन, तिलहन, जूट, ढैंचा और सब्जी फसलों का कुल 8678.39 क्विंटल गुणवत्तायुक्त बीज तथा 25 फलों की 90,000 गुणवत्तायुक्त पौधों का उत्पादन महाविद्यालयों, क्षेत्रीय अनुसंधान केन्द्र और कृषि विज्ञान केन्द्रों के माध्यम से किया गया। विश्वविद्यालय द्वारा कुल 205 लीटर फिंगरलिंग्स और कृषि मछली बीज का उत्पादन भी किया गया।
- विश्वविद्यालय के अन्तर्गत कुल 03 सीड हब ए आई सी आर पी (दलहन), बी ए यू, सबौर, कृषि विज्ञान केन्द्र, मुंगेर तथा कृषि विज्ञान केन्द्र, लखीसराय हेतु संचालित है। जिसके माध्यम से कुल 1000 क्विंटल गुणवत्तायुक्त दलहन बीज उत्पादन का लक्ष्य लिया गया।
- विश्वविद्यालय के पुस्तकालय ने 900 फुल टेक्स्ट जर्नल तथा 1,150 सी.ए.बी.आई. बुक्स का फुल एक्सेस अर्जित किया है। पुस्तकालय सी.ई.आर.ए. के माध्यम से कुल 3,625 जर्नलस का ऑनलाईन फुल एक्सेस, कृषि विज्ञान के कुल 490 ऑपन एक्सेस जर्नलस, 'कृषि कोष' का एक्सेस और 'कृषि प्रभा' के माध्यम से 8,096 ई–थिसेस का एक्सेस है। सभी महाविद्यालयों के पुस्तकालय को ई–रिर्सोसिस का ऑनलाईन एक्सेस दिया गया है। पुस्तकालय के दस्तावेजों के स्वचालन एवं डिजिटाइजेशन की शुरूआत की गई तथा अधिकांश नये अभिलेखों को डाटाबेस तैयार किया गया।
- विश्वविद्यालय द्वारा 7वीं वार्षिक अंतर महाविद्यालय स्पोर्टस एवं एथलेटिक प्रतियोगिता के आयोजन के अलावा अंतराष्ट्रीय योग दिवस, स्वच्छता पखवाड़ा और कृषि शिक्षा दिवस मनाया गया।
- विश्वविद्यालय के विभिन्न महाविद्यालयों से कुल 25 छात्र–छात्राओं ने 22–25 फारवरी, 2017 के दौरान राजस्थान के पशुचिकित्सा और पशु विज्ञान विश्वविद्यालय, बीकानेर में आयोजित 17वें एग्री–यूनीफेस्ट, 2016–17 में भाग लिया। इसके अलावा, विभिन्न महाविद्यालयों से कुल 34 छात्र–छात्राओं ने चौधरी चरण सिंह कृषि विश्वविद्यालय, हिसार में 25–29 मार्च, 2017 को आयोजित 17वीं अखिल भारतीय इंटर कृषि विश्वविद्यालय क्रीडा एवं खेल प्रतियोगिता में विश्वविद्यालय प्रतिनिधित्व किया। निबंध लेखन, विचार–विमर्श, वाद–विवाद, वाग्मिता (इलोक्यूशन), प्रश्नोत्तरी प्रतियोगिता जैसी गतिविधियों को नियमित रूप से विश्वविद्यालय के विभिन्न महाविद्यालयों में आयोजित किया गया।
- संकाय विकास योजना (फेक्ल्टी डेवेलपमेंट प्रोग्राम) के अन्तर्गत कुल 05 संकाय सदस्यों का चयन उच्च शिक्षा कार्यक्रमों हेतु किया गया। साथ हीं कुल 31 संकाय सदस्यों/वैज्ञानिकों ने विभिन्न 21 दिवसीय समर/विंटर स्कूल में भाग लिया।
- आई०सी०एफ०ए०, नई दिल्ली द्वारा विश्वविद्यालय को वैश्विक कृषि नेतृत्व अवार्ड से सम्मानित किया गया। इसके अलावा कृषि विज्ञान केन्द्र, हरनौत को बेस्ट कृषि विज्ञान केन्द्र अवार्ड (जोनल) से सम्मानित किया गया। विश्वविद्यालय में कार्यरत वैज्ञानिकों को विभिन्न प्रकार के कुल 49 अवार्ड से सम्मानित हुए।
- विश्वविद्यालय द्वारा ''हैपनिंग बीएयू'' नामक अंग्रेजी में साप्ताहिक समाचार–पत्र और ''बी०ए०यू० एक नजर'' नामक हिन्दी में पाक्षिक समाचार बुलेटिन नियमित रूप से प्रकाशित किया गया। वर्ष 2016–17 के दौरान 152 से अधिक शोध पत्र, 25 पुस्तक अध्याय और बहुत सारे सम्मेलन पत्र और प्रसार लेख के प्रकाशन का श्रेय विश्वविद्यालय को है। इसके अलावा विश्वविद्यालय के अन्य प्रकाशन जैसे बिहार किसान डायरी (वार्षिक), कृषक संदेश (त्रैमासिक पत्रिका), किसान समाचार (त्रेमासिक), कृषि कैलेण्डर के साथ विभिन्न कृषि साहित्यों का प्रकाशन भी किया गया है।

EXECUTIVE SUMMARY

Bihar Agricultural University, Sabour has now completed seven years of service since its establishment on August 5, 2010. The significant achievements of university's mandated activities for the year 2016-17 are summarized below:

- University offers courses for the award of under-graduate and post-graduate degrees through its different faculties namely, Faculty of Agriculture, Faculty of Veterinary Sciences and Faculty of Dairy Technology. Post-graduate programmes are being offered in 14 disciplines of Agricultural Sciences, 13 disciplines of Veterinary Sciences and one in Dairy Technology with intake capacity of 148 seats. The university also offers Ph. D programme in selected disciplines of Agriculture (06) and Veterinary Sciences (05) with an intake capacity of 34 seats.
- The third convocation of the university was observed on 3rd February, 2017, presided by Sri Ram Nath Kovind, His Excellency Governor of Bihar. A total of 128 undergraduate and 55 postgraduate were awarded degrees in their respective faculties/disciplines.
- The research programme in the university was executed with six key groups *viz.,* (1) Crop Improvement, (2) Natural Resource Management, (3) Crop Protection, (4) Product Development & Marketing, (5) Social Sciences and (6) Animal Science through 222 projects including 172 in-house, 38 nationally and 12 internationally funded projects.
- Under Crop improvement programme, experiments on cereals, legumes, oilseed, vegetable, fruit, ornamental and fibre crops have been commenced through utilizing conventional as well as molecular tools to attain targeted goals.
- Rice section of the university organized inter-disciplinary and three tier multi-locational testing of elite breeding lines in addition to rice improvement activities for all the rice ecosystems of Bihar to improve the rice productivity.
- Apart from identification of elite lines with consistent high yield potential for various agro-climatic regions and rice growing ecologies of Bihar, Grain quality, bio-fortification and improvement for major biotic and abiotic stresses were taken to address the needs of ecology; conventional heterosis and molecular breeding approaches are intensively pursued to progress the genetic potential. Under BAU-IRRI collaborative 'Stress Tolerant Rice for Asia and South Africa' (STRASA) project total 23 trials including 13 multi-location trials, were conducted for screening of genotypes of early, medium and late maturity having QTLs for drought and drought + submergence tolerance for unfavourable climatic situations of Bihar.
- The improvement of aromatic rice "*Katarni"* and other local landraces having aromatic and short grain characters were evaluated to attain improvement with respect to plant height, photo-insensitiveness and high yield.
- The water is very imperative and depleting natural resource. Keeping this in view, the research programme on aerobic and direct seeded rice trials are being pursued to develop the suitable genotypes for less rainfall receiving areas of the state.
- Under wheat improvement programme, various sets of genotypes were evaluated for timely and late sown conditions to check out promising genotypes for late sown condition. Various fertiliser responsive genotypes were evaluated for higher yield. Wheat breeding for developing disease resistance lines has been initiated. *Sabour Nirjal*, a superior variety for rainfed ecosystem has been developed with a yield potential 25-30 q/ha.

- Under the maize improvement programme, breeding & seed production, development of short duration hybrids/composites and development of speciality corn are few important initiatives. Efforts also made to develop short duration hybrid maize for *kharif* season. Development and evaluation of inbred lines, evaluation of station trials, multi -location trials, strip test, heat tolerant maize for Asia trials, fast track trials, and state maize varieties trials are going on.
- Improvement of pulses like chickpea, pigeonpea, mungbean for production and productivity enhancement were carried out. Cold and submergence tolerant pigeon pea genotype development is under progress. Under chickpea improvement program, various trials of AICRP on Chickpea (Desi and Kabuli) programmes have been conducted.
- Under fibre improvement programmes, various trials of Jute (*Corchorus capsularis* and *C. olitorius* both) have also been conducted for fibre yield, fibre quality and plant height.
- Under oilseed improvement programme, linseed breeding at BAU focuses mainly on development of varieties for irrigated, rainfed and *Utera* conditions under AICRP/state trials, whereas mustard breeding is mainly concerned with development of varieties for late sown and timely sown irrigated condition along with broadening of gene pool through wide crosses.
- In order to bring significant improvement in yield, quality and storability parameters among vegetables, the breeding programmes have been undertaken in tomato, brinjal, garlic, bottle gourd and cauliflower.
- Under Natural Resource Management (NRM) group activities like sustainable intensification and diversification of rice based cropping systems like Hybrid Rice- Maize + Potato - Sorghum + Cowpea (Fodder) and Rice(S)- Potato+ Radish – Onion + Maize (relay cropping) for green cob and vegetable based cropping system like Onion - Onion- Bottle gourd and Okra-Cabbage-Bottle Gourd were evoked after a thorough research.
- Integrated farming system model with various components like field crops, fodder, vegetables, dairy, fishery, goatry, duckery and fruits were developed and evaluated for livelihood security.
- Optimization of agro-techniques and impact analysis of climate change on crops though crop simulation modelling approach was carried out. Precision nitrogen management was evaluated for improving productivity and to enhance nitrogen use efficiency in rice-wheat system.
- Resource Conservation Technology (RCT), conservation agriculture and Soil-carbon dynamics under rice based cropping system and maize based cropping system were intensively studied.
- Identification of efficient microbial isolates for the preparation of effective crop specific biofertilizer programme is at final stage.
- Remote sensing and GIS approach was applied to study natural resources and the way out for their efficient utilization. Studies were conducted on soil quality, carbon sequestration and organic matter dynamics under various long term rice base diversified cropping system.
- Mitigation options for arsenic and fluoride contamination was also carried out. Nanotechnology, a new dimension was also included in the University research activities. Development of multi nutrient nano-clay polymer composite fertilizer, partially acidulated nano-rock phosphate for increasing Phosphorus use efficiency (PUE), studies on effect of different nano-material on various fungal pathogens and development of novel nano-polymer for increasing shelf life of fruits were the few initiative under the agies of the nanotechnology.
- Crop Protection group has made significant contributions in survey and surveillance of key insect pests and diseases of major crops in Bihar and integrated management of important agricultural pests and pathogens.
- The scientists have designed several strategies and implement for hunting a better option to manage the

insect-pests and diseases infestation in various crops.

- To address the future problems, the group has increased operational efficiencies and maintained the highest possible level of services to the farmers and stakeholders while strengthening the research programs.
- Diseases and insects on vegetables like brinjal, chilli, potato, tomato and okra were surveyed and diseases like phomopsis blight, late blight and leaf curl and insects like brinjal shoot and fruit borer and Diamond back moth were found to be most prevalent in the area.
- Several other pest management strategies were also standardized on cereals, pulses, vegetables, fruits, beetle vine and jute to generate information for farmers benefit.
- Virulence spectrum of bacterial leaf blight pathogen of rice was characterized. Evaluation of promising varieties was also performed at the screening nurseries.
- The scientists are involved in the research on preservation of fruits and vegetables using modern technologies.
- Under Product development and Marketing research group The food science and technology department is mainly working on several products and technologies for postharvest quality preservation and improvement. The department has achieved eco-friendly postharvest quality preservation pointed gourd using nitric oxide and benzyl amino purine. Both the chemicals are Generally Recognized As Safe (GRAS) and do not affect produce quality and environment.
- Litchi sulphuring is a commercial practice for quality preservation. However excess use of sulphur is not allowed due to several health effects. A user friendly technique of in package sulphuring has been developed where fruits do not directly come in touch with sulphur. The results were quite appreciable and need to verify at commercial level. Different combinations of cereals, pulses, and fruits have been made to prepare baked and extruded products. The best combination for the products with good sensory (texture) and physical qualities was maize (80 %), rice (10%) and gram (10%). The products developed are gluten free products and can be used by the gluten allergic persons.
- Agricultural engineering is engaged in development and refinement of need based farm machinery and post-harvest technology. The department has designed and developed number of machines like self-propelled secondary tillage machine, manual-cum-power operated maize-cum-paddy thresher etc.
- The social science group covered diverse areas like of Information and Communication Technologies (ICTs) in the agricultural sector (participatory video production, interconnectivity of the KVKs through video conferencing facilities, digital storytelling and outreach of videos through the internet), design and development of branding strategies and impact study of innovative programs, assessment of production system constraints and development of research and extension recommendation domains, farmers motivation to adopt sustainable farm technology and modelling farmers behaviour, identification and validation of indicators for monitoring and evaluation of agricultural education and related aspects.
- In the field of agricultural economics, studies on market mapping for linking farmers to the market, impact of fertilizer subsidy and production and marketing of onion in Bihar were carried out.
- Extension education is an important wing of the university which acts as link between lab and land. It deals with the important aspects like leadership development among farmers and rural youths, promotion of Agri-entrepreneurs for proper dissemination of agricultural technology and attracting youth to agriculture. The successful Self Help Groups (SHGs) and their impact on socio-economic status have been analysed in details for further promotion of SHGs in the villages.
- Agricultural economics conducted the studies on agricultural production system and their constraints in Agro-climatic Zone-II of Bihar. Studies on value chain analysis of chickpea and pigeon pea in Bihar

revealed the need for developing strong market linkages, market information systems and collection centre for every producer.

- Krishi Vigyan Kendra of the university played an important role in facilitating application of agricultural technologies. A total of 12,965 Front Line Demonstrations (FLDs) were conducted i.e., 1,851 on cereals, 70 on oilseeds, 356 on pulses, 1,543 on vegetables, 195 on fodder crop, 1,960 on other crops, 1,906 on enterprises, 287 on implements, 4,514 on livestock and 279 on women empowerment. Besides, a total of 183 On Farm Trials (OFT) and 4,024 cluster FLDs were also conducted by the KVKs on different crops/aspects.
- Pre-*Rabi* and *Kharif Samellan* were organized by the different KVKs wherein a total of 12,891 farmers have participated. Besides, Scientific advisory committee meetings have also been organized at 20 KVKs benefitting 977 participants.
- The NICRA project is running under the jurisdiction of four KVKs at Aurangabad, Supaul, Jehanabad and Banka for technology demonstrations. The programmes of PPV & FRA were organized at seven KVKs benefitting 1,785 farmers.
- *World Soil day*, *Jai Jawan Jai Kisan* week and *Parthenium Awareness week* were also observed at different KVKs benefitting a total of 7,215, 3,464 and 2,493 farmers, respectively. Under *Pradhan Mantri Fasal Bima Yojana*, a total of 17,010 farmers were educated.
- *Kisan Choupal*, an innovative step to revive the rich tradition of the villages successfully completed five years now. A total number of 67,132 farmers and 4,721 extension functionaries were benefitted through *Kisan Choupal* during the year under report.
- Under *Soil Health Card* scheme, a total of 18,481 soil samples were analysed covering 15,773 farmers from 1,073 villages through KVKs and Colleges of the university.
- *Kisan Mela* on the theme of 'Agriculture Development through Skill Development' was organised which was inaugurated by Dr. A.K. Singh, DDG (Agricultural Extension), ICAR, New Delhi. A total of 24,000 farmers and extensions functionaries participated in the mela.
- University through its electronic media and production centre, has developed 30 short films on agriculture an allied sector for effective dissemination of technology. All the 20 KVKs are well connected with videoconferencing facility. During the year 2016-17, 435 videoconferences were conducted in which 23,915 farmers participated. Besides, university has also provided 3,361 advisories through mobile messaging service benefitting a total of 67, 61,451 and responded to 2,275 calls and 256 Whatsapp queries pertaining to agriculture and allied problems.
- A total of 24 training courses sponsored by BAMETI, ATMA, NIAM, MANAGE, NABARAD, CIMMYT and other agencies were conducted and trained 1,039 farmers, farmwomen and extension functionaries. Besides, 3,957 different types of training courses were conducted by KVKs benefitting 90,450 male and 27,854 female. Besides, 13 training programmes were organised on Palmyrah Palm products and 12 training programmes on training of master trainers on palmyrah palm products benefitting 2,319 and 172 participants, respectively.
- During the year 2016-17, university has produced a total of 8678.39 quintals of quality seeds of cereals, pulses, oilseeds, jute, dhaincha and vegetable crops and 90,000 quality saplings of 25 fruit crops through different farms of university's colleges, RRS and KVKs. The university also produced 205 lakh fingerlings and fish spawn during 2016-17. Three seed hubs are proposed under the jurisdiction of BAU, Sabour namely, AICRP (Pulses), BAU, Sabour; KVK, Munger and KVK, Lakhisarai with 1000 q of quality pulses seed production for the year 2017-18.
- The library has acquired online access of CAB abstract with 900 full-text journals and full access of

1,150 CABI e-Books. It has also online access to 3,625 full-text journals through CeRA, 490 open access journals on Agricultural Science, access of *Krishikosh* and 8,096 e-Theses from *Krishi Prabha*. All College Libraries of the university have also been given online access of all the e-resources. Automation and Digitization of library documents has been initiated and till date most of new arrivals have been entered in database.

- The university has organized 7th Annual Inter-College Sports and Athletic Meet and celebrated *International Yoga Day* and *Swachhta Pakhwada* and *Agricultural Education Day*.
- Twenty five students of the University belonging to various colleges have participated in 17th AGRI-UNIFEST, 2016-17, held at Rajasthan University of Veterinary and Animal Sciences, Bikaner during February 22-25, 2017. Besides, 34 students from different colleges participated in 17th All India Inter Agricultural University Games and Sports Meet at CCS HAU, Hisar during March 25-29, 2017. Various activities such as essay writing, debate, elocution and quiz competition were organized at different college of University on regular basis.
- Five faculty members were selected for perusing higher education programmes under faculty development scheme and thirty one faculty members/ scientists participated in 21 days training programmes.
- The university has bagged Global Agriculture Leadership Award from ICFA, New Delhi and Best KVK Award from ICAR, New Delhi apart from 49 awards received by different scientist of the university.
- University also publishess "Happening at BAU"- the Weekly Newsletter in English and *"BAU-Ek Nazar"* the fortnightly Newsletter in Hindi, regularly. More than 152 research papers, 25 book chapters and number of conference papers and popular articles are to the credit university during 2016-17. Various in-house publications such as *Krishak Sandesh* (Quarterly*), Kisan Samachar* (Quarterly), *Krishi* Calendar have been published during 2016-17.

1. INTRODUCTION

The Bihar Agricultural University was established as the second agricultural University of the state on August 5, 2010 at the initiative of visionary honourable Chief Minister Sri Nitish Kumar who is aiming at ensuring rainbow revolution in the state.

The main campus of the newly created University is located at the erstwhile Bihar Agricultural College, Sabour. The University has eight colleges (6 crop sciences, + 1 Veterinary and 1 Dairy Science) and 12 research stations spread across three agro-ecological zones of Bihar. The University also has 20 Krishi Vigyan Kendras established in 20 of the 25 districts falling under the jurisdiction of the University.

1.1 Vision

Bihar Agricultural University was established with the objective of improving quality of life of people of state especially farmers constituting more than two-third of the population. Having set ultimate goal of benefitting society at large the University intends achieve it by imparting world class need based agricultural education, research, extension and public service.

1.2 Objectives

The University established and incorporated for the following purposes:

i. Making provision for imparting education in different branches of agriculture and any other allied branches of learning and scholarship which the University may find necessary to include;

ii. Furthering the advancement of learning and conducting of research in Agriculture;

iii. Undertaking extension education activities for the welfare of people of State;

iv. Promoting partnership and linkages with national and international educational institutions;

v. Such other purposes as the University or the State Government may from time to time determine.

1.3 Agricultural Education

Bihar Agricultural University is presently conducting under-graduate programmes in Agriculture, Horticulture, Veterinary Science and Diary Technology. The University is imparting Post Graduation level courses in 14 disciplines of Agriculture and 13 disciplines of Veterinary Sciences. BAU is one of the first State Agricultural Universities to have started Centre of Excellence for Teaching and Learning (CETL) to train faculty members in teaching technology and propagate good teaching practices for quality leaning. University firmly believes in holistic development of students and organises lectures of exports on career, motivation and leadership. Besides, training and workshop on communication skills & personality development are also organized.

1.4 Agricultural Research

Bihar Agricultural University has been assigned responsibility of crop improvement, augmenting horticulture and live stock production apart from management of agricultural activities and carrying out researches that could improve overall agriculture production in agro climatic zones II, IIIA and IIIB of the state. Scientists are working on the improvement of natural and genetic resource management, diversification of production systems and value-added crop and livestock products. Social, economic and policy research is an integral component of the research to better target sustainable development and to enhance the uptake and impact of the research outputs. The research programs are characterized in six groups namely, Crop Improvement, Natural Resource Management, Crop Protection, Social Sciences, Product Development & Marketing and Animal Sciences. These research programs are mandate of different units of the University *i.e.,* Colleges of Agriculture at Sabour, Buxar, Agwanpur (Saharsa), Purnea and Kishanganj; Nalanda College of Horticulture at Noorsarai (Nalanda); Bihar Veterinary College and Sanjay Gandhi Institute of Dairy Technology at Patna and various Regional Research Stations in form of students dissertation, Plan and Non-plan projects.

The University has developed collaboration with number of national and international institutes of repute. It has a strong linkage with the ICAR institutes including Directorate of Rice Research, Directorate of Wheat Research, Indian Institute of Pulse Research, Indian Institute of Vegetable Research, Indian Institutes of Farming System Research, Indian Institute of Maize Research, Central Plantation Crop Research Institute, Central Institute of Subtropical Horticulture, National Dairy Research Institute, Indian Veterinary Research Institute and several others.

Similarly, University research is also dovetailed with various international organizations *viz.,* International Rice Research Institute for stress tolerant rice (STRASA) rainfed rice development (IRRAS), aerobic rice breeding and dry direct seeded rice; International Center for Maize and Wheat Improvement (CIMMYT) for a biotic stress tolerant and climate resilient maize hybrids, cropping system agronomy and wheat breeding; International Crop Research Institute for Semi-Arid Tropics (ICRISAT) for improving chickpeas, groundnuts and pigeonpea breeding. BAU and ICRISAT are also exploring possibility of developing pigeonpea hybrids using indigenous materials. The University is also collaborating with International Plant Nutrient Institute (IPNI) for developing site specific nutrient management in rice, wheat and maize. With Evonick Germany, University is developing technologies for offsetting terminal water stress in rainfed winter legumes.

New research for development facility have been created for micropropagation of banana, strawberry and exotic flowers; protected cultivation; biofertlizers and biopesticides production. Key research themes in the University includes improving resource use, natural resource management including climate change adaptation and mitigation; farming system research; genetic enhancement of crops including horticulture and livestock resilient to biotic and abiotic stresses; product development and value addition, technology transfer and outscaling; capacity enhancement and social sciences and policy research.

1.5 Agricultural Extension

In the field of extension education, Bihar Agricultural University has many initiatives to its credit. New methods have been successfully experimented by University for technology transfer to farmers. Quite a number of technologies that University succeeded in popularizing among farmers were developed at the University. The University has developed a knowledge network

and dissemination system for increasing access and capacity building of farmers in the state with the intervention of Information and Communication Technology (ICT).

The University has established Electronic Media & Production Centre (EMPC) at Sabour for audio, video and multimedia development / production which comprises of audio and video studios, PCR room, recording/edition room, digital archives, library and auxiliary facilities. An agriculture e-portal has also been developed for web-casting using Web Portal for agriculture related services, SMS facilities for farmers with high speed internet connectivity. Complete information (Climatology, Variety, Agronomy, Plant disease management, Post harvest management etc.) and recommended package of practices for the mandate crops in the form of video/audio/multimedia have been put on the web portal which is augmented/updated continuously. Besides, the video of multi media are distributed to the farmers through SD cards. Now, the University headquarters is well connected with all 20 Krishi Vigyan Kendras to connect with farmers from the University headquarters with timely and for relevant messages.

The work taken under tribal development programme through KVKs is helping in income generation as well as employment generation by producing more and more farm products from less and less land and water, inclusion of mushroom crop in agriculture sector, employment generation for unemployment rural youth, improvement in standard of living, income generation and improvement in health and farm well being. It has a website devoted to the farmers "www.kisangyan.com" besides Bihar Agricultural University has developed its website "www.bausabour.ac.in." and information on the web is being updated regularly.

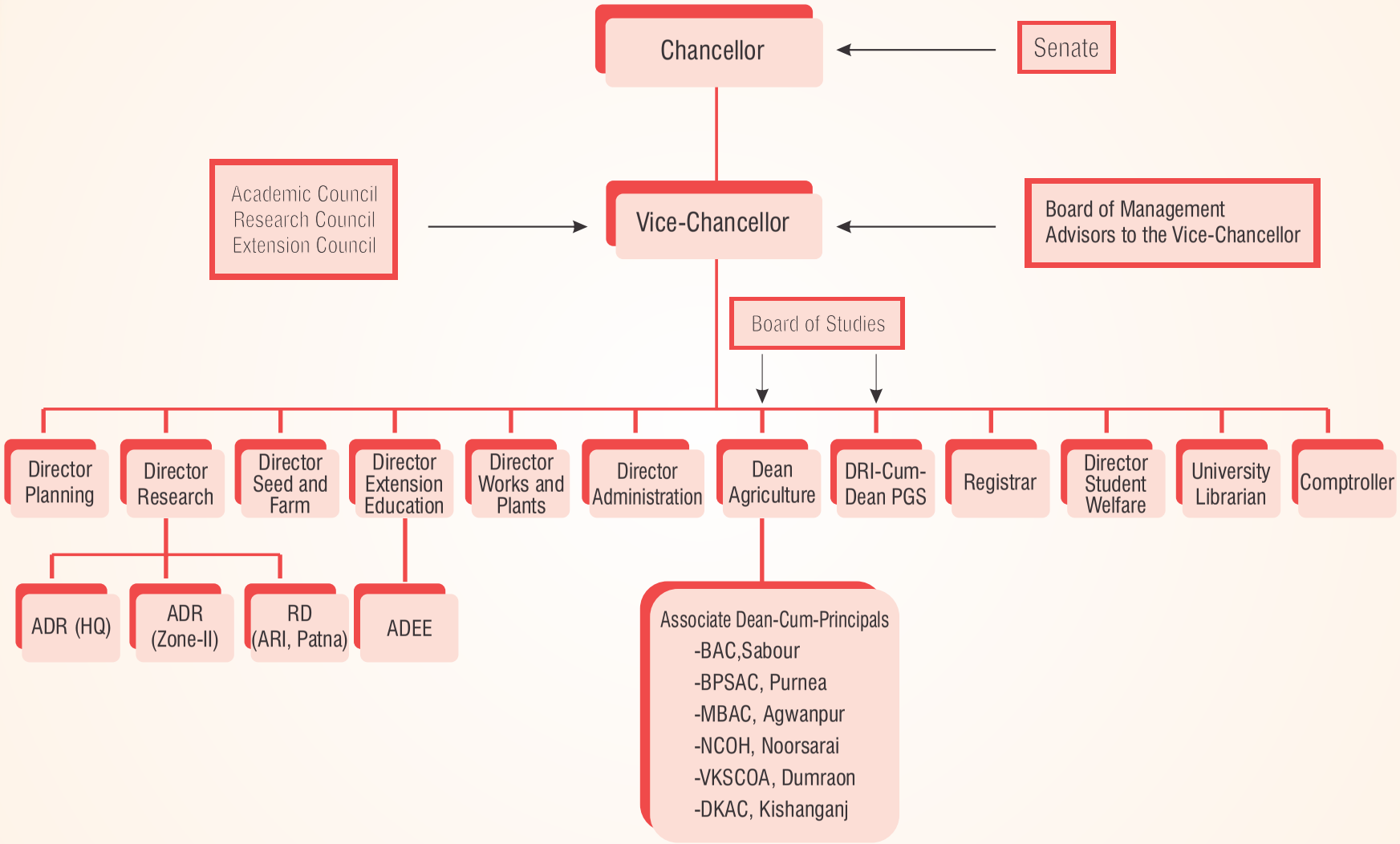
1.6 University Administration

1.6.1 Senate

Senate is the highest body of the University is headed by the honourable Chancellor. Vice-Chancellor is empowered to chair senate meetings in absence of Chancellor as per provisions of Acts and Statutes. Agriculture Production Commissioner, Principal Secretary of Food and Consumer Protection, Additional Secretary, Animal Husbandry and Fishery Department, Chief of Forest Conservation, Director Agriculture, Director Animal Husbandry, Director Fisheries, Joint Director Agriculture Education, Director Research, Director Extension Education, all Deans and Principals of different Colleges of the University are among the Members of Senate. Responsibilities entrusted to senate include policy review besides review of the progress being made by University in different fields.

1.6.2 Board of Management

Board of Management in University is the apex body responsible for formulation/ modification and review of acts besides formulation of policies concerning functioning of the University. The Vice Chancellor is the Chairman and other ex-officio Members of the Board include Agriculture Production Commissioner/Principal Secretary / Secretary, Department of Agriculture, Principal Secretary/ Secretary, Department of Finance, Director Agriculture, Director Horticulture. There is one external Member from academic who is well known in the field of agriculture and/or allied science. There are five Members nominated by State Government, State Legislature (2), women working at grass root level (1), Progressive farmer (1), Agri-entrepreneur (1) and one representative of ICAR. There are one each of Director, Dean, and Head of department are nominated by Vice Chancellor. The Registrar acts as Member Secretary of the Board. The Board is responsible for framing rules, regulations and amendments to it. It is also responsible for financial requirement and review of the University



Organogram of Bihar Agricultural University, Sabour

1.6.3 Academic Council

The top educational body of the University has been entrusted responsibility of reviewing educational programmes periodically in order to maintain high standards of education in University. The Council is empowered to formulate necessary rules and regulations for implementation of educational programmes. Headed by Vice-chancellor, the members of the Council include Director, Deans, Chairman/Head of the departments, two Heads from each college, one nominated Professor, one expert from the field of agriculture with Registrar as Member Secretary. The responsibility of the Council is to take care of all the academic affairs of the University.

1.6.4 Chancellor

The Governor of Bihar is the Chancellor of the University by virtue of his office. He is the head of the University and presides over convocations of the University.

1.6.5 Vice Chancellor

The Vice Chancellor is the whole time officer of the University. The Vice Chancellor is the principal executive and academic officer of the University and ex-officio Chairman of the Boardof Management and the Academic Council. He shall in the absence of Chancellor, preside at the Convocation of the University and confer degrees on persons entitled to receive them.

Vice Chancellor exercises general control over the affairs of the University and is responsible for due maintenance of discipline in the University.

1.6.6 Other Senior Officials

Deans, the senior officials of the University are the Chairman of their respective Faculties besides Board of Studies of the concerning Faculty. They are responsible for organizing teaching programmes and are needed to report to the Vice Chancellor. The Director of Research is responsible for the direction and co-ordination of research programmes; Director of Residence Instruction is responsible for inter-faculty and inter-departmental co-ordination of under-graduate and Post-graduate instructions; Director of extension provides direction and co-ordination of agricultural extension programme; Registrar acts as ex-officio Secretary of the Board of Management and the Academic Council; Comptroller is responsible to the Vice Chancellor for preparation of the budget and statement of accounts of a University. Director, Seeds & Farms, Director, Planning and Director, Administration are the other officers of the University.

1.7 Staff Position

The details of staff position in the University is presented in Table 1.1

Table 1.1 Staff position of the University as on 31.03.2017

S.N.	Particulars	Filled-up
1	Deans/Directors/University Officers	11
2	Univ. Prof-cum-Chief Scientist	32
3	Assoc. Prof-cum-Sr. Scientist	24
4	Asstt. Prof-cum-Jr. Scientist	313
5	Non-Teaching Staff (Hq. + Colleges + Research Centre)	754
6	Programme Coordinator	09
7	Subject Matter Specialist	93
8	KVK (Non-Teaching Staff)	137
	Total	**1373**

2. EDUCATION

Agriculture is a principal occupation of more than half of the workforce in India. Agriculture affected by many factors which makes its management challenging. To meet such challenges, quality agricultural education is indispensable. The Bihar Agricultural University offers courses for the award of Under-graduate, ,Post-graduate and Ph.D. degrees through its different faculties namely, Faculty of Agriculture, Faculty of Veterinary Sciences and Faculty of Dairy Technology. The Masters and Ph.D. degrees are awarded in Agricultural Sciences (at Bihar Agricultural College, Sabour), Veterinary Sciences (at Bihar Veterinary College, Patna) and Dairy Sciences (at Sanjay Gandhi Institute of Dairy Technology, Patna). Post-graduate programme is being offered in 14 disciplines of Agricultural Science, 13 disciplines of Veterinary Sciences and one discipline of Dairy Technology**.** BAU has established Centre of Excellence for Teaching and Learning (CETL) and Placement Cell.

2.1 University & its Colleges

Presently, Undergraduate/Postgraduate teaching is carried out by eight different colleges of Bihar Agricultural University. A brief profile of different college and programmes are given below:

2.1.1 Bihar Agricultural College, Sabour, Bhagalpur

Bihar Agricultural College, Sabour

Bihar Agricultural College, Sabour is one of the oldest Colleges of Agriculture in the country established in 1908 in the Bhagalpur district. It is situated about 8 km East of Bhagalpur (the nearest railway junction) at 86°57′′S longitude and 25°15' N latitude at an altitude of 46 meter. The Sabour Farm was started as an Experimental Farm in 1906. The foundation stone of an Agricultural College at Sabour was laid by Sir Andrew Henderson Leith Frazer; the then Lt. Governor of Bengal on 17thAugust, 1908. The college when initially started for Diploma of Licentiate in Agriculture, imparted training in agriculture including livestock and rural economy, physics, chemistry, botany, entomology, veterinary, agricultural engineering and land record. The first and second Principals of the Colleges were Sri A.C. Dobbs (1906-1911) and Sri E.J. Woodhouse (1911-1915), respectively. The PG courses in five agricultural subject's viz. Agronomy, Horticulture, Plant Pathology, Entomology and Agricultural Extension were started from August 1955. The Govt. of Bihar sanctioned the scheme for introducing M.Sc. Ag. course at Bihar Agricultural College. The library is enriched with 3 rare books *viz., Hortus Malabaricus* (12 Volumes), *Museum Restrcum* Et. Commercial (6 Volumes) and Plants of Coast of Commercial (3 Volumes) and 6 Softwares in CD form *viz.,* AGRIS, Agricola, Cabsac, Crop CD., HortCD Soul and Librarian Library Management Software.

2.1.2 Bihar Veterinary College, Patna

Bihar Veterinary College, Patna, is the heritage of Veterinary Education in India. It has glorious history of 85 years since its inception on 2nd April, 1927. It became an integral part of Bihar Agricultural University, Sabour (Bhagalpur) with its establishment on 5th August, 2010. Resolutions of 2010-11 of this College was in sighted in the direction of promoting Livestock production,

Bihar Veterinary College, Patna

health and prevention of animal diseases in Bihar through integrated teaching, research and extension programme. Recently many initiatives were taken to boost up the academic activities, research projects, training programmes and strengthening of the livestock farm. Laboratories are equipped with modern facilities, equipments and techniques. Further, class rooms, conference hall, and other infrastructures were also constructed as well as reformed. Emphasis was also focused on widespread training to the livestock farmers, unemployed youths, women, veterinary officers and other concerned personnel of the State, for improvement of livestock farming, breed selection, disease control methodology and balanced & healthy feeding of animals. The College has 17 departments with Composite Livestock Farm, Library, Clinical Complex, Veterinary Emergency response Unit, Boys and Girls Hostels, Guest House and Staff quarters. The college has experienced and learned faculties and elaborate laboratory facilities with adequate infrastructure for undergraduate and postgraduate teaching and research. The College has been recognized by Veterinary Council of India and has obtained accreditation from the Indian Council of Agricultural Research

2.1.3 Sanjay Gandhi Institute of Dairy Technology, Patna

Sanjay Gandhi Institute of Dairy Technology (SGIDT), Patna was established on 14th December, 1980 under Rajendra Agricultural University, Pusa (Samastipur), Bihar. Academic activities started since 1982 in RAU, Pusa campus and subsequently shifted to ARI, campus, Patna since 1986. Later, the college was shifted to its own premises on 16th May, 1999, at Jagdeopath, Patna and presently it is working under the Faculty of Dairy Technology, Bihar Agricultural University, Sabour, Bhagalpur. Since inception,

Sanjay Gandhi Institute of Dairy Technology, Patna

it has provided high dividends in terms of excellent academic and research outputs. It has fine-tuned and upgraded its academic programmes from time to time to harness the benefits of technological advancement in the new millennium. The institute has experienced faculty members who are involved in guiding, training, placements and extra-curricular development of the students. This is the only institute offering B. Tech. (Dairy Technology) in the state. In truncated Bihar having Agriculture and Animal Husbandry as main sectors for development of state, the institute of Dairy Science and Technology has special significance and plays a vital role in upgrading the economy of the state

2.1.4 Nalanda College of Horticulture, Noorsarai, Nalanda

The Nalanda college of Horticulture was inaugurated on 22nd August, 2006 by Hon'ble Chief Minister, Sri Nitish Kumar. The 1st batch of B.Sc. (Horticulture) was admitted on 12th January, 2007. B.Sc. (Hort.) graduates of this college have got placement in different Nationalized Banks and other Private & Public sector organization. Some students are doing Post Graduate studies in reputed institution line CFTRI, Mysore, BAU, Sabour etc. The Govt. has transferred 21 acres of land for College campus development at Noorsarai, Nalanda.

Nalanda College of Horticulture, Noorsarai, Nalanda

2.1.5 Mandan Bharti Agricultural College, Agwanpur, Saharsa

The Mandan Bharti Agriculture College (MBAC), Agwanpur (Saharsa) was notified on 1st April, 2007, and started in the campus of Regional Research Station (RRS), Agwanpur which has been functioning there on since July, 1987. The College fulfils the long-cherished aspiration of the people of region for agricultural development of sacred but problem-ridden land of the Kosi region. The 1st batch of the students was admitted in January, 2008. The laboratory facilities have been developed for Soil Science & Agricultural Chemistry, Mycology & Plant Pathology, Agronomy and Horticulture. The total area of the college is around 77.5 acres. The college has been engaged in agricultural research besides education and transfer of technology. The area of responsibility of this College for research and extension in Koshi zone II comprising the Saharsa, Supaul, Madhepura, and Khagaria. The research activities of the College are coordinated and monitored by the Associate Director Research (ADR) of Regional Research Station (RRS). The priority of the research agenda is determined by the ADR through conducting the Zonal Research and Extension Advisory Committee (ZREAC) meeting both for *Kharif* and *Rabi* season. The on-campus research is conducted in various disciplines. In addition, there are well equipped laboratories in some of the disciplines to conduct research on priority areas. A well-developed soil testing laboratories is established at RRS premises where the training of farmers and functionaries associated with soil, water, and manure testing is also organized.

Mandan Bharti Agricultural College, Agwanpur, Saharsa

2.1.6 Veer Kunwar Singh College of Agriculture, Dumraon, Buxar

The Veer Kunwar Singh College of Agriculture, Dumraon (Buxar) has been established on 27th April, 2010 vide the order of the Govt. of Bihar. The first batch of students was admitted in the year 2012. The VKSCOA, Dumraon (Buxar) is only an Agricultural College in Zone-III B of Bihar always in readiness to serve the farmers and concerned officers of the districts like Buxar, Bhojpur, Rohtas and Kaimur. The College is situated 18 km East of Buxar historically known as Karm Bhumi of Lord Ram and Tapobhumi of Maharsi Vishwamitra in the sub-division of Dumraon. The main

Administrative Building of the college is located 03 km south to the National Highway No. 84 and 1.5 km south of the Railway Station at Dumraon. Dumraon is a historical place witnessing the grand temple of Maa Dumreshwari. The land and soils (light, medium & heavy) are suitable for growing agricultural and horticultural crops. The land and soils of the area being centre of the natural diversity as influenced by the rivers Ganga and Sone, are known in the state for high fertility, productivity and potentiality.

Veer Kunwar Singh College of Agriculture, Dumraon, Buxar

2.1.7 Bhola Paswan Shastri Agricultural College, Purnea

This college was established in the year 2011. It is situated 3 km away from Purnea Junction and 4 km from National Highway. Since historical times, Purnea has been a famous educational, political and cultural centre. After the establishment of the College, a batch of 32 students was enrolled. At present, the college has developed infrastructure in terms of classrooms, laboratories, library and computer with internet facilities.

Bhola Paswan Shastri Agricultural College, Purnea

The College has also arranged Boys Hostel at campus and Girl's Hostel in town with full facilities. College is having facilities like training hall to conduct training on relevant subject pertaining to innovative agricultural technology both on and off campus. Scientists of the College are also imparting training in the programme organized by line department and NGO operating in the area. College is having 84 hectares land, out of which 52 hectares is under seed production of improved varieties of paddy, wheat and pulses.

2.1.8 Dr. Kalam Agricultural College, Kisanganj

Dr. Kalam Agricultural College, Kishanganj was established on 10th August, 2015. Kishanganj Agriculture College was named in the remembrance of the former Hon'ble President Late Dr. A.P.J Abdul Kalam. Kishanganj is known for good quality tea production apart from pineapple and jute and the first district in Bihar to produce tea at a large scale. DKAC, Kishanganj serves the farmers and concerned officers coming under Zone – II of the State. At present, the College has developed infrastructures in terms of classrooms, laboratories, library, hostels, residence for faculty etc. The College has a number of administrative sections for smooth running *viz*., (i) Student's Cell (ii) Establishment Section (iii) Security & Estate (iv) Sports & Games (v) Technical Cell (vi) Legal Cell (vii) Training Programme Cell and other Extension Activities. The intake capacity of the college is 60 for undergraduate students.

Dr. Kalam Agricultural College, Kisanganj

2.2 Under Graduate Programme

The admission to UG programme is done through Bihar Combined Entrance Competitive Examination and ICAR combined test. The minimum eligibility requirement for admission to the degree programme is I. Sc. i.e. 10 + 2 or equivalent examination with Physics, Chemistry and Biology /Mathematics.

Table 2.1 Intake capacity of different constituent Colleges during 2016-17

Sr. No.	Name of College	Name of College		
		BAU Seats	ICAR/VCI Seats	Total
1	Bihar Agricultural College, Sabour, Bhagalpur	51	09	60
2	Mandan Bharti Agriculture College, Agwanpur, Saharsa	25	05	30
3	Veer Kunwar Singh College of Agriculture, Dumraon, Buxar	42	08	50
4	Bhola Paswan Shastri Agriculture\ College, Purnea	42	08	50
5	Nalanda College of Horticulture, Noorsarai, Nalanda	21	04	25
6	Sanjay Gandhi Institute of Dairy Technology, Patna	21	04	25
7	Bihar Veterinary College, Patna	51	09	60
8	Dr. Kalam Agriculture College, Kishanganj	51	09	60
	Total	**304**	**56**	**360**

2.2.1 Students enrolled

The number of students took admission to different colleges during academic session 2016 – 17 is given in Table 2.2.

2.2.2 Students passed out

A total of 130 students passed out during Academic Year 2016-17 which is mentioned in Table 2.3.

2.3 Post-Graduate Teaching

One of the mandates of the University is imparting Post-graduate education in different disciplines of Agriculture and Veterinary Sciences. The Masters and Ph.D. Degrees are awarded in Agriculture at Bihar Agricultural College, Sabour Campus, Veterinary Sciences at Bihar Veterinary College, Patna and in Dairy Technology at Sanjay Gandhi Institute of Dairy Technology, Patna.

Table 2.2 Number of enrolled students in different Colleges during Academic Year 2016-17

Sr. No.	Name of College	Degree Programme	Male	Female	Total
1	Bihar Agricultural College, Sabour, Bhagalpur	B.Sc. (Hons) Agriculture	34	26	60
2	Mandan Bharti Agriculture College, Agwanpur, Saharsa	B.Sc. (Hons) Agriculture	16	14	30
3	Veer Kunwar Singh College of Agriculture, Dumraon, Buxar	B.Sc. (Hons) Agriculture	20	30	50
4	Bhola Paswan Shastri Agriculture College, Purnea	B.Sc. (Hons) Agriculture	31	19	50
5	Nalanda College of Horticulture,Noorsarai, Nalanda	B.Sc.(Hons) Horticulture	17	05	22
6	Sanjay Gandhi Institute of Dairy Technology, Patna	B.Tech. (DT)	17	7	24
7	Bihar Veterinary College, Patna	B.V.Sc. & A.H.	41	18	59
8	Dr. Kalam Agriculture College, Kishanganj	B.Sc. (Hons) Agriculture	41	18	59
	Total		**217**	**137**	**354**

Table 2.3 Number of passed out students in UG Programme from different Colleges during 2016-17

Name of the college	Number of Pass out students
Bihar Agriculture College, Sabour	44
Mandan Bharti Agricultural College, Agwanpur, Saharsa	14
Nalanda College of Horticulture, Noorsarai, Nalanda	08
Bihar Veterinary College, Patna	09
Sanjay Gandhi Institute of Dairy Technology, Patna	07
Bhola Paswan Shastri Agricultural College, Purnea	30
Veer Kunwar Singh College of Agriculture, Dumraon, Buxar	18
Total	**130**

2.3.1 Master's Degree programmes

Post Graduate programmes are offered in fourteen disciplines of Agricultural Sciences namely, Agronomy, Horticulture (*Pomology*),Horticulture (*Olericulture*), Soil Science & Agricultural Chemistry, Plant Breeding & Genetics, Extension Education, Plant Pathology, Biochemistry & Crop

Physiology, Agricultural Economics, Agricultural Statistics, Entomology, Molecular Biology & Biotechnology, Seed Science & Technology and Hort. Post Harvest Technology. Similarly in Veterinary Sciences, Post-graduate degree programmes are offered in thirteen disciplines namely, Animal Genetics & Breeding, Animal Nutrition, Veterinary Gynecology & Obstetrics, Veterinary Parasitology, Livestock Production Management, Anatomy & Histology, Pharmacology & Toxicology, Veterinary & A. H. Extension Education, Veterinary Surgery & Radiology, Veterinary Microbiology, Veterinary Medicine, Veterinary Public Health & Epidemiology (VPHE) and Veterinary Pathology. In the faculty of Dairy Technology, one Post Graduate programme has been started in the Department of Dairy Technology at Sanjay Gandhi Institute of Dairy Technology, Patna.

Table 2.4 Number of available seats and admitted students in Master's Programmes

A. Faculty of Agriculture

Sr. No.	Subject	BAU Seats	ICAR Seats	Total Seats	M	F	Total
1	Agricultural Economics	04	01	05	04	01	05
2	Agricultural Statistics	03	01	04	-	-	-
3	Agronomy	09	03	12	05	05	10
4	Biochemistry and Crop Physiology	02	-	02	-	-	-0
5	Entomology	04	02	06	04	01	50
6	Extension Education	04	01	05	03	02	05
7	Horticulture (*Pomology*)	09	03	12	05	08	13
8	Horticulture (*Olericulture*)	09	02	11	07	03	10
09	Horticulture (Post-Harvest Technology)	03	01	04	01	01	02
10	Molecular Biology & Biotechnology	04	01	05	-	02	02
11	Plant Breeding & Genetics	09	03	12	06	06	12
12	Plant Pathology	06	02	08	06	04	10
13	Seed Science & Technology	02	-	02	02	-	02
14	Soil Science & Agricultural Chemistry	09	03	12	04	08	12
	Total	**77**	**23**	**100**	**47**	**41**	**88**

B. Faculty of Veterinary Sciences

1	Animal Genetics & Breeding	05	02	07	-	-	-
2	Animal Nutrition	05	02	07	-	-	-
3	Veterinary Gynecology and Obstetrics	04	01	05	04	-	04
4	Livestock Production Management	02	-	02	-	-	-
5	Veterinary Medicine	02	-	02	02	-	02
6	Veterinary Microbiology	02	-	02	-	-	-
7	Veterinary Parasitology	04	01	05	-	-	-
8	Veterinary Pathology	02	-	02	-	-	-
09	Veterinary Public Health & Epidemiology	02	-	02	-	-	-
10	Veterinary Surgery and Radiology	02	-	02	-	-	-
11	Veterinary Surgery & Radiology	02	-	02	02	-	02
12	Veterinary & A. H. Extension Education	02	-	02	-	-	-
13	Pharmacology & Toxicology	03	01	04	-	-	-
14	**Total**	**38**	**08**	**46**	**08**	**08**	**08**

C. Faculty of Dairy Technology

1	Dairy Technology	02	-	02	-	-	-

2.3.2 Ph.D. Degree Programmes

Availability of seats for Ph.D. coaurses and students admitted in academic session 2016-17 in faculty of Agriculture and Veterinary Science is given in Table 2.5.

Table 2.5 Number of available seats and admitted students in Ph.D. Programme

Sr. No.	Subject	BAU Seats	ICAR Seats	Total Seats	M	F	Total
Faculty of Agriculture							
1	Agronomy	3	1	04	04	-	04
2	Extension Education	1	1	2	-	01	01
3	Horticulture (*Olericulture*)	3	1	04	02	01	03
4	Horticulture (*Pomology*)	3	1	04	01	03	04
5	Plant Breeding & Genetics	2	1	3	02	01	03
6	Soil Science & Agricultural Chemistry	4	2	6	04	02	06
	Total	**16**	**07**	**23**	**13**	**08**	**21**
Faculty of Veterinary Sciences							
1	Animal Genetics & Breeding	2	1	03	-	01	01
2	Animal Nutrition	1	1	02	-	01	01
3	Veterinary Gynecology and Obstetrics	1	1	02	-	-	-
4	Live Stock Production Management	1	1	02	-	-	-
5	Veterinary Parasitology	1	1	02	-	-	-
	Total	**16**	**05**	**11**	**-**	**02**	**02**

2.4 University Convocation

The third convocation of the university was organized at BAU, Sabour on 3rd February, 2017, presided by Sri Ram Nath Kovind, His Excellency Governor of Bihar, Sri Ram Vichar Rai, Hon'ble Agriculture Minister. Details of degree recipients, gold medal are given in Table 2.6 and 2.7

Student receiving degree certificate from Hon'ble Chancellor

Table 2.6 Number of degree recipients in different Degree programmes

Sr. No.	Degree Programme	Numbers of Students
A. Under Graduate Degree Programme		
1	B.Sc. (Hons) Agriculture	106
2	B.Sc. (Hons) Horticulture	08
3	B. Tech (DT)	05
4	B.V.Sc. & A. H.	09
	Total	**128**
B. Post Graduate Degree Programme		
1	M. Sc. (Ag.)	45
2	M.V.Sc.	07
3	M.V.Sc.Ph.D. (Agriculture Faculty)	03
	Total	**55**
	Grand Total (A+B)	**183**

Table 2.7 Recipients of Gold Medal Award during the 3rd Convocation

Sr. No.	Name of the Students /Recipients	Registration No.	Degree	Batch	OGPA
A. Under Graduate Degree Programme					
3	Anjali Kumari	A/BAC/35 1/2012-13	B.Sc. (Ag.)	2012-13	8.983
4	ManormaKumari	DT/SGIDT /347/2012-13	B.Tech. (DT)	2012-13	8.136
B. Master's Degree Programme					
1	Vikash Kumar Patel	M/ENTO/186/ BAC/2014-15	M.Sc. (Ag)	2014-15	8.824
2	Subash Kumar	M/AGRO/217/ BVC/2014-15	M.V.Sc.	2014-15	8.757

2.5 Students Qualified as SRF

Four M.Sc. students of Bihar Agricultural College, Sabour have qualified in Senior Research Fellowship Examination conducted by the Indian Council of Agricultural Research, New Delhi. The names of the students are given in Table 2.8.

Table 2.8 Details of the students qualified SRF examination during 2016

Sr. No.	Name of students	Registration No.	Department
1	Sri Om Singh	BAC/D/PBG/002/2016-17	Plant Breeding & Genetics
2	Ms. Madhumita	BAC/D/EXTN/001/2016-17	Extension Education
3	Sri Durgesh Singh	BAC/D/AGRO/003/2016-17	Agronomy
4	Ms. Seema	BAC/D/SSAC/005/2016-17	Soil Science & Ag. Chemicals

2.6 Best Ph.D. Thesis Award

The University has started giving, the best Ph.D. thesis award of the year since 2016, and in that context Dr. Ravi Shankar Deo Barman was awarded the best Ph.D. thesis award-2016, from the faculty of Veterinary Sciences, for his Ph.D. thesis entitled, "Studies on the effects of different shade materials on the performance of buffalo calves",.

2.7 Collaboration with International Organizations

Shri Sudhir Kumar (D/PBG/30/BAC/2014), and Ms. Prity Sundaram (D/PBG/31/BAC/2014-15), two Ph.D. students, department of Plant Breeding & Genetics, Bihar Agricultural College, Sabour have been sent to International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, Hyderabad, Andhra Pradesh as research scholars for their Ph.D. collaborative research work.

2.8 Centre of Excellence for Teaching and Learning

The presence and use of technology in higher education, learning environment has become an increasingly important conversation for instructors and institutions in universities and colleges. In this endeavour, establishment of Centre of Excellence for Teaching and Learning (CETL) promotes the enhancement of learning and teaching at the University. Centre of Excellence for Teaching has been established in the year of 2014 at Bihar Agricultural University, Sabour. This centre is committed to foster teaching and learning. It acts as a catalyst for the academic community by offering wide range of activities namely; research based instructional methods for quality learning, nurturing the inner skills of students and faculty members through Special Interest Groups (SIG).

Centre of Excellence for Teaching and Learning organized one day long workshops on "Professional Etiquettes and Personality Development among Agricultural Students" at Dr. Kalam Agricultural College, Kishanganj, Bhola Paswan Shastri Agricultural College, Purnea and Mandan Bharti Agricultural, Agwanpur, Saharsa from April 19-22, 2016. Dr. Niraj Kumar, Professor of Rural Management at

Dr Niraj Kumar, Professor of Rural Management delivering his lecture in the training

Xavier Institute of Management, Bhubaneswar was as resource person for the workshops. During the workshops students were trained about professional etiquettes viz., greetings, handshaking, gesture, posture, first impression, business meeting, etiquettes, interview skills and persuasive communication.

Centre of Excellence for Teaching and Learning is having its group in facebook and whatsapp group. Groupies are sharing their thoughts/knowledge through groups. These groups seem excellent for e-discussion and knowledge sharing among the members.

3. Research

3.1 Crop Improvement

3.1.1. Rice

3.1.1.1 All india coordinated rice improvement project scheme (aicrips)

Advance variety trial–2 aerobic (avt 2-aerobic)

12 entries including checks were evaluated. Total 08 entries were found to be statistically superior to the local check, Rajendra Suwasini (2523 kg/ha).

Advance variety trial 1-aerobic (avt 1-aerobic)

Out of six entries tested in, entry no. 3009 (3631 kg/ha) and entry no. 3010 (3882 kg/ha) were found to be statistically superior to the local check R. Suwasini (3615 kg/ha).

Initial variety trial –aerobic (ivt-aerobic)

64 Entries including checks were tested out of which 39 entries were found to be significantly superior to the local check R. Suwasini (2021 kg/ha).

Advance variety trial 2-irrigated medium (avt 2-im)

Ten entries including checks were tested. Varietal difference in respect of grain yield was found significant and it varied from 2849 kg/ha (entry no. 1203) to 5306 Kg/ha (entry no. 1206). In addition to entry no. 1206, entry no. 1201 (5271 kg/ha) also recorded significantly superior yield over the local check R. Sweta (4167 kg/ha).

Advance variety trial-1irrigated medium (avt 1-im)

Total 42 entries including checks were evaluated. Yield differences among the entries were found significant which varied from 3281 kg/ha (entry no. 1353) to 5505 kg/ha (entry no 1354). Two entries, entry no. 1354 and entry no. 1357 (5430 kg/ha) were found to be statistically superior to the local check R. Sweta (4563 kg/ha).

Initial variety trial-irrigated medium (ivt-im)

81 entries including checks were evaluated. Varietal difference in respect of grain yield was found significant and it varied from 2357 kg/ha (entry no. 1413) to 5099 Kg/ha (entry no. 1416). Total 20 entries were recorded significantly higher yield over the local check R. Sweta (3454 kg/ha).

Advance variety trial-2 early transplanted (avt-2 etp)

17 entries including checks were tested. Varietal difference in respect of grain yield was found significant which ranged from 1997 kg/ha (local check Prabhat) to 4196 Kg/ha (entry no. 810).

Total thirteen entries were found to be statistically superior to the local check Prabhat (1997 kg/ha).

Advance variety trial-1 early transplanted (avt-1 etp)

27 entries including checks were tested. Varietal difference in respect of grain yield was found significant and it varied from 1352 (entry no. 905) to 4487 Kg/ha (entry no 931). Fifteen entries were found to be statistically superior to the local check Prabhat (2198 kg/ha).

Initial variety trial – early transplanted (ivt-etp): 64 entries including checks were tested. Varietal difference in respect of grain yield was found significant and it varied from 2009 kg/ha (entry no. 1015) to 4985 kg/ha (entry no. 1045). Total 50 entries were recorded statistically superior yield to the local check Prabhat (2016 kg/ha).

Initial variety trial-early direct seeding (ivt-eds) 49 entries including checks were evaluated. Varietal difference in respect of grain yield was found significant and it varied from 1000 kg/ha (entry no. 120) to 5550 kg/ha (entry no. 126). Total 20 entries were found to be statistically superior to the local check Prabhat (2965 kg/ha).

Initial variety trial-new plant type (ivt-npt) 21 entries including checks were evaluated. Varietal difference in respect of grain yield was found significant and it varied from 1307 kg/ha (entry no. 3819) to 3513 kg/ha (entry no. 3801). Only the highest yielder (entry no. 3801) was found to be statistically excelled the local check R. Sweta (2696 kg/ha).

3.1.1.2 International Network for Genetic Evaluation of Rice (INGER)

International Irrigated Rice Observation Nursery (IIRON): 30 entries including checks were evaluated. Yield varied from 2778 kg/ha (Entry no. 21) to 6852 kg/ha (entry no. 22). Only the highest yielder (entry no. 22) was found to be statistically superior to the local check Sita (5463 kg/ha).

International rainfed lowland observation nursery (IRLON): 42 entries including two checks namely R. Mahsuri-1 and R. Sweta were evaluated. Yield range was recorded from 4019 kg/ha (LC2: R. Sweta) to 8241 kg/ha (entry no. 35). None of the entry could surpass the late maturity local check R. Mahsuri-1 (8241 kg/ha) whereas total 30 entries out-yielded medium maturity local check R. Sweta (4019 kg/ha).

3.1.1.3 State Plan

Sabour Location

Uniform varietal trial-2 (uvt-2)

Total 13 entries including check Prabhat were evaluated in this trial. Varietal difference in respect of grain yield was found significant and it varied from 1278 kg/ha (check Prabhat) to 2306 kg/ha (BRR 0016). All the 12 entries were found to be statistically superior to the check Prabhat.

Uniform varietal trial-3 (uvt-3)

Total seven entries were evaluated including check Sita. Yield range was 2967- 4640 kg/ha. None of the entry could surpass the check Sita (4230 kg/ha).

Uniform varietal trial-4 (uvt-4)

Total seven entries were evaluated including check R. Mahsuri-1. Yield range was 3318- 5440 kg/ha. None of the entry could surpass the check R. Mahsuri-1 (5401 kg/ha).

Uniform varietal trial-aerobic (UVT -aerobic)

Total 11 entries were evaluated including checks IR 64 © and R. Suwasini (LC). Varietal difference in respect of grain yield was found significant and it ranged from 2788 kg/ha (IR 64) to 4379 kg/ha (BRR 0007). Five entries recorded significant yield superiority to the local check R. Suwasini (3333 kg/ha).

Uniform varietal trial-directly seeded rice (UVT-DSR)

14 entries including two checks i.e. Prabhat and Sahbhagi Dhan were evaluated under this trial. Varietal difference in respect of grain yield was found significant and it varied from 1727 kg/ha (BRR 0080) to 3848 kg/ha (BRR 0070). Two entries namely BRR 0070 and BRR 0069 (3727 kg/ha) out-yielded significantly the best check Sahbhagi Dhan (3091 kg/ha).

Uniform varietal trial-aromatic rice variety Trial (UVT-ARVT)

Nine entries including checks were evaluated in this trial. Grain yield was varied between 1714 kg/ha (check S. Surbhit) to 2474 kg/ha (Malbhog). None of the entries could statistically surpass the best check R. Suwasini (2365 kg/ha).

Purnea location

Uniform varietal trial-2 (UVT-2)

Total 13 entries including checks were evaluated in this trial. Varietal difference in respect of grain yield was found significant and it varied from 2300 kg/ha (Prabhat) to 3267 kg/ha (BRR 0043). Nine entries were found to be statistically superior to the check Prabhat.

Uniform varietal trial-3 (UVT-3)

Six entries were evaluated including check Sita. Varietal difference in respect of grain yield was found significant and it varied from 2553 kg/ha (BRR 0025) to 4333 kg/ha (BRR 2014). The highest yielder BRR 2014 could beat the check Sita (3450 kg/ha) significantly.

Uniform varietal trial-4 (UVT-4)

Total 11 entries were evaluated including check R. Mahsuri-1. Yield was ranged from 3400 kg/ha (BRR 0042) to 4233 kg/ha (BRR 0045). None of the entries was found to be statistically superior to check R. Mahsuri-1 (4400 kg/ha).

Uniform varietal trial-aerobic (UVT -Aerobic)

Total 11 entries were evaluated including checks. Varietal difference in respect of grain yield was found significant and it varied from 3153 kg/ha (BRR 0006) to 4357 kg/ha (BRR 0043). Four entries were found to be statistically superior to the local check R. Suwasini (3217 kg/ha).

Uniform varietal trial-directly sown rice (UVT-DSR)

14 entries including two checks i.e. Prabhat and Sahbhagi Dhan were evaluated under this trial. Varietal difference in respect of grain yield was found significant and it varied from 1587 kg/ha (BRR 0085) to 2500 kg/ha (BRR 0069). Three entries including the highest yielderBRR 0069 out-yielded significantly the best check Sahbhagi Dhan (2007 kg/ha).

Uniform varietal trial-aromatic rice varietal trial (UVT-ARVT)

Nine entries including checks were evaluated under this trial.

Grain yield varied from 1443 kg/ha (check S. Surbhit) to 2067 kg/ha (Jasua). The entry Jasua, Katarni (2017 kg/ha) and Hafsal (2003 kg/ha) were found to be statistically superior to the best check R. Suwasini (1757 kg/ha).

Patna Location

Uniform varietal trial-2 (UVT-2)

Total 13 entries including checks were evaluated in this trial. Varietal difference in respect of grain yield was found significant and it varied from 3914 kg/ha (Prabhat) to 8207 kg/ha (BRR 0017). Nine entries were found to be statistically superior to the check Prabhat.

Uniform varietal trial-3 (UVT-3)

Seven entries were evaluated including check Sita. Varietal difference in respect of grain yield was found significant and it varied from 5421 kg/ha (Sita) to 7003 kg/ha (BRR 2014). Three entries including highest yielder entry BRR 2014 could beat the check Sita (5421 kg/ha) significantly.

Uniform varietal trial-4 (UVT-4)

Total 11 entries were evaluated including check R. Mahsuri-1. Yield was found varied significantly from 3704 kg/ha (BRR 0042) to 7071 kg/ha (BRR 0060). Only BRR 0060 was found to be statistically superior to check R. Mahsuri-1 (4848 kg/ha).

Uniform varietal trial-aromatic rice varietal trial (UVT-ARVT)

Nine entries including checks were evaluated under this trial. Very poor grain yield obtained due to heavy lodging. Grain yield was varied 126 kg/ha (Jasua) to 3746 kg/ha (S. Suwasini). None of the entry could beat S. Suwasini significantly.

3.1.1.4 Cereal System Initiative for South Asia (CSISA)

Direct seeded rice-medium (DSR-M)

36 entries were tested along with the checks. Varietal differences in respect of grain yield was found to be significant. Yield varied from 1488 kg/ha (entry no. 20) to 5655 kg/ha (entry no. 35). Ten entries were found to be superior statistically to the local check R. Sweta (4613 kg/ha).

Direct seeded rice-medium early (DSR-ME)

40 entries were tested along with the checks. Varietal differences in respect of grain yield were found to be significant. Yield varied from 2113 kg/ha (entry no. 33) to 6878 kg/ha (entry no. 23). 15 entries recorded significantly higher yield than the local check R. Suwasini (4630 kg/ha).

Direct seeded rice-early (DSR-E)

40 entries were tested along with the checks. Varietal differences in respect of grain yield were found to be significant. Yield varied from 1052 kg/ha (entry no. 19) to 5093 kg/ha (entry no. 4). Six entries recorded yield significantly higher than the local check Prabhat (1726 kg/ha).

3.1.1.5 Stress Tolerant Rice for Africa and South Asia (STRASA) MET-1

Total 14 entries were evaluated including local check R. Mahsuri-1. Yield differences were found to be significant and varied from 2827 kg/ha (CGZR-1) to 4971 kg/ha (IR 91953-141-2-1-2(R-119). Two entries IR 91953-141-2-1-2(R-119) and IR 92937-178-2-2(R-155) recorded yield significantly superior to R. Mahsuri-1 (3752 kg/ha).

MET-2 (Loc-1)

Total seven entries were evaluated including local checkPrabhat. Yield differences were found to be significant and varied from 2183 kg/ha (Prabhat) to 3638 kg/ha (MTU1010). Entry R-RHZ-7 recorded yield significantly superior to Prabhat (2183 kg/ha).

MET-2 (Loc-2)

Total seven entries were evaluated including local check Prabhat. Yield differences were found to be significant and varied from 2123 kg/ha (Prabhat) to 3437 kg/ha (MTU1010). Entry R-RHZ-7 recorded yield significantly superior to Prabhat (2123 kg/ha).

Swarna Sub-1+ drought (control)

Total 16 entries were evaluated including two checks namely S. Sub-1 and Swarna. Yield differences were found to be varied from 6696 kg/ha (IR 96321-315-294-B-1-1-1) to 9494 kg/ha (IR 96321-558-563-B-2-1-3). However, none of the entry could statistically surpass the best check Swarna (9063 kg/ha).

Swarna Sub-1+ drought (Drought)

Total 16 entries were evaluated including two checks namely S. Sub-1 and Swarna. Yield differences were found to be significant and varied from 3590 kg/ha (IR 96321-558-257-B-4-1-2) to 4791 kg/ha (IR 96321-558-563-B-2-1-3). Two entries namely IR 96321-558-563-B-2-1-3 and IR 96321-558-209-B-6-1-1 (4538 kg/ha) were out-yielded the best check Swarna (3932 kg/ha) significantly.

Drought donors

Total 24 entries were evaluated including checks. Yield differences were found to be varied from 949 kg/ha (Koi Murali) to 4348 kg/ha (Binuhangin). Top three yielder donors were Binuhangin, Dular and Uri. Donors were crossed with the locally adapted varieties for transfer of drought tolerance trait.

Participatory varietal selection (PVS)

Total 15 entries were evaluated including checks. Yield differences were found to be varied from 2446 kg/ha (IR 96321-327-300-B-1-1) to 4982 kg/ha (Swarna Sub-1). However, none of the entry could statistically surpass the best check Swarna Sub-1.

G E interaction experiment

Total 63 entries including R. Sweta (LC-1) and R. Mahsuri-1 (LC-2) were tested for GxE interactions especially for Fe and Zn content. These genotypes yieldedlow and none could statistically surpass the local checks. Samples of each entry for micro-nutrient (Zn and Fe) analysis were sent to IRRI-South Asia Hub centre.

3.1.1.6 Multilocation Trials

Altogether 34 multi-location trials (08 at Dhangai, 12 at Madhepura and 14 at Sabour) have been conducted under normal/

submergence/ moisture stress condition to identify submergence + drought / drought tolerant entries of different maturity group. The submergence trials were not conducted at Dhangai.

Swarna sub-1 + drought late

Total 51 entries of late maturity duration were tested in two separate trials comprising 07 and 44 entriesincluding checks (R. Mahsuri-1 as Local Check), simultaneously under submergence and reproductive stage drought conditions of both the trial. The first trial with 07 entries was conducted at Sabour, Madhepura and Dhangain locations but the trial with 44 entries was conducted at Sabour location only. The first trial having 07 entries showed non-significant differences among the entries for grain yield/ha under reproductive drought condition at all the locations. Under submergence condition the yield was ranged between 2700 kg/ha (R. Mahsuri) to 4522 kg/ha (IR 96321-315-402-B-1) at Sabour and 3535 (R. Mahsuri) to 4514 kg/ha (IR 96321-315-402-B-1) at Madhepura. All the test entries except Swarna were found to have significantly higher grain yield over R. Mahsuri (2700 kg/ha) at Sabour whereas non-significant differences was observed at Madhepura.

In case of second trial having 44 entries the yield differences among the entries were found to be significant which varied from 2500 (Swarna Sub-1) to 4228 kg/ha (IR 96321-315-323-B-3-1-1) under moisture stresscondition. Altogether 18 entries exhibited significantly higher grain yield over R. Mahsuri (3532 kg/ha). The entry IR 96321-315-323-B-3-1-1 showedhighest grain yield/ha followed by IR 96321-1447-521-B-2-1-2 (4191kg), IR 96322-34-223-B-1-1-1 (4081kg) and IR 96321-558-563-B-2-1-3 (4007kg). Under submergence condition in the same experiment, 16 entries were found to be significantly superior over the local check R. Mahsuri-1 (2567 kg/ha). Here also entry IR 96321-315-323-B-3-1-1 recorded highest yield/ha of 4100 kg followed by IR 96322-34-223-B-1-1-1 (4050 kg), IR 96321-558-563-B-2-1-3, Swarna sub 1 (4033 kg) and IR 96322-34-282-B-4-1-1 (4000kg).

Conclusively under both the stress condition entry IR 96321-315-323-B-3-1-1,IR 96322-34-223-B-1-1-1and IR 96321-558-563-B-2-1-3 performed comparatively superior yield to the local checks.

Swarna sub-1+drought medium

One trial having 08 entries including local check Sita was conducted under moisture stress at reproductive stage (Sabour, Madhepura and Dhangain) and submergence conditions (Sabour& Madhepura) locations. Under both the conditions, the data for grain yield/ha was found to be non-significant at Sabour location, whereas at Madhepura it was non-significant under submergence condition only. Yield differences was obtained significant under moisture stress trialsboth at Madhepura and Dhangain location where all the entries including checks Swarna and Swarna Sub-1 out yielded significantly over the local check Sita. The grain yield of Sita was 5682 and 5622 kg/ha in Madhepura and Dhangai, respectively. The yield performance of entries were recorded as good as normal condition at Madhepura and Dhangai in drought trials.

Swarna sub-1+droght early

16 entries were tested including checks Swarna, Swarna Sub-1 and R. Suwasini (local check) under reproductive stage drought condition at Sabour, Madhepura and Dhangain and under submergence condition at Sabour and Madhepura. At Sabour under reproductive stage drought, 11 entries including Swarna, were found to be having significant yield superiority over the local check R. Suwasini (3125 kg/ha) while at Madhepura and Dhangain 12 entries recorded significantly superior to R. Suwasini. The yield/ha at Sabour ranged between 2593 (IR 96321-1099-347-B-1-1) to 4676 kg (IR 96321-1099-347-B-1-2) while at Madhepura and Dhangai it was 5506 (R. Suwasini) to 8641 (Swarna) and 5611 kg (IR 96321-315-294-B-1-5) to 9244 kg (Swarna), respectively. The yield performance of entries were recorded as good as normal condition at Madhepura and Dhangai in drought trials.

Under submergence condition at Sabour, 5 entries were found to be significantly superior to the local check R. Suwasini (2611 kg/ha) where Swarna Sub-1 (4833 kg/ha) gave maximum grain yield followed by IR 96321-1099-347-B-1-2 (4333 kg/ha). However, none of the entry could surpass R. Suwasini significantly under submergence condition at Madhepura.

Swarna Moro Late

17 entries including checks Swarna, Swarna Sub-1 and R. Mahsuri-1 (LC) were evaluated under irrigated and reproductive stage drought conditions, simultaneously at Sabour, Madhepura and Dhangain. Under irrigated conditionat Sabour and Madhepura,R. Mahsuri-1 yielded 5465 and 9564 kg/ha, respectively, upon which none of the entry could significantly surpass. However, two entries namely IR 91648-B-85-B-1-1(8433 kg/ha) and IR 96321-315-402-B-1 (8167 kg/ha) out yielded R. Mahsuri-1 (7400 kg/ha) at Dhangai. The performance of IR 91648-B-85-B-1-1 and IR 96321-315-402-B-1 were 5032 and 5574 kg/ha at Sabour, and 7860 & 9328 kg/ha at Madhepura, respectively. Under reproductive stage drought trial, three entries namely, IR 96321-315-402-B-1, IR 96321-327-300-B-1-1 and IR 96321-327-128-B significantly out yielded R. Mahsuri at Sabour and recorded 4135, 4386, 4511 kg/ha, respectively. These three entries also showed significantly higher grain yield/ha over local check and having 6756, 7044 and 6644 kg productivity, respectively at Dhangai in addition to other seven entries. However, at Madhepura, none of the entry could surpass R. Mahsuri-1 (9276 kg/ha) under this situation. At Madhepura and Dhangai the performance of entries under drought trial was as like as irrigated condition.

Swarna Moro Medium

48 entries were tested under irrigated at Sabour, Madhepura and Dhangain and reproductive stage water stress conditions at Sabour, Madhepura only including local check R. Sweta. Under irrigated condition at Sabour five entries namely, Swarna (4905 kg), IR 91648-B-89-B-8-1-B (4187 kg), IR 91648-B-89-B-6-1 (3987 kg), IR 91648-B-89-B-7-2&IR 91648-B-238-B-1-3 (3828 kg) exhibited statistically higher grain yield/ha over R. Sweta (3349 kg). However at Madhepura, none of the test entry could surpass significantly R. Sweta (6439 kg/ha). At Dhangain, 28 entries were able to excel R. Sweta (5778 kg/ha). Under reproductive stage drought condition, only two entries namely IR 91648-B-89-B-8-1-B (3528 kg/ha) and IR 91648-B-89-B-6-1 (3472 kg/ha) could surpass R. Sweta (2722 kg/ha) at Sabour. However, at Madhepura none of the entry could surpass R. Sweta (5556 kg/ha). The yield at Madhepura ranged from 4208 (IR 91648-B-59-B-3-2) to 6333 kg/ha (IR 91648-B-117-B-1-2) which envisages as good as irrigated condition.

MTU 1010 + QTL

14 Entries including check MTU 1010 were tested under irrigated and reproductive stage drought conditions at Sabour, Madhepura and Dhangain.

Under irrigated condition, two entries namely IR 91631-28-1-7-1-1-B (6686 kg/ha) and IR 91631-27-5-4-1-1-B (6799 kg/ha) surpassed check variety MTU 1010 (5152 kg/ha) at Madhepura location while at Dhangain location, 04 entries including IR 91631-27-5-4-1-1-B (8025 kg/ha) were found to be significantly superior to MTU 1010 (7042 kg/ha). None of the entry could surpass MTU 1010 (4205 kg/ha) at Sabour location under irrigated situation but the entry IR 91633-29-2-1-1-1-B (4225 kg/ha) was at par with check. Under drought condition two entries, IR 91633-29-2-1-1-1-B (3310 kg/ha) and IR 91631-28-1-2-1-3-B I (3079 kg/ha) significantly superior over MTU 1010 (2361 kg/ha).Similarly at Dhangai, eight entries observed to have significantly higher yield over MTU 1010 (5792 kg/ha). Entry IR 91633-45-2-1-1-1-B was having highest grain yield/ha of 7317 kg followed by IR 91633-53-1-2-1-1-B (7150 kg), IR 91633-29-2-1-1-1-B (7025 kg) and IR 91631-27-5-4-1-1-B (7008 kg). At Madhepura and Dhangai the performance of entries under drought trial was as like as irrigated condition. Conclusively the entry IR 91633-29-2-1-1-1-B performed better under both the situations.

3.1.1.7 Adaptive Trials (Varietal Testing Experiments)

Non hybrid trials

Sabour

Under this trial, 8 entries were tested along with the check R. Bhagwati. Yield differences were found to be significant and varied from 2238 kg ha^{-1}(R. Bhagwati-2) to 5556 kg ha^{-1}(BRR 2028). Four entries were found to be statistically superior to R. Bhagwati (3202 kg ha^{-1}).

Purnea

Under this trial, 8 entries were tested along with the check R. Bhagwati. Yield varied from 2343 kg ha^{-1}(R. Bhgwati-2) to 3833 kg ha^{-1}(BRR 2028). None of the entry could beat R. Bagwati (3263 kg ha^{-1}) significantly.

Agwanpur

Eight entries were tested along with the check R. Bhagwati. Yield ranged from 3131 kg ha^{-1}(R. Bhagwati) to 6814 kg ha^{-1}(RAU-724-48-33). Six entries were found to be significantly superior to the check R. Bhagwati.

Dumraon

Under this trial, 8 entries were tested along with the check R. Bhagwati. Yield differences were found to be significant and varied from 4156 kg ha^{-1}(RAU 1197) to 7773 (RAU-724-48-33). Five entries recorded yield significantly superior to the check R. Bhagwati (4607 kg ha^{-1}).

Bikramganj

Under this trial, 8 entries were tested along with the check R. Bhagwati. Yield differences were found to be significant and varied from 3417 kg ha^{-1}(RAU 1197) to 6444 kg ha^{-1}(RAU-724-48-33). Five entries including RAU-724-48-33 out yielded the check R. Bhagwati (4639 kg ha^{-1}).

Tilaundha

Under this trial, 8 entries were tested along with the check R. Bhagwati. Yield differences were found to be significant and varied from 5017 kg ha^{-1}(RAU 1197) to 7707 kg ha^{-1}(RAU-724-48-33). Four entries including RAU-724-48-33 out yielded the check R. Bhagwati (5909 kg ha^{-1}).

Patna

Under this trial, 8 entries were tested along with the check R. Bhagwati. Yield differences were found to be significant and varied from 3148 kg ha^{-1}(RAU 1197) to 6963 kg ha^{-1}(BRR 2028). Five entries including BRR 2028 out yielded the check R. Bhagwati (3630 kg ha^{-1}).

Hybrid-Trial

Sabour

In this trial also, 8 hybrids were tested along with two checks namely PA 6444 and DRRH2. Yield variation was found from 3356 kg ha^{-1}(Loknath-510) to 5363 kg ha^{-1}(Shanti). None of the test hybrid was found to be significantly superior to the best hybrid

Purnea

In this trial, 8 hybrids were tested along with the check PA 6444. Yield ranged from 3690 kg/ha (Shanti) to 5767 kg ha^{-1}(Arize 6444). None of the test hybrid was found to be significantly superior to PA 6444.

Agwanpur

In this trial, 8 hybrids were tested along with the check PA 6444. Yield ranged from 5056 kg ha^{-1}(Loknath-510) to 6700 kg ha^{-1}(Arize 6444). Yield differences were non-significant.

Dumraon

In this trial, 8 hybrids were tested along with the check PA 6444. Yield differences were found to be significant and varied from 5906 kg ha^{-1}(Shanti) to 8877 kg ha^{-1}(Sava 124). Two hybrids namely Sava 124 and Loknath-510 (8083 kg ha^{-1}) out yielded the best check hybrid DRRH2 (7086 kg ha^{-1}).

Bikramganj

In this trial, 8 hybrids were tested along with the checks. Yield differences were found to be significant and varied from 4889 kg ha^{-1}(Sava 124) to 8361 kg ha^{-1}(Loknath-510). Hybrid Loknath-510 out yielded the best check hybrid PA 6444 (7278 kg ha^{-1}).

Tilaundha

In this trial, 8 hybrids were tested along with the checks. Yield range was recorded from 4903 kg ha^{-1} (Shanti) to 7110 kg ha^{-1} (DRRH2). None of the hybrids could surpass the best check DRRH2.

Patna

In this trial, 8 hybrids were tested along with the checks. Yield range was recorded from 3519 kg ha^{-1} (Shanti) to 7963 kg ha^{-1} (SRH-5200). None of the hybrids could surpass the best check DRRH2 (7778 kg ha^{-1}).

3.1.1.8 Testing of Private Paddy Hybrids

Sabour Location

13 hybrids from 4 different seed companies were tested along with two checks PA 6444 and Kanak. Yield ranged from 3519 kg/ha (Kanak) to 5440 kg/ha (KSP 172). Three hybrids including KSP 172 surpassed the best check (hybrid) PA 6444 (4630 kg/ha) with more than 10% yield superiority over PA 6444.

Purnea Location

The same set of 13 hybrids were tested at Purnea along with two checks PA 6444 and Kanak. Yield was ranged from 4200 kg/ha (Arize Nano) to 5633kg/ha (PAC 835). Three hybrids including PAC 835 surpassed the best check (hybrid) PA 6444 (5133 kg/ha) with more than 5% yield superiority.

Dhangai Location

Similar trial of 13 hybrids from 4 different seed companies were tested at Dhangai, Bikramganj. Average yield was varied from 4625 kg/ha (Sava 127) to 6625 kg/ha (BS 023). Four hybrids including BS 023 surpassed the best check (hybrid) PA 6444 (5667 kg/ha) with more than 5% yield superiority.

3.1.1.9 Development of Early and Medium Maturity Rice Hybrids for Bihar

Total 236 cross combinations (of CMS line with locally adapted varieties, elite genotypes) i.e. F1s and their respective male parents, of different maturity groups were tested in Augmented Block Design along with 04 checks repeated after every 50 entries in a plot size of 0.80 m^2 (one row of 4.0 m). Two checks were used each for early (EM) and medium maturity (MM) group where, popular hybrid PA 6129 and variety Prabhat were used for EM group whereas hybrid PA 6444 and variety Rajendra Sweta were used for MM group.

Rice with purple leaf colour was used as marker to fill gaps where number of plants were less or planting as border rows to minimize the gap or border effect in view to enhance the precision in the experimental results. Both male (restorers) and females (maintainers) were identified among the tested genotypes along with a large number of partial restorers and partial maintainers. Out of 236 genotypes, 41 (17%) were found to be restorers of which maximum (34) was of early maturity (EM) group and a few (7) of medium maturity (MM) group showing a range of 5-75% yield superiority over the hybrid check PA 6129 and 56-159 % yield superiority over the varietal check Prabhat. 52 genotypes were found to be maintainers which was 22% of the total genotypes under evaluation. Among these, 40 were of early maturity (EM) group, 10 were of medium maturity (MM) group and two were of late maturity group (LM). Rest of the genotypes i.e. 145 or 61% of the total genotypes were found to be partials. F1s of all the 52 genotypes were back-crossed with their male parents at the same time when they were found having desirable male sterility. For this plants from F1 row (in TCN) were taken into pots, spikelets of these plants were cut and covered and next day morning hand pollination was done by collecting pollen from the respective male parent preferably from a single plant. The plant, from which pollen was collected, was tagged and harvested for seed backup of the parental line. These back-crosses were made towards transfer of CMS (Cytoplasmic Male Sterility) into the genotypes found maintainers in view of the development of the new CMS lines.

New cross combinations using CMS line

New crosses between CMS line Pusa 6A and selected elite genotypes were made. 213 such cross combinations have been developed.

New cross combinations using wild rice

Wild rice *O. longistaminata* and *O. nivarahave* been crossed with locally adapted varieties namely MTU 1010, R. Suwasini, R. Sweta, S. Deep, S. Ardhjal, S. Shree, Sita and R. Mahsuri-1.

New cross combinations using japonica rice

Nipponbare (japonica rice) has also been crossed with locally adapted varieties namely MTU 1010, S. Shree, Sita, R. Mahsuri-1, R. Suwasini, R. Sweta, S. Deep and S. Ardhjal.

3.1.1.10 Molecular and Morphological Characterization of Local Germplasm Of Rice Characterisation of Rice Germplasm of Tiloundha, Sabour and Patna

Pre and Post-harvest morphological data of germplasm of Tiloundha, Sabour and Patna were taken on 8 parameters viz. Plant Height(cm), Days to 50% flowering, Tiller Number, Panicle length(cm), Flag leaf length (cm), Grain length (mm), Grain breadth(cm) and L/B ratio. The duplicate entries were earlier identified on the basis of high similarity index of the 11 morphological data during Kharif 2013. Molecular diversity studies among the duplicate entries in the germplasm of Tiloundha, Sabour and Patna was completed using 26, 32 & 32 SSR markers, respectively. Based on the Dendrogram prepared through NTSYS software 90% similarity was found between Ti7/Til8, Til9/Til11, Til11/Til14, Til25/Til27, Til27/Til28, Til27/Til29, Til36/Til39, Til36/Til44 & Til39/Til45 in Tiloundha Collection, Pat72/Pat79 in Patna Collection and Sab33/Sab36 in Sabour Collection. These entries were earlier found to be more than 60% similar based on the morphological data taken in 2013. Hence molecular diversity study with the SSR markers on suspected duplicate entries based on the morphological data was further supported.With this important data, the duplicated entries would be discarded from the set of 230 germplasm pool of Tiloundha, Patna and Sabour Collection and the diverse germplasm can be used in the breeding programmes.

Characterization of rice landraces collected locally

Three new entries were collected locally and multiplied for further study. The entries were: Kala Basmati, Lal Basmati & Karibank. Upon PCR amplification using aroma specific primers as suggested by Bradbury et al. (2005) all these entries showed fragrant band of 257bp. This indicates the presence of *badh2* allele in these 3 genotypes which is responsible for production of aromatic compound 2-acetyl pyrroline in all aromatic rice varieties. PCR amplification using gene specific primer namely BADEX5-7 was used on 13 landraces rice of Bihar namely Kishanganj Basmati, Hafsal, Champaran Basmati, Jasua, Sonachur, Malida, Katarni, Burma Bhusi, Kali Kumud, Lakhipat, Barogar, Gutraj, Malbhog were taken. The sequence of BADEX5-7 was as given by Sakthivel K. et al, 2009 which can be used as functional marker to distinguish Indian Bamsmati and non-Basmati fragrant cultivars. As expected the genotypes Kishanganj Basmati, Champaran Basmati, Jasua, Sonachur, Katarni, R. Kasturi and Malbhog gave fragrant specific band size of < 104bp whereas the rest of the genotypes showed amplification of >111bp which non-fragrant specific band.

3.1.1.11 Breeding for Architectural Modification of Katarni Rice through Marker Assisted Selection

Survey of parental polymorphism between Katarni, IR64, Rajendra Sweta and BPT 5204 was undertaken through the set of 25 additional SSR markers in rice were conducted Validation of F_1 plants of Katarni/BPT5204 through parental polymorphic SSR was done in PCR. Backcrossing of 8 validated Katarni/BPT5204 F_{1s} with recurrent parent Katarni was done to obtain the BC_1F_1 seeds. 388 BC_1F_1 plants of Katarni/R.Sweta//Katarni were raised out of which 107 plants were selected based on the foreground selection using *badh2* gene specific primer (Bradbury 2005). Out of 107 fragrant allele positive plants, 87 were found to be positive for *sd1* gene through PCR using *sd1* gene specific primer as suggested by Spielmeyer, 2003. On the basis of grain and leaf aroma KOH sensory test, 15 plants were selected out of the 87 positive plants for *sd1* gene. These 15 plants will be evaluated for the presence of aroma, *sd1* gene with

early flowering trait in next segregating generation. Out of about 10000 F_2 plants of Katarni/R.Sweta, 410 plants were selected based on KOH sensory test, plant height and early date of flowering. Out of about 6000 F_2 plants of Katarni/IR64, 350 plants were selected on the basis of plant height and date of flowering.

3.1.1.12 EIRLSBN

SHW

Total 26 entries were evaluated including R. Mahsuri-1 (local check). Yield differences were found to be varied from 1823 kg/ha (NDR 9496) to 6042 kg/ha (OR 2416-9). However, none of the entry could statistically surpass the local check R. Mahsuri-1 (5781 kg/ha).

Observation Yield Trial (OYT)

Total 68 entries were evaluated in this trial. Yield differences were found to be varied from 1375 kg/ha (LPR 1150(B)) to 5250 kg/ha (OR 2437-15).

3.1.1.13 Varieties Recommended/Released

Sabour Deep

The variety has been released for Irrigated Medium Lands. It is having medium plant height and matures in 110-115 days. It gives 35-40 quintal yield per hectare. The variety is having extra-long slender grain with a very good cooking quality.

Sabour Shree

The variety has been developed by the Rice Scientists of Agricultural Research Institute, Patna. It is a cross between Haryana Basmati/ Mahsuri. The variety has a yield potential of about 6.0 t / ha, superior to Rajendra Sweta, BPT 5204 and Sita. It is well suited to irrigated medium land under favourable condition of rice- wheat cropping system of Bihar.This variety is of medium maturity duration (135-140 days), semi-dwarf plant height (100-105cm), medium slender grain and white kernel, high degree of milling (70.6%) and head rice recovery (63.0%) and very good cooking and keeping (fresh for 8-10 hours after cooking) qualities. It is a non-aromatic, non-shattering and easily threshable variety, resistant to major diseases, insect pests and lodging and can sustain drought at the early vegetative stage and water logging at the later stage.

3.1.2. Wheat

3.1.2.1 Timely Sown Irrigated Conditions

Under timely sown irrigated condition six trials viz., NIVT-1A, NIVT-1B, AVT, Wheat Biofortification Trial, Station Trial & Multi Location Station trial were conducted.

NIVT- 1A (TS-IR)

With 49 entries including 4 checks viz; HD2967, DBW 88, WH 1105 and K 0307 were evaluated in simple lattice with two replications. The varietal differences among the entries were highly significant. The check entry K 0307 gave the highest yield (48.7 q/ha)

followed by HD 3219 (48.5 q/ha) and HUW 801 (48.5 q/ha). Our entry BRW 3786 (46.5 q/ha) was at par with the best checks K 0307 & HD 2967.

NIVT-1B (TS-IR)

With 49 entries including HD2967, WH 1105, K0307 and DBW 88 as checks were tested in simple lattice with two replications. The various entries showed significant differences with respect to grain yield. Highest grain yield was recorded with the genotype NW 6090 (50.1 q/ha) followed by PBW 748 (49.2 q/ha) & BRW 3771 (45.3 q/ha) and both were significantly superior to the best check K 0307 (42.2 q/ha). Our entry BRW 3771 (45.3 q/ha) was at per with the best check K 0307 but significantly superior to other three checks.

AVT

AVT was conducted with a single test entry HD 3184 along with five checks namely K 1006, HD 2967, K 0307, HD 2733 & DBW 39 in RBD with four replications. The varieties differ significantly with respect to grain yield. Highest grain yield (44.9 q/ha) was observed with the check entry DBW 39. The test entry HD 3184 was at par with (44.7 q/ha) four checks but significantly superior to fifth check i.e. HD 2733 (36.2 q/ha).

Biofortification Trial (TS-IR)

10 entries including four checks i.e. MACS 6222, GW 322, DPW 621 & K 0307 in RBD with four replications. Grain yield differences among the genotypes were significant. Highest grain yield was recorded with the check variety K 0307 (40.6 q/ha) followed by HPPAU 10 (40.2 q/ha) & HPBW 02 (38.5 q/ha).

Station Trial (TS-IR)

23 entries including three checks viz., HD 2967, K 0307 and Sabour Samriddhi (BRW 3708) in RBD with three replications. Yield differences among the genotypes were found to be significant. The genotype BRW 3806 recorded the highest yield (49.50 q/ha) followed by BRW 3796 (47.00 q/ha) and BRW 3788 (46.83 q/ha) BRW 3793 (45.67 q/ha), BRW3799 (45.17 q/ha) and BRW 3792 (44.16 q/ha). All these entries were significantly superior to the best check K 0307 (42.84 q/ha). Based on the performance of yield & disease reaction four genotypes i.e. BRW 3792, BRW 3793, BRW 3796 and BRW 3799 have been entered in NIVT (TS-IR).

Multi Location Station Trial (TS-IR)

10 entries including four checks viz., HD 2967, K 0307, HD 2733 & Sabour Samriddhi (BRW 3708) in RBD with three replications. Significant yield differences among the genotypes were observed. The genotype RW 3762 gave the highest yield (44.28 q/ha) & it was significantly superior to the best check Sabour Samriddhi (42.61 q/ha). Based on the performance in the coordinated trial, the genotype BRW 3773 has been promoted to AVT (TS-IR) under NWPZ.

3.1.2.2 Late Sown Irrigated Condition

Under late sown irrigated condition four trials viz., NIVT-3A, SPL-VLS, Station Trial and MLST were conducted.

NIVT-3A

36 entries including four checks i.e. DBW 14, HI 1563, HD 3059 and DBW 90 were evaluated in simple lattice with two replications. Yield differences among the genotypes were significant. Highest grain yield was recorded with the genotype PBW 752 (40.0 q/ha) and it was significantly superior to the best check DBW 90 (36.1 q/ha).

Special Very Late sown

11 entries including three checks i.e. DBW 14, WR 544 & DBW 71 in RBD with four replications. Yield differences among the genotypes were significant.

Check variety DBW 71 recorded the highest yield (28.50 q/ha) followed by PBW 757 (26.7 q/ha), DBW 219 (26.3 q/ha) and another check variety WR 544 (26.2 q/ha). All these entries were at par with each other.

Station Trial

16 entries including two checks viz., DBW 14 and HI 1563 in RBD with three replications. Significant yield differences were observed among the genotypes. Highest grain yield was recorded with the genotype BRW 3807 (36.73 q/ha) followed by BRW 3791 (36.54 q/ha), BRW 3795 (35.12 q/ha) and BRW 3802 (33.95 q/ha). All these entries were significantly superior to the better check DBW 14 (29.32 q/ha). BRW 3791 has been entered in NIVT 3A (LS-IR).

Multi Location Station Trial (LS-IR)

10 entries including three checks DBW 14, HI 1563 and Sabour Shrestha (BRW 934) in RBD with three replications. Yield differences among the genotypes were significant. The genotype BRW 3768 was the top yielder (36.11 q/ha) followed by BRW 967 (35.24q/ha) and SW 152 (33.27 q/ha). All these entries were significantly superior to the best check HI 1563 (30.67 q/ha).

3.1.2.3 Timely Sown Rainfed Irrigated Condition

Four trials viz., NIVT-5A, AVT (RI), AVT (RF) and Station Trial were conducted.

NIVT 5A (TS-RI)

36 entries including four checks viz; , HD 2888, WH 1142, DBW 110 and DBW 93 were tested in simple lattice with two replications. Yield differences among the genotypes were observed to be significant. The test entry HD 3237recorded the highest yield (41.8 q/ha) followed by Check HD 2888 (40.9 q/ha), HI 1620 (40.7 q/ha) and DBW 210 (40.5 q/ha). All these entries at par with the best check HD 2888. Our entry BRW 3775 topped (53.9 q/ha) in the Central Zone & hence promoted to AVT (TS-RI) in that zone.

AVT (TS-RI)

05 entries including 3 checks viz; C 306, K8027 and HD 2888 were tested in RBD with four replications.

Highly significant yield differences among the treatments were observed. Highest grain yield was recorded with the genotype HI 1612 (40.4 q/ha) and it was significantly superior to all the checks. Another test entry WH 1181 (36.8 q/ha) was at par with the check K 8027 (32.2 q/ha) but significantly superior to other two checks.

AVT (TS-RF)

Five entries including three checks i.e. HD 2888, K 8027 & C 306 in RBD with four replications. The varieties differ significantly with respect to grain yield. The check entry HD 2888gave the highest grain yield (34.8 q/ha) and both the test entries K 1317 (28.4 q/ha) and HD 3171 (26.4 q/ha) were significantly inferior to check HD 2888.

Station Trial

23 entries including two checks HD 2888 and C 306 in RBD with three replications. Significant yield differences were observed among the genotypes. Highest grain yield (35.84 q/ha) was recorded with the genotype BRW 3806 and it was significantly superior to both the checks i.e. HD 2888 (33.00 q/ha) & C 306 (29.00 q/ha). Another genotype BRW 3798 (35.17 q/ha) was at par with HD 2888 but significantly superior to another check C 306 (29.0 q/ha). Both BRW 3806 and BRW 3798 have been entered in NIVT-5A (TS-RI).

3.1.2.4 Bihar State Wheat Varietal Trial for Timely sown and late sown irrigated conditions

Two experiments were conducted for timely sown and late sown irrigated conditions separately to identify appropriate variety location wise.

Timely sown irrigated condition

In timely sown irrigated condition, Zone II (Agwanpur, Madhepura & Purnea), varieties like HD 2967 (39.9 q/ha.) followed by HD 2824 (37.4 q/ha) & DBW 39 (36.3 q/ha). Under Zone III A (Bhagalpur, Tiloundha), DBW 39 (43.3 q/ha), HD 2967 (41.4 q/ha) & HD 2824 (40.3q/ha) and for Zone III B (Mokama and Bikramganj), varieties like NW 5054 (40.2q/ha), Sabour Samriddhi (39.9 q/ha) & HD 2733 (39.6 q/ha)expressed superior performance in respective zones.

Under late sown irrigated condition

Under late sown conditions, Zone II (Agwanpur, Madhepura & Purnea), varieties like DBW 14 (31.9 q/ha.) followed by HP 3059 (31.6 q/ha) & HD 2643 (29.5 q/ha). Under Zone III A (Bhagalpur, Tiloundha), CSW 16 (32.3 q/ha), Sabour Shreshtha (30.2 q/ha) and for Zone III B (Mokama and Bikramganj), varieties like DBW 107 (30.2 q/ha) & Baj (29.9 q/ha) expressed superior performance in respective zones.

3.1.2.5 Identification of High Yielding Wheat Genotypes Suitable for Limited Irrigation

On the basis of morphological, physiological and yield performance, identified total 15 genotypes including six fresh genotypes (SAWYT 1 , 14-15,P.N -60, SAWYT 14-15,P.N 89, HTWYT 14-15, P.N 33, HTWYT 14-15, P.N 51, HTWYT 14-15, P.N 1, HTWYT 14-15, P.N 34, showed superior per plant yield performance over best check i.e. DBW 14.

3.1.2.6 Development of Spot Blotch Resistant Genotypes of Spring Wheat for Eastern Gangetic Plain of India Using Double Haploid (DH) Technology.

F1 developed from high yielding locally adapted and spot blotch tolerant parents was grown under controlled condition pseudo seeds formation through wheat X maize crossing.Protocol for *in vitro* haploid generation by rescuing the resultant embryo from wheat X maize cross have been achieved.But the frequency was low which is being taken up in the further experiments.

F1 pollinated with maize pollen

Haploid plants germinating from the pseudo seeds formed from wheat X maize cr osses

Four Barley experiments under timely sown condition viz. IVT-RF, IVT-IR, AVT-RF and AVT-IR were conducted.

IVT-RF

19 entries including two checks viz., K 603 and Lakhan in RBD with four replications under rainfed condition. Yield differences among the genotypes were significant. Highest grain yield was recorded with the genotype HUB 247 (28.93 q/ha) followed by HUB 248 (28.50 q/ha). Both these genotypes were at par with the check variety Lakhan (28.44 q/ha) but significantly superior to other check K603 (24.28 q/ha).

IVT-IR

27 entries including six checks viz., BH 902, HUB 113, BH 959 etc. in RBD with four replications under irrigated condition. Yield differences among the genotypes were significant. Highest grain yield of 37.38 q/ha was recorded with the genotypes DWRB 157 & HUB 250 and both were significantly superior to the highest yielding check BH 902 (34.00 q/ha).

AVT (TS – RF)

7 entries including 3 checks i.e. Lakhan, K 560 and K 603. Highly significant yield differences among the treatments were observed. The highest grain yield was recorded with the genotype KB 1318(36.59 q/ha) followed by HUB 242 (36.18 q/ha) but at par with the check entry K 560 (35.17 q/ha) but significantly superior to other checks i.e. K 603 (26.69 q/ha) and Lakhan (26.603 q/ha)

The lowest yield was observed with with the genotype K 1323 (15.31 q/ha).

AVT (TS – IR)

5 entries including 3 checks i.e. HUB113, K 508 and Jyoti. Highly significant yield differences among the treatments were observed. The highest grain yield was recorded with the genotypeDBRW 137 (43.82 q/ha) and it was significantly superior with the best check Jyoti (34.78 q/ha)

3.1.3. Maize

3.1.3.1 Evaluation of inbred lines

Altogether 69 inbred lines were evaluated. Out of them, 24 inbred lines were found suitable for high yield, lodging resistance, tight husk cover and lower ear placement. Fourteen inbred were categorized as male parent, 19 inbred as female parents and 7 inbred for both male and female parents.

Station trial 301

A total of 105 entries along with checks were evaluated in α lattice design with 2 replications. Range of grain yield (at 15 % moisture) was 7.4 - 14.15 t ha^{-1}. Entry No. 3 (12.38 t ha^{-1}), 9 (12.91 t ha-1), 17 (11.87 t ha^{-1}) and 22 (11.97 t ha^{-1}) were found to be at par with check DHM 117 (11.93 t ha^{-1}) and DKC 9081(12.15 t ha^{-1}) for grain yield.

Station trial 302

A total of 72 entries along with checks were evaluated in α lattice design with 2 replications. Range of grain yield (at 15 % moisture) was 5.61-13.47 t ha^{-1}. Entry No. 2 (13.47 t ha-1) showed 10% yield superiority over check DKC 9081 (12.12t ha^{1}).

Station trial 303

A total of 33 entries along with checks were evaluated in RBD with 2 replications. Range of grain yield (at 15 % moisture) was 6.36-12.21 t ha-1. Entry No. 1 (11.28 t ha^{-1}), 6 (11.43 t ha^{-1}) and 9 (12.21 t ha^{-1}) exhibited 9.5%, 10.7 % and 16.4% higher yield than check, DHM 117 (10.21 t ha^{-1}). However yield of these entries were at par with yield of DKC 9018 (11.21 t ha^{-1}).

3.1.3.2 HTMA Rabi Trials

AEDWTC-1

A total of 20 entries along with checks were evaluated in α lattice design with 2 replications. Range of grain yield (at 15 % moisture) was 6.36-12.21 t ha^{-1}. Entry No. 1 (11.28 t ha^{-1}), 6 (11.43 t ha^{-1}) and 9 (12.21 t ha^{-1}) exhibited 9.5%, 10.7 % and 16.4% higher yield than check, DHM 117 (10.21 t ha^{-1}). However yield of these entries were at par with yield of DKC 9018 (11.21 t ha^{-1}).

AEMWEH 1

A total of 40 entries along with checks were evaluated in α lattice design with 2 replications. Range of grain yield (at 15 % moisture) was 5.93-11.34 t ha^{-1}. Entry No. 21 (10.73 t ha^{-1}) exhibited 18% higher yield than check, NK 6240 (9.12 t ha^{-1}).

AHTC 22

A total of 45 entries along with checks were evaluated in α lattice design with 2 replications. Range of grain yield (at 15 % moisture) was 5.32-9.65 t ha^{-1}. Entry No. 2 (9.58 t ha^{-1}), 18 (9.32 t ha^{-1}) and 39 (9.65 t ha^{-1}) exhibited 19%, 16 % and 20% higher yield than check BIO9544 (8.05 t ha^{-1}), respectively.

AMLDDTC -1

A total of 15 entries along with checks were evaluated in α lattice design with 2 replications. Range of grain yield (at 15 % moisture) was 4.67-9.42 t ha^{-1}. Entry No. 9 (9.42 t ha^{-1}) exhibited 23% more yield than check.

3.1.3.3 HTMA Spring

AHS III-15

A total of 35 entries along with checks were evaluated in α lattice design with 2 replications. Range of grain yield (at 15 % moisture) was 2.76-9.29 t ha^{-1}. Entry No. 6 (8.96 t ha^{-1}), 9 (9.29 t ha^{-1}), 12 (8.64 t ha^{-1}) and 24 (8.66 t ha^{-1}) exhibited higher yield than check.

ASHII 15

A total of 55 entries along with checks were evaluated in α lattice design with 2 replications. Range of grain yield (at 15 % moisture) was 1.95-6.19 t ha^{-1}. Entry No. 37 (6.19 t ha-1) produced 12.3 % higher yield than check HTMH5101 (5.43 t ha^{-1}).

DEYH 15

A total of 40 entries along with checks were evaluated in α lattice design with 2 replications. Range of grain yield (at 15 % moisture) was 3.42-9.73 t ha^{-1}. Entry No. 1 (8.56 t ha^{-1}), 7 (9.13 t ha^{-1}) and 34 (9.73 t ha^{-1}) exhibited 14.1%, 19.5%, 10.6 % and 24.4% higher yield than check HTMH5101(7.35 t ha^{-1}), respectively.

DHTC-22

A total of 90 entries along with checks were evaluated in α lattice design with 2 replications. Range of grain yield (at 15 % moisture) was 2.42-7.55 t ha^{-1}. Entry No. 47 (7.55 t ha^{-1}) exhibited 12.1% higher yield than check 31Y45 (6.64 t ha^{-1}).

DHTC 32

A total of 95 entries along with checks were evaluated in α lattice design with 2 replications. Range of grain yield(at 15 % moisture) was 2.69-9.83 t ha^{-1}. Entry No. 12 (9.83 t ha^{-1}) showed 23.1% higher yield than check DKC 9081 (7.56 t ha^{-1}), respectively.

DHTC 42

A total of 85 entries along with checks were evaluated in α lattice design with 2 replications. Range of grain yield (at 15 % moisture) was 2.09-6.03 t ha^{-1}. Entry No. 7 (5.48 t ha^{-1}), 56 (5.12 t ha^{-1}), 58 (6.03 t ha^{-1}), 59 (5.33 t ha^{-1}) and 83 (5.11 t ha^{-1}) exhibited 26.3%, 21.2%, 33 %, 24.3 % and 21.1% higher yield than check 31Y45(4.04 t ha^{-1}), respectively.

DHTC 52

A total of 115 entries along with checks were evaluated in α lattice design with 2 replications. Range of grain yield(at 15 % moisture) was 1.8-6.37 t ha^{-1}. Entry No. 45 (5.8 t ha^{-1}) and 86 (246.37 t ha^{-1}) exhibited 10.6% and 18% higher yield than check BIO 9522 (5.22 t ha^{-1}), respectively.

DM II YW11

A total of 55 entries along with checks were evaluated in α lattice design with 2 replications. Range of grain yield (at 15 % moisture) was 3.32-8.25 t ha^{-1}. Entry No. 4 (7.36 t ha^{-1}), 5 (8.25 t ha^{-1}) and 50 (7.47 t ha^{-1}) exhibited 11.7%, 21.2 % and 13.0% higher yield than check 31Y45 6.50 t ha^{-1}), respectively.

DMWH 11

A total of 20 entries along with checks were evaluated in α lattice design with 2 replications. Range of grain yield (at 15 % moisture) was 1.90-6.63 t ha^{-1}. Entry No. 9 (6.53 t ha^{-1}), 12 (6.45 t ha^{-1}), 14 (6.47 t ha^{-1}) and 15 (6.63 t ha^{-1}) exhibited 13.4%, 12.3 %, 12.6 % and 14.7 % higher yield than check DKC 9108 (5.65 t ha^{-1}), respectively.

DMYH 11

A total of 125 entries along with checks were evaluated in α lattice design with 2 replications. Range of grain yield (at 15 % moisture) was 2.27-9.59 t ha^{-1}. Entry No. 36 (8.79 t ha^{-1}), 43 (9.10 t ha^{-1}), 45 (8.2 t ha^{-1}), 54 (8.41 t ha^{-1}) and 99 (9.59 t ha^{-1}) exhibited 18.7%, 21.5%, 13.0%, 15.1 % and 25.5% higher yield than check, DKC9108 (7.14 t ha^{-1}), respectively.

3.1.3.4 Multilocation Trials

MLT 1

Multilocation trials were carried out at Sabour and Purnea locations. A total of 5 experimental hybrids were evaluated. Top three higher yielder crosses were CAH1511 (6.2 t ha^{-1}), CAH153 (6.1 t ha^{-1}) and CAH152 (6.0 t ha^{-1}).

MLT 2

A total of 17 experimental hybrids along with checks were evaluated at Sabour and Purnea locations. Grain yield of Entry No. 1 (4.7 t ha^{-1}), 2 (5.0 t ha^{-1}), 3 (5.5 t ha^{-1}),6 (6.1 t ha^{-1}), 7 (5.2 t ha^{-1}), 8 (5.1 t ha^{-1}), 9 (4.9 t ha^{-1}), 10 (5.3 t ha^{-1}) , 11 (5.5 t ha^{-1}) and 14 (4.5 t ha^{-1}) were 11%, 16 %, 24%, 31%, 19 %, 18%, 14 %, 21% and 24% higher grain yield than the best check SHM 29 4.2 t ha^{-1}), respectively.

3.1.3.5 Hybrid Testing of Maize (MNC)

Experiments were conducted in RBD at BPSAC, and BAC during Rabi (winter) season of 2015-16 to evaluate thirteen full season maize hybrids of Pvt. Seed Companies for testing their 25suitability in Bihar. Hybrids Bio 9637 and DHM117 were used as check. The result showed that over the location check DHM117 (9.96 t ha^{-1}) was found higher grain yielder than the check Bio 9637 (7.48 t ha^{-1}). At Purnea (zone II), none of the test hybrids showed significantly higher grain yield over best check DHM117 (10.10 t ha^{-1}). Among the tested hybrids, five top grain yielder were DKC 9135 (9.24 t ha^{-1}), NMH 920 (9.20 t ha^{-1}), DKC9120 (9.06 t ha^{-1}), DEKALB-9165 (8.66t ha^{-1}) and [Robust (PMH 2250)] (8.53 t ha^{-1}). At Sabour (zone III A), only one test hybrid [Robust (PMH 2250)] (11.10t ha^{-1}) showed significantly higher grain yield, with 13% superiority over the best check DHM117 (9.81t ha-1). Test hybrids [Robust (PMH 2250)] (11.10t ha^{-1}), NMH 1247(10.81t ha^{-1}), DEKALB-9165(10.69t ha^{-1}), DKC 9155(10.52t ha^{-1}) and Laxmi3636 (10.16 t ha^{-1}) were recorded as top ranking hybrids among the tested hybrids at Sabour. Over the location none of the test hybrids showed significantly higher yield over the best check DHM117 (9.96 t ha^{-1}). Whereas, eight test hybrids viz. [Robust(PMH 2250)] (9.82t ha^{-1}), DEKALB-9165(9.68 t ha-1), NMH 1247(9.59t ha^{-1}), Laxmi3636 (9.34t ha^{-1}), DKC 9135(9.25t ha^{-1}), DKC 9155(9.00t ha^{-1}), NMH920 (8.74t ha^{-1}) and DKC 9120(8.69t ha^{-1}) showed significantly higher grain yield over the low yielder check Bio 9637 (7.48 t ha^{-1}). Over the location test hybrids [Robust (PMH 2250)] (9.82t ha^{-1}), DEKALB-9165(9.68 t ha^{-1}), NMH 1247(9.59t ha^{-1}), Laxmi3636 (9.34t ha^{-1}) and DKC 9135(9.25t ha^{-1}) recorded as high yielder hybrids for the character grain yield.

3.1.3.6 AICRP on Maize

IVT (Late maturity)

Forty one experimental hybrids were evaluated in RBD, three replications, two rows of four meter row length in plot size of 4.8m2. The range of days to 75% dry husk was 126-143days.

The Mean grain yield varied from 39.0q/ha to 112.oq/ha. On the basis of mean grain yield performance five top ranking test hybrids (entries) were IMR110 (112.0q/ha), IMR109 (110.5q/ha), IMR128 (100.2q/ha), IMR117 (100.1q/ha) and IMR112 (99.0q/ha).

IVT (Medium maturity)

Forty experimental hybrids were evaluated in RBD, three replications, two rows of four meter row length in plot size of 4.8m2. The range of days to 75% dry husk was 125-141days. The Mean grain yield varied from 30.8q/ha to 109.0q/ha. On the basis of mean grain yield performance five top ranking test hybrids (entries) were IMR221 (109.0q/ha), IMR205 (107.8q/ha), IMR228 (92.9q/ha), IMR209 (90.9q/ha) and IMR223 (85.2q/ha).

3.1.3.7 Speciality Corn

Development of hybrids for speciality corn

A total of 31 entries including three checks (VLBC 1, G5414 and HM 4) were evaluated for baby corn yield, fodder and quality traits in kharif 2015. The experiment was conducted in RBD with 3 replications, plot size $6m^2$. The cross VQL1 x CM128 was found significantly superior to the check G5414 (15.02 q/ha) with respect to baby corn yield (18.89 q/ha), cob yield(88.54 q/ha), fodder yield (417.26 q/ha), cob length (19.76 cm), cob girth (2.03cm), baby corn length (8.90 cm), babycorn girth (1.37cm) and ascorbic acid content (71.41 mg/100g). Its T.S.S content was 9.20^{o} brix and sugar content was 10.59 percent. Its plant height and ear height is 104.86 cm and 49.22 cm respectively. Nine hybrids VQL1 x HKI 3209 (16.84q/ha), HKI209 x VQL1 (15.09 q/ha), EC595979 x HKI3209 (14.70 q/ha), VQL1 x G18 (14.20q/ha), HKI 1105 x G18 (14.15 q/ha), HKI 323 x G18 (13.75 q/ha), HKI 323 x EC595979 (12.92q/ha), EC595979 x CM128 (12.84 q/ha) and VQL1 x HKI 1105 (12.72 q/ha) were at par with the check G5414 (15.02 q/ha) with respect to baby corn yield. Analysis of mean yield performance of the experiment conducted during kharif 2014, Rabi 2014-15 and kharif 2015 and kharif 2016 revealed that the cross VQL1 x CM128 (18.53 q/ha) significantly out yielded the best check G5414 (15.10 q/ha) having maturity 47 days in kharif season.

Promising hybrids of baby corn

3.1.4. Pulses

3.1.4.1 Pigeonpea

Evaluation of long duration pigeonpea

Eighteen entires inluding checks were evualuted. Varietal difference with respect to grain yield was found significant which ranged from 1012 to 1892 Kg/ha. Highest grain yield (1892 Kg/ha) was recorded by ICPL 99095 followed by ICPL 99087 (1507.7 Kg/ha). While none of the entries were found statistically superior than the Local check Bahar (1780 Kg/ha).

Selection of pigeonpea lines for cold tolerance

Genotypes catograzied into cold escape, cold tolerant and susceptible. It has been found that the early group of pigeonpea genotypes which completed their reproductive cycle before temperature down below $10\ ^{0C}$ does not effected by temperature considered cold escape such as , ICP-13359, ICP-11627, ICP-11059, ICP-11477. Other long to medium duration genotypes ICP-15382, ICP-7076, ICP-7076 and ICP-14229, i.e., also developed pods normally since temperature were not critically low during winter season. Entries CP-13359, ICP-11627, ICP-11059, ICP-11477 showed cold escape.

AICRP IVT Early

Among early entries, entry no.9 (822 kg/ha), 10 (670 kg/ha), 6 (587 kg/ha) and 4 (535 kg/ha) were out yielded other entries. It has also been found that out of fourteen entries, one entries were of medium duration (matured in 180-185 days) and yielded heighest 1100 kg/ha , three were matured between 150-160 days however yield ranged between 200-350 kg/ha while all other attained 75% maturity by 120 days (107-123 days).

improvement of pigeonpea for plant type, early maturity, pod borer resistance and moisture stress tolerance

Out of 250 entries procured from NBPGR, 23 genotypes showed less infestation (< 30%) with minimum7 percent. However maximum infestation went up to 90 %. Asha showed infestation of 15 to 59%, Patam: 41 to 78%; Pusa 9: 19 to 48%; Bahar: 13 to 37%. Days to maturity ranged from 135-267 days. 43 entries matured in less than 150 days. Out of total 13 entries were of determinant, however all other were NDT type.

Evaluation of high yielding early pigeonpea genotypes

Among 13, two entries such as ICPL-20325 (1358 kg/ha), ICPL-2011248 (1174 kg/ha) were significantly higher yielder over both checks (ICPL 88039, and PAU 881).

Harvesting of all entries completed by 3rd week of November, 2015. This offers potential to take second crop.

Screening and evaluation of mid-Early genotypes

Out of total, two entries such as BRA 1 (1475 kg/ha), BRA2 (1587 kg/ha) were significantly higher yielder over ICPL 88039. Harvesting of all entries completed by 3rd week of December, 2015. This offers potential to take second crop. Entries BRA1 and 2 are of mid early maturity and offer potential to increase area under pulses in Bihar. It can escape cold. It also offer farmers to take second crop in the same field.

3.1.4. 2 Chickpea

Characterization and Evaluation of chickpea genotypes (Desi) for heat tolerance

Among the eighty genotypes, varietal difference with respect to grain yield was found significantly superior which ranged from 300 kg/h to 1905.2 kg/ha. Highest grain yield was recorded by ICC 4958 followed by IPC 10-59, JG 14, PG 186, JG 18 under late sown condition. Overall 23 lines found significantly superior over best check (DCP 92-3, 1598 kg/ha). Heat intensity index was 0.36. Large area in Bihar comes under Rice-fallow, which remains fallow after harvest of late sown rice due to non suitability of varieties for this particular area. Hence identification of chickpea lines suitable for late sown (heat tolerant) condition may be grown in the fallow area.

Seed multiplication of advanced high yielding chickpea lines

Among 27 entries, varietal difference with respect to grain yield was found significantly superior which ranged from 1555 kg/h to 2043.2 kg/ha. Highest grain yield (2043.2 kg/ha) was recorded by cross no 14 (ICCV 10 x ICCV 97105) which was 15% superior to check PG 186.While two entries were at par with check. The trials were planted under normal moisture condition, however disease and insects infestation was less than 10 %.Entries BRC301 and BRC 302 will be sent to AICRP on chickpea for its inclusion in IVT.

Evaluation of advanced generation chickpea lines for late sown condition.

Among 218 lines, it was found that average yield under late sown condition was 1100 Kg/ha, which ranged from 200 kg (ICC15618) to 1600 kg/ ha (ICCMABC-21 and ICCMABC-02). The lines which shown promise at normal sown condition are ICCRIL-01-0346 Flowering initiated 52 days after sowing and maximum genotypes attended 50% flowering in 65 days and attended maturity within 110 day.

All India Coordinated Research Projects

Collection, Maintenance and utilization of Germplasm

out of 75 germplasm IPC2010-62 (1860kg/ha), IPC2010-14 (1750kg/ha), BG3037 (1700kg/ha), GNG2216 (1660kg/ha) and BDG1080 (1620 kg/ha) were observed to be superior for seed yield. The yield of the best check was 1500 kg/ha (PG186).

I.V.T. (Desi)

40 entries were tested in RBD with three replications.Varietal differences for seed yield were found to be significant. Four entries namely, BRC-3 (2178kg/ha), BDNG2015-1 (2142kg/ha), IPC2011-141 (2066kg/ha) and NDG14-11 (2038kg/ha) were found to be significantly superior to the best check KWR108 (1823kg/ha). One entry, BRC-1 has been promoted to AVT-1(Desi), 2016-17 for NEPZ.

AVT-1 (Desi)

07 entries were evaluated in RBD with four replications and found that varietal differences for seed yield to be significant. Only one entry namely, GNG2264 (2756kg/ha) was significantly superior to the best check GCP105 (1599kg/ha).

AVT -2 (Desi)

Total 06 entries were evaluated in RBD with four replications. Varietal differences for seed yield were found to be significant. But none of the entries was significantly higher yielder than the best check KWR108 (2080kg/ha). However, two entries namely, BG3043 (2096Kg/ha) and HC-5 (1971kg/ha) were found at par with the best check KWR108.

G2.AVT -2 (Desi) N.S.

06 entries were tested in RBD with three replications for different traits in which varietals differences for seed yield were found to be significant.Two entries, namely, BG3043 (1891Kg/ha) and IPC2005-66 (1833kg/ha) were observed higher yielder than the check KWR108 (1319kg/ha).

G2.AVT -2 (Desi) L.S.

04 entries were tested in RBD with three replications for different traits in which varietals differences for seed yield were found to be significant. Only one entry, IPC2010-62(2097kg/ha) was significantly superior to the best check PG186 (1463kg/ha).

I.V.T. (Late sown)

29 entries were evaluated in RBD with three replications. Varietal differences for seed yield were found to be significant. Two entries namely, Phule G-13110 (2080kg/ha) and RKG13-155 (2038kg/ha) were observed significantly superior than the best check BG372 (1789kg/ha).

AVT-1 (Late sown)

04 entries were evaluated in RBD with four replications and found that varietal differences for seed yield to be significant. None of the entries was significantly superior to the best check PG186 (1469kg/ha). However, only one entry namely, GNG2215 (1329Kg/ha) was observed at par with the best check PG186.

AVT -2 (Late sown)

Total 04 entries were tested in RBD with four replications. Varietal differences for seed yield were found to be significant. But none of entries was found significantly higher yielder than the best check BG372 (1641kg/ha).

ICRISAT Trials

ICVT (Desi)

20 entries were evaluated for different traits in which varietal differences for seed yield were found to be significant. Three entries, namely ICCV15113 (1851Kg/ha), ICCV15114 (1820kg/ha) and ICCV15115 (1695kg/ha) were observed significantly Superior to the best check JG 16 (1414Kg/ha).

PYT (Desi)

59 entries were tested for different traits and Better yield performing entries, namely, ICCV33 (2348kg/ha), ICCV176 (2136kg/ha) and ICCV182 (1872kg/ha).

F_6 Progenies (Desi)

20 entries were evaluated for different traits in which better yield performing entries, namely, ICCV63 (1464kg/ha), ICCV56 (1456kg/ha) and ICCV82 (1040kg/ha).

MHT-1B

13 entries were evaluated for different traits and better yield performing entries, namely, ICCV23 (1248kg/ha), ICCV13 (1123kg/ha) and ICCV14 (1040kg/ha).

AYT (Desi)

08 entries were tested for different traits in which better yield performing entries, namely, ICCV19 (1926kg/ha), ICCV62 (1310kg/ha), ICCV13 (0957kg/ha) and ICCV11 (0844kg/ha).

F_4 Progenies (Desi)

05 Progenies were evaluated for different traits in which better yield performing entries, namely, ICCV4521 (1102kg/ha) and ICCV4589 (1082kg/ha).

State Trial

Station Trial (Desi)

22 entries were evaluated in RBD design with three replications for different traits. The varietal differences for seed yield were found to be significant. Four entries, namely, BRC-37 (2205 kg/ha), BRC-32 (2135 kg/ha), BRC-35 (1990 kg/ha) and BRC-36 (1976kg/ha) were observed higher yielder than the best check DCP92-3 (1450 kg/ha).

SVT, chickpea at BAC, Sabour

16 entries were evaluated in RBD design with three replications for different traits in which varietal differences for seed yield were found to be significant. Six entries namely, BRC-3(2136kg/ha), BRC-4(2050kg/ha), BRC-1 (2011kg/ha), PG186 (1843kg/ha), DC-1(1834kg/ha) and GCP105 (1807kg/ha) were found to be significantly superior to the best check Pusa256 (1494kg/ha).

SVT, chickpea at PRC, Mokama

16 entries were tested in RBD design with three replications for different traits. The varietal differences for seed yield were found to be significant. Five entries namely, viz. BRC-3(1751kg/ha), BRC-1(1644kg/ha), BRC-4 (1583kg/ha), GCP105 (1536kg/ha) and PG186 (1561kg/ha) were found to be significantly higher yielder than the best check Pusa 256 (1215kg/ha).

FLD

Twenty (20) nos. of F.L.D. on chickpea with varieties PG186 was conducted in the farmer field with full package technology. The highest seed yield was recorded 1630 kg/ha was observed. The range of increase of improved variety over local variety varied from 22% to 42%.

3.1.4. 3 Lentil

Station trial

Identification of donor parents resistant to Fusarium wilt and generation of breeding material in lentil (*Lens culinaris* M.)

Arun (884 Kg/ha), was found best check Five entries found significantly superior than the check. Out of 16 entries BRL-1 has yielded out highest (1250 Kg/ha) followed by BRL-3 (1195 Kg/ha), IC248956 (1194 Kg/ha), BRL-2 (1148 Kg/ha), and GP 2909 (1051 Kg/ha). These entries namely BRL-1, BRL-2, IC248956, BRL-3 and GP 2909 will be evaluated further in Multilocational trials to validate its yield performance. BRL-1 and BRL-2 are nominated to AICRP on MULLaRP for Rabi 2016-17.

Evaluation of various released varieties for yield in different zones of Bihar State) State Varietal Trial (Govt.of Bihar)

A trial consisting 16 released varieties including check from different states was conducted to test the performance for its adaptability in different ecological regions of Bihar at Model Bhitti, BAC, Sabour. HUL 57 (1250 Kg/ha) was the best check. Significant differences were found amongst the varieties).Three entries were found significantly superior than the check. Out of 16 entries BRL-3 has yielded out highest (1860 Kg/ha) followed by BRL-1 (1629 Kg/ha) and BRL-2 (1539 Kg/ha). Other varieties were at par with the best check HUL 57 (1250 Kg/ha). Amongst varieties PL8 (1388Kg/ha), followed by P.Vaibhav (1320 Kg/ha) and Noori (1319 Kg/ha). The entries namely BRL-1, BRL-2 and BRL-3 will be evaluated further in Multilocational

trials to validate its yield performance. Promising varieties from the trial will be evaluated further to validate its yield performance and may be recommended for cultivation

Exploring extra early early maturing

Among 9 germplas evualuated, maturity ranged from 101 days to 130 days in timely sown condition and 5 entries were found very early namely; LKH-4 (101 days) followed by GP 3227 (104 days), LKH-2 (106 days), LKH-1 (108 days) and LKH-3 (109 days).While, in late sown condition maturity ranged from 90 days to 126 days and 4 entries were found very early namely; LKH-4 (90 days) followed by LKH-1 (94 days), GP 3227 (95 days), and LKH-2 (98 days) .HUL 57 (1250 Kg/ha) was the best check.

3.1.4. 4 Mungbean

Identification of YMV resitant doner parents to develop high yielding, synchronous maturity varieties

Among the 15 entries, Samrat (PDM-139) was found best check (1363 Kg/ha). IPM 2-3 (1771 Kg/ha) found significantly superior than the check followed by KL -3 (1509 Kg/ha). The entries from the trials will be evaluated further in Multilocational trials to validate its yield performance.

Screening & validation trial (Non-plan)

10 lines with higher yield were found. IPM 2-3 has yielded out highest (1933 Kg/ha) followed by D4 (1875 Kg/ha), D7 (1850 Kg/ha) KL-1 (1833 Kg/ha), JBT (1833 Kg/ha), BRM8-1 (1783 Kg/ha), IC369223 (1666 Kg/ha), D5 (1687 Kg/ha) D1 (1666 Kg/ha), and LM -126 (1666 Kg/ha) was found best check (1363 Kg/ha). Out of 15 entries IPM 2-3 (1771 Kg/ha) found significantly superior than the check followed by KL -3 (1509 Kg/ha).

State Varietal Trial for evualting yields in different zones of Bihar (Govt. of Bihar)

Four lines were found superior in terms of yield Samrat (1413 Kg/ha) was found best check. Four varieties found significantly superior than the check. Out of 10 varieties IPM2-3 has yielded out highest (1831 Kg/ha) followed by Meha (1667 Kg/ha), IPM 2-14 (1737Kg/ha) and IPM 205-7 (1532 Kg/ha).

Understanding heat and drought tolerance mechanism in lentil (*Lens culinaris* Medik.) and its improvement by over-expression of antioxidant genes.

Under *in vitro* conditions shoot regeneration protocol from embryonic axis explants of

lentil genotype HUL 57 was achieved.Seeds of fourteen genotypes were sown under early and late sown condition for evaluation under heat Morphological and phonological variation of these genotypes have been analyzed which will be compared with molecular and biochemical differences.

Evaluation of 14 lentil genotypes under late sown condition for heat tolerance.

Regeneration of shoots from embryonic axis explants.

3.1.5. Oilseed

3.1.5.1 Linseed

Development of linseed variety under irrigated condition

BAC, Sabour

Significant differences among the genotypes were found for seed yield. The genotype, BRLS-101(2137 kg/ha) and, BRLS-102 (2346 kg/ha) significantly out yielded than the best check, T-397 (1841 kg/ha) for seed yield.

BRU Dhangai

Significant differences among the genotypes were found for seed yield. The genotype, BRLS-101(2141 kg/ha) and, BRLS-102 (2324 kg/ha) significantly out yielded than the best check, Shekhar (1816 kg/ha) for seed yield

ARI Patna

Significant differences among the genotypes were found for seed yield. The genotype BRLS-102 (2180 kg/ha) significantly out yielded than the best check, T-397 (1841 kg/ha) for seed yield.

PRC Mokama

Significant differences among the genotypes were found for seed yield. The genotype, BRLS-101 (1992 kg/ha) and, BRLS-102 (2229 kg/ha) significantly out yielded than the best check, Shekhar (1666 kg/ha) for seed yield.

BPSAC Agwanpur

Significant differences among the genotypes were found for seed yield. None of the genotype significantly out yielded than the best check, Shekhar (1324 kg/ha) for seed yield. However, four genotypes,namely,BRLS-101 (1346 kg/ha), BRLS-102 (1449 kg/ha) and BRLS-104 (1373 kg/ha) were found to be at par with the best check, Shekhar (1324).

IRS Madhepura

Significant differences among the genotypes were found for seed yield. The genotype BRLS-102 (1737 kg/ha) significantly out yielded than the best check, Shekhar (1525 kg/ha) for seed yield.

BPSAC Purnea

Significant differences among the genotypes were found for seed yield. The genotype, BRLS-101(1812 kg/ha) and, BRLS-102 (1971 kg/ha) significantly out yielded than the best check, Shekhar (1485 kg/ha) for seed yield.

Screening of germplasm under utera condition

Analysis of variance for seed yield revealed non-significant variances owing to un replicated treatments. Five top ranking entries were selected on the basis of seed yield in order of BRLS-112-2 (1497 kg/ha), BRLS-113 (1454 kg/ha), BRLS-110-2 (1453 kg/ha), BRLS-109-2 (1428 kg/ha), BRLS-111-2 (1312 kg/ha).

Evaluation of entries under rainfed condition (IVT Rainfed)

Significant differences among the genotypes were found for seed yield.

None of the genotype was found to be significantly superior for seed yield than the best check, T-397 (1660 kg/ha).

Evaluation of entries under irrigated condition (IVT Irrigated)

Significant differences among the genotypes were found for seed yield. The genotype BRLS -102 (2568 kg/ha) was found to be significantly superior to for seed yield than the best check, T-397(1973 kg/ha).

Evaluation of entries under *utera* condition (IVT *utera*)

Significant differences among the genotypes were found for seed yield. None of the genotype was found to be significantly superior for seed yield than the best check, T-397 (804 kg/ha).

3.1.5. 2 Mustard

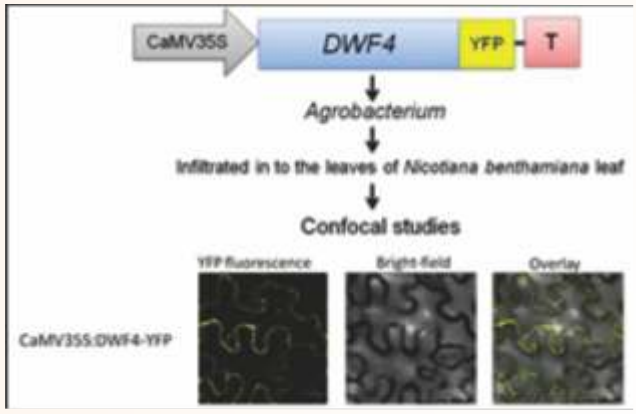
Development/adoption of mustard varieties for timely sown irrigated condition

Multi-location evaluation of three state varietal trials namely MSVT-I, II and III were carried out at 8 locations during 2015-16 including 12, 8 and 12 entries respectively. Among these trials, MSVT-I was under third year evaluation while MSVT-II and MSVT-III were under second and first year evaluation respectively. Best entry over-location in MSVT-I was MSVT15-21 (1272 kg ha^{-1}). Best entry over-location in MSVT-II was MSVT 15-14 (1394 kg/ha). Best entry over-location in MSVT-III was MSVT 15-9 (1209 kg ha^{-1}). In MSVT I the highest yield among all the 12 entries at eight locations was exhibited by entry no. MSVT 15-27 having yield 1782.6 kg ha^{-1} at Jalalgarh location. In MSVT II the highest yield among all the 08 entries at eight locations was exhibited by entry no. MSVT 15-14 having yield 2091.6 kg ha^{-1} at Bikramganj location. In MSVT III the highest yield among all the 12 entries at eight locations was exhibited by entry no. MSVT 15-5 having yield 1647 kg ha^{-1} at Jalalgarh location.

3.1.5.3 Safflower

Brassinosteroid-mediated increase in seed yield and enhanced abiotic tolerance in safflower

AtDWF4 is a rate limiting step in Brassinosteroid pathaway. In order to overexpress AtDWF4, the coding sequence of AtDWF4 gene was cloned under CaMV35S promoter. Excise half cotyledon of safflower (A1) was used for genetic transformation. Cotyledon were selected and regenerated on selection medium. The presence of transgene in transgenic safflower was confirmed by PCR analysis. The expression of transgene was confirmed by RT-PCR. For sub-cellular



localization study, the CSD of *AtDWF4* was cloned under the CaMV35S and YFP tag at C terminal. *A. tumefaciens* harbouring sub-cellular localization construct was hand infiltrated in the leaf of *Nicotiana benthamiana* leaf. The confocal studies showed that DWF4 protein was localized to the cytoplasm.

3.1.5.4 Sesame

Development of high yield and short duration varieties of sesame for Bihar.

Two trials were conducted under AICRP on sesame during 2015-16. 29 entries in IVT and 15 entries in AVT trial including three checks namely TKG-22, GT-10 and JTS-8 were evaluated at sabour location for identification of high yielding and early genotype. The trials were conducted in RBD with 3 replications. Trials detail is given below:

IVT

Significant differences were found among the entries for yield but none of the entry was found to be significantly superior to checks (TKG-22,1126.8Kg/ha, GT-10, 1013.2 Kg/ha and ZC-JTS -8, 1133.7Kg/ha)

AVT

The range of yield varied from 205.2 Kg/ha (AVTS-15-3) to 1553.6 Kg/ha (AVTS-15-10).Entry AVTS-15-10 was found to be superior to the best check (TKG 22, 1311.5Kg/ha) however, AVTS-15-8 (1135.3 Kg/ha) was found to at par with the best check.

3.1.6 Jute

3.1.6.1 *Capsularis jute*

Evaluation of *capsularis* jute germplasm for fiber yield

10 entries out perform the fibre yield of both the check with CIN-83 ranked first for fibre yield (g/plant) followed by CIN-08 and CIN-35.Superior entries will be utilized as a parent in further breeding programme.

NP (JB) 2.1: NHP

Total 5 entries with two checks were evaluated for fibre yield and related traits Five randomly selected plants were evaluated for plant height, basal diameter, green weight (entire plot), fibre weight (entire plot) and fibre yield/plant of the 7 entries (for fibre yield) is as follows. Entry no. V1 was the first ranker that yielded 39.0 quintals of fibre/hectare followed by V5 (34.26q/ha) and V3 (33.28q/ha). Entry V1 was statistically superior the best check.

NP (JB) 5.29: IET

Total seven entries with 2 checks were evaluated for fibre yield and related traits. Five randomly selected plants were evaluated for plant height, basal diameter, green weight (entire plot), fibre weight (entire plot) and fibre yield/plant of the 7 entries (for fibre yield) is as follows. Significant differences were observed for all the characters and for all the entries. Test entry JRCPS-1 was top performing entry (37.62q/ha) over the best check as its yield was statistically higher than the JRC-517 (35.59 q/ha)

NP (JB) 5.30: AVT-I

Total three entries with 2 checks were evaluated for fibre yield and related traits. Five randomly selected plants were evaluated for plant height, basal diameter, green weight (entire plot), fibre weight (entire plot) and fibre yield/plant of the 7 entries (for fibre yield) is as follows. Significant differences were observed for all the characters and for all the entries. Test entry JRCJ-8 was though top performing entry (31.85q/ha) over the best check but its yield was statistically at par with the fibre yield of JRC-517 (31.16 q/ha).

NP (JB) 2.5)

Total forty five cross populations with two checks were evaluated for fibre yield. It was found that cross OIN 22 X JRP-128 was top performing followed by OIN-22 X JRO-204 and OIN-278 X JRO-524 over the best check JRO-204. Superior crosses were selected and advanced to next generation for further breeding work. These crosses are the part of National Hybridization Programme aimed at varietal improvement of jute and allied fibres.

3.1.6.2 *Olitorious jute*

NP (JB) 2.2

Total 16 F5 populations + 2 checks were evaluated. Single plant progenies of 10 crosses were evaluated in JRO-128 X JRO-878 SPP2 (12.18 g/plant fibre) was the top performer followed by OIN-028 X JRO-620 SPP 2 (11.46 g/plant) and OIN-028 X JRO-62- SPP 3 (10.93 g/plant). Selection within the progenies and between the progenies was made.

NP (JB) 2.3

Total 24 F3 populations + 2 checks were evaluated. Cross population OIJ-158 X JRO- 8432 have the highest fibre yield (11.61g/plant) followed by OIJ-198 X JRO-8432 and OIN-702 X JRO-204

NP (JB) 2.4

Total thirteen F3 populations and 2 checks were evaluated and OIN-471 X JRO-524 was top performer for fibre yield followed by OIN-113 X JRO-204 and OIN-421 X JRO- 8432.

NP (JB) 5.26 (IET)

Total nine entries with two checks were evaluated. Significant differences were observed among different treatments fibre yield was highest for NOJ-27-26 (38.19 q/ha.) followed y BCCCO-13 (37.30q/ha) and BCCO-15 (37.62 q/ha) but all are statistically at par with best check JRO-204 (37.33 q/ha)

NP (JB) 5.28 (AVT II)

Total four no. of entries with two checks were evaluated4. NJ-7050 was observed superior

than the best check but statistically at par. Superior entries over all the locations will be released as varieties.

3.1.7 Roselle

Evaluation of roselle germplasm [No. NP (MB)] 1.4]

total 51 accessions with 2 checks were evaluated for fibre yield and related traits. Accession REX-1 was top performer that yielded 18.14 gram fibre per plant followed by REX-44 (17.84g/plant) and ER-67 (17.67g/plant). Fibre yield of best check AMV-5 was 15.83 g/plant.

AVT-I with roselle (*H. sabdariffa*) [NP (SB) 12.67]

Significant differences were observed among different treatments. JRHS-3 was the highest yielder as its fibre yield was 22.44 q/ha. Statistically significant and higher than the best check remaining entries were at par with the best check.

AVT-II with roselle (*H. sabdariffa*) [NP (SB) 12.68]

Significant differences were observed among four entries ove two check. JRHS-1 observed to be the highest yielding entry (31.58 q/ha) followed by AHS-255 (30.33 q/ha) and JRHS-2 (27.69 q/ha) though none of the entry were statistically superior to the best check HS-4288 (30.03 q/ha).

3.1.8 Fruit

All India Coordinated Research Project on Fruits

3.1.8. 1 Mango

In varietal germplasm collection and evaluation trial, out of 52 evaluated germplasms, highest fruit yield was obtained in cv. Bangalora(152.77 kg/tree) followed by Mulgoa (61.57 kg/tree). However, average fruit weight was recorded maximum (30.00 g) in cv. Hathijhula. Among the varieties, maximum TSS (24.30°B) was recorded in cv. Amrapali.

Nutritional survey of mango orchards

A total 32 mango orchards were surveyed as per technical programme. The maximum fruit yield of 2.50 to 3.00 q/plant was recorded with all proper cultural practices in the orchard of Md. Khurshid Alam, Village- Mokimpur, P.O.- Shahkund, Dist. Bhaglpur. The soil status was observed as pH-Acidic (6.17), EC-Normal (0.213 ds/m), Organic Carbon-Low (0.47%), N-Low (137.98 kg/ha), P_2O_5-Medium (29.06 kg/ha) and K_2O-High (350.8 kg/ha).

Assessing the effect of climatic variability on mango flowering and yield

Flowering and fruiting behaviour along with the yield of different mango cultivars namely Langra, Bombay, Zardalu and Totapuri were tested in relation to weather parameters (temperature, humidity, rainfall, numbers of rainy day, sun shine hours and wind velocity). Among the evaluated cultivars, the minimum time for full bloom of flower (31 days) was noticed in cv. Zardalu. However, maximum flowering intensity was observed in Totapuri (85.97%) while minimum fruit drop percentage (80.48%) was observed in Bombay. The average fruit weight (469.75 g) and fruit yield (17.52 t/ha) was recorded maximum in Totapuri.

3.1.8. 2 Litchi

Collection and evaluation of germplasm of litchi

Four new clones were identified during the reported year.

A large variation was recorded in late maturing clones of Manraji, China and Bedana. The material was collected as air-layers and was planted in the nursery. All the cultivars survived and growth was found satisfactorily in nursery.

Litchi hybridization programme for improving yield, high pulp content and increased harvesting span.

Altogether a sum of 6558 flowers was crossed in seven different cross combinations during 2016. Among these crosses, only 2675 flowers set to fruit (40.79 per cent of total cross) and only 101 fruits reached to maturity which was only 1.54 per cent of total crosses. On sowing of the seeds of those mature fruits, finally 31 seeds of four cross combinations were germinated.

Screening of existing litchi hybrids

Thirty bearing litchi hybrids were evaluated during 2016. Among these, performance of hybrids H 104, H-141, H 73, H 597 and H 573 were found promising in terms of earliness, seed size, late maturity, yield and pulp per cent.

3.1.8. 3 Guava

Testing the performance of promising hybrids/selections of guava

Five plants of each hybrids/selections namely Arka Amulya, Arka Mridula, CISH-G-1, CISH-G-3, CISH-G-4 and Allahabad Safeda have been planted at a spacing of 5 × 5 m in row trial to evaluate its performance in Sabour condition, during July, 2015. The growth of these hybrids was found satisfactory.

Testing the performance of new promising hybrids/selections of guava

Five plants of each hybrids/selections namely S-1(MPUA&T), S-2(MPUA&T), Arka Kiran, SRD-Hybrid-1, SRD-Hybrid-4, GS-35 and CISH-G-5 have been planted at a spacing of 5 × 5 m in row trial, during July, 2015. The growth of these hybrids was found satisfactory.

3.1.8.4 All India Coordinated Research Project on Palms (Coconut)

Conservation and evaluation of genetic resources of coconut in different agro-climatic regions

13 germplsms were taken under evaluation. Among the genotype planted in 2011, variety MYD (Malayan Yellow Dwarf), COD (Chowghat Orange Dwarf) were found as better performing varieties with maximum plant height (508 cm and 360 cm, respectively) number of leaves per plant (17 and 9.4 leaves per plant, respectively). Among the varieties planted in 2013, CRP-509 (ECT) has found as the best performing one with highest plant height of 201.6 cm followed by Chandra Kalpa and Zanjibar Tall with plant height of 204.2 cm and 200.9 cm respectively. The growth parameters, recorded at three months interval revealed maximum growth of 41 per cent during July to September and minimum during January to March. All plants are still in vegetative growth stage.

Collection, conservation and evaluation of location specific germplasm

surveys were conducted in Katihar, Purnea and Mahepura district. Three germplasm were identified superior for collection. Two accession from Madhepura and Naugachia collected during 2014-15 has been planted in main plot after seedling preparation from collected seed.

Demonstration of released coconut varieties in different agro- climatic regions

cultivar Konkan Bhyte, Kera Bastar, Kahi Kuchi Hybrid-1, Konkan Bhatye, Gauthumi Ganga, Kalyani Coconut-1, Kalpa Dhenu, Kalpa Pratibha, Kalpa Mitra, Kalpa Raksha and Kera Keralam were taken under evaluation. Kera Bastar and Konkan Bhatye were found as the better performing varieties with highest plant height of 432.2 cm and 365.7 cm, respectively with 14.2 and 12.5 numbers of leave per plant, respectively.

3.1.9 Minor fruits

Survey, collection and evaluation of minor fruits.

A *bael* variety identified by research council has been released by State Variety Release Committee in its meeting held 29.08.2016 . The variety is high yielding (700-800 fruits/tree), having pleasant aroma, thin peel (2.35 mm), Pulp contains less mucilage & seeds (91), TSS- 43.6%, Acidity- 0.58%; Vit C 34 mg/100g.It is also good for for processing purposes such as juice making.

Next Generation Sequencing based Transcriptome Profiling and Gene Network Analysis of Ripening Strawberry Fruit to Unravel In-Depth Molecular Physiology of Strawberry Fruit Ripening

Samples of different developmental/ripening stages of strawberry fruits were processed and outsourced for RNA-Sequencing work and data obtained was analyzed using various bioinformatics tools. For *in planta* characterization of a few ripening related genes, attempts was done to develop a suitable protocol for stable transformation of strawberry using *Agrobacterium* mediated transformation adapting a strawberry regeneration protocol developed already.The Illumina platform was used for the sequencing of pair end cDNA libraries, developed from the RNA of the different fruit tissues. The reads obtained were *de novo* assembled using assembly program and COG's was used for further analysis. Transcripts were annotated using NCBI BLAST with the proteins of Viridiplantae taken from Uniprot database. Pathway analysis was done using KAAS Server. The gene expression estimation was carried out by aligning the reads to the master control transcript data. Our preliminary analysis identified several up-regulated genes in ripening strawberry fruit, which are related to various events associated with fruit ripening such as cell wall hydrolysis, aroma and anthocyanin biosynthesis among others. The preliminary analysis also identified transcription factors which expressed differently during the strawberry fruit

ripening. To elucidate the ripening process in non-climacteric fruits, strawberry was used as a model system. Our preliminary analysis identified several up-regulated genes including the genes related to cell wall hydrolysis, aaroma and anthocyanin biosynthesis among others. Further work on characterization of these genes is underway which may lead to the elucidation of non-climacteric fruit ripening process in detail.

3.1.10 Vegetable and Floricultur

3.1.10.1 Brinjal

Varietal evaluation trial on Brinjal - long (IET)

This trial was conducted with 07 entries including 02check varieties (Kashi Taru and Punjab Sadabahar), tested in RBD Design and replicated four times. The highest marketable yield 452.59 q/ hawas recorded from the entry 2015/BRLVAR-2 which was at par with 2015/BRLVAR-3 (420.85 q/ha) and significantly out yielded from rest of the entries as well as the check variety. However, the lowest of 198.82 q/ha was recorded in the entry 2015/BRLVAR-4.

Varietal Evaluation Trial on Brinjal - Long (AVT-I)

This trial was conducted with 06 entries including 02check varieties (Kashi Taru and Punjab Sadabahar), tested in RBD Design and replicated four times. The highest marketable yield 252.64 q/ hawas recorded from the entry 2014/BRLVAR/3 which was at par with check Punjab Sadabahar (234.89 q/ha). However, the lowest of 197.71 q/ha was recorded in the entry 2014/BRLVAR-2.

Varietal Evaluation Trial on Brinjal - Long (AVT-II)

This trial was conducted with 09 entries including 03check varieties (Kashi Taru, Punjab Sadabaharand Rajendra Baingan-2), tested in RBD Design and replicated thrice. The highest marketable yield 268.37 q/ hawas recorded from the entry 2013/BRLVAR/1 which was at par with 2013/BRLVAR/1 (259.13 q/ha). However, the lowest of 182.75 q/ha was recorded in the check Kashi Taru.

Varietal Evaluation Trial on Brinjal - Round (IET)

This trial was conducted with 07 entries including 02check varieties (KS-224 and Swarna Mani), tested in RBD Design and replicated thrice. The highest marketable yield 332.75 q/ hawas recorded from the entry 2015/BRRVAR-5 which was significantly out yielded the rest of the entries as well as the check varieties. However, the lowest of 198.82 q/ha was recorded in the entry

2015/BRRVAR-1.

Varietal Evaluation Trial on Brinjal - Round (AVT-I)

This trial was conducted with 06 entries including 02check varieties (KS-224 and Swarna Mani), tested in RBD Design and replicated four times. The highest marketable yield 287.99 q/ hawas recorded from the entry 2014/BRRVAR-3 which was significantly out yielded the rest of the entries as well as the check varieties. However, the lowest of 260.59 q/ha was recorded in the entry 2014/BRRVAR-4.

Evaluation Trial on Hybrid Brinjal - Long (AVT-I)

This trial was conducted with 06 entries including 03checks (Punjab Sadabahar, Navina and ARBH-786), tested in RBD Design and replicated four times. The highest marketable yield 385.88 q/ hawas recorded from the entry 2014/BRLHYB-2 which significantly out yielded the rest of the entries as well as the checks. However, the lowest of 219.58 q/ha was recorded in the entry 2014/BRLHYB-3.

Evaluation Trial on Hybrid Brinjal - Long (AVT-II)

This trial was conducted with 08 entries including 03checks (Punjab Sadabahar, Navina and ARBH-786), tested in RBD Design and replicated thrice. None of the entries could surpass the check Navina (339.59 q/ha marketable yield).

Evaluation Trial on Hybrid Brinjal - Round (AVT-I)

This trial was conducted with 09 entries including 03checks (Kashi Sandesh, Swarna Mani and Pusa

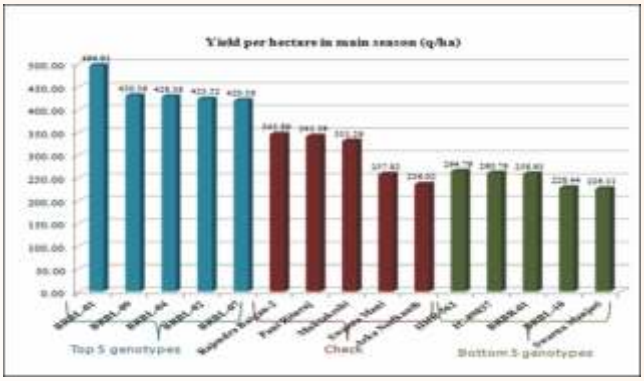
Hybrid-6), tested in RBD Design and replicated thrice. None of the entries could surpass the check Kashi Sandesh (395.76 q/ha marketable yield).

Evaluation Trial on Hybrid Brinjal - Round (AVT-II)

This trial was conducted with 08 entries including 03checks (Kashi Sandesh, Swarna Mani and Pusa Hybrid-6), tested in RBD Design and replicated thrice.The highest marketable yield 410.67 q/ hawas recorded from the entry 2013/BRRHYB-5 which was at par with the check Kashi Sandesh (405.25 q/ha) and significantly out yielded rest of the entries as well as the check variety. However, the lowest of 271.51 q/ha was recorded in the entry 2013/BRRHYB-3.

Development of high yielding brinjal genotype(s) for plains of Bihar

Twenty five genotypes with five checks were evaluated in the summer season for their performance in summer under heat stress and tolerance to fruit and shoot borer which causes havoc loss in this season. The normal yield in this season went down to less than half of that in main season and incidence of fruit and shoot borer was in general very high reaching about 70%. BRBL-02 (281.19 q/ha total yield and 170.58 q/ha marketable yield), Pusa Purple Long (302.96 q/ha total yield and 165.71 q/ha marketable yield), Pusa Purple Cluster (190.66 q/ha total yield and 125.42 q/ha marketable yield), IIHR-586 (234.91 q/ha total yield and 123.17 q/ha marketable yield) and BRBL-04 (183.66 q/ha total yield and 121.55 q/ha marketable yield) were the promising genotypes. In this season BRBL-04, BRBL-02, Pusa Purple Cluster performed somewhat better against fruit and shoot borer incidence, exhibiting less than 25% attack of the pest on them.Twenty six genotypes including five checks were evaluated in RBD in main season, i.e., autumn-winter.BRBL-01 (496.91q/ha), BRBL-09 (430.36q/ha), BRBL-04 (428.36q/ha), BRBL-02 (423.52 q/ha) and BRBL-07 (420.36q/ha) have been the superior yielders outyielding the checksRajendra Baingan-2 (345.89 q/ha), Pant Rituraj (341.39 q/ha), Muktakeshi (331.26q/ha), Swarna Mani (257.82 q/ha) and Arka Neelkanth (236.02 q/ha). Pusa Shyamla, BRBL-01, BRBL-02, Nurkee and Pusa Purple Cluster have been found to be less infested by fruit and shoot borer.



Yield performance of the top five, check and bottom five genotypes in autumn-winter season

Twenty onehybrids were evaluated in RBD in main season, i.e., autumn-winter against two checks Pusa Hybrid-6 and Pusa Hybrid-9. Among the hybrids evaluated BRBR-102xBRBL-01 (717.90 q/ha) been found to be the best yielder followed by BRBR-102 x BRBR-103 (689.05q/ha) and Swarna Mani x Muktakeshi (634.57q/ha) that were significantly superior over the checks Pusa Hybrid-9 (420.15q/ha)and Pusa Hybrid-6 (379.67q/ha). Multi-location trials were conducted at Sabour, Jalalgarh, Noorsarai and Saharsa with promising entries to identify their performance in different locations in the autumn-winter season. Significant variations between genotypes and locations were observed. BRBL-01 and BRBL-02 were found to perform outstandingly at Sabour, Noorsarai and Saharsa, whereas, at Jalalgarh none of the genotypes surpassed the check Rajendra Baingan-2.

3.1.10.2 Okra

Evaluation trial on hybrid Okra (AVT-I)

This trial was conducted with eight entries including two checks (Arka Anamika and NBH-180),

Evaluation trial on hybrid Okra (AVT-II)

This trial was conducted with ten entries including checks (Arka Anamika), tested in RBD Design and replicated thrice. The highest yield 154.94 q/ ha was recorded from the entry 2013/OKHYB-4 which significantly out yielded rest of the entries as well as the checks. However, the lowest of 98.26 q/ha was recorded in the entry 2013/OKHYB-

3.1.10.3 Cauliflower

Varietal evaluation trial on cauliflower-mid season (AVT-I)

This trial was conducted with seven entries including one check variety (Pusa Sharad) tested in RBD Design and replicated thrice. The highest curd yield 237.73 q/ ha was recorded from the entry 2013/CAUMVAR-1 which significantly out yielded rest of the entries as well as the check variety. However, the lowest of 146.10 q/ha was recorded in the entry 2013/CAUMVAR-5.

3.1.11.4 Tomato

Varietal evaluation trial on determinate tomato (AVT-I)

This trial was conducted with seven entries including one check variety (H-86) tested in RBD Design and replicated thrice. The highest total fruit yield 473.53q/ ha was recorded from the entry 2014/TODVAR-3 which significantly out yielded from rest of the entries as well as the check variety. However, the lowest of 258.72 q/ha was recorded in the entry 2014/TODVAR-4.

Varietal evaluation trial on determinate tomato (AVT-II)

This trial was conducted with five entries including one checks (H-86) were tested in RBD Design with four replications. The highest total fruit yield 397.66 q/ha was recorded from the entry 2013/TODVAR-1 which was significantly out yielded from rest of the entries while the entry 2013/TODVAR-2 gave the lowest fruit yield of 272.02 q/ha.

Varietal evaluation trial on indeterminate tomato (IET)

This trial was conducted with seven entries including one check variety (Arka Vikas) were tested in RBD Design and replicated thrice. The highest total fruit yield of 532.22 q/ ha was obtained in the entry 2015/TODINDVAR-4 which was significantly superior to rest of the entries while the lowest yield (411.25 q/ ha) was recorded in the entry 2015/TODINDVAR-1.

Varietal evaluation trial on Cherry tomato (IET)

This trial was conducted with six entries including one checks (Swarna Ratan) were tested in RBD Design with four replications. The highest total fruit yield 345.29 q/ha was recorded from the entry 2015/TOCVAR-1 followed by that of the entry 2015/TOCVAR-6 (330.73 q/ha) which were significantly out yielded from rest of the entries as well as the check Swarna Ratan (266.89 q/ ha). However, the lowest of 201.67 q/ha was recorded in the entry 2015/TOCVAR-2.

Evaluation Trial on Hybrid Determinate Tomato (IET)

This trial was conducted was conducted with seven entries including three checks (BSS-488, Bhagya and Kashi Anupam) with three replications under RBD design. The data reveals that the total fruit yield of 437.76 q/ha was recorded to be the highest in the check hybrid - Bhagya followed by that of 2015/TODHYB-2 (426.57 q/ ha) which were found significantly superior to that of rest of the entries. The lowest yield (217.95 q/ ha) was obtained from the check – Kashi Anupam.

Evaluation Trial on Hybrid Determinate Tomato (IET)

This trial was conducted was conducted with seven entries including three checks (BSS-488, Bhagya and Kashi Anupam) with three replications under RBD design. The data reveals that the total fruit yield of 437.76 q/ha was recorded to be the highest in the check hybrid - Bhagya followed by that of 2015/TODHYB-2 (426.57 q/ ha) which were found significantly superior to that of rest of the entries. The lowest yield (217.95 q/ ha) was obtained from the check – Kashi Anupam.

Evaluation trial on hybrid determinate tomato (AVT-I)

This trial was conducted was conducted with seven entries including two checks (BSS-488 and Bhagya) with three replications under RBD design. The highest fruit yield of 451.35 q/ ha was recorded in the entry 2014/TODHYB-3 which was statistically to that of rest of the entries including checks. The lowest fruit yield of 294.36 q/ ha was observed under the entry 2014/TODHYB-1.

Evaluation trial on hybrid determinate tomato (AVT-II)

This trial was conducted was conducted including seven entries along with two checks (BSS-488 and DVRT-2) in RBD Design with 03 replications. The entry 2013/TODHYB-2 produced the highest fruit yield of 458.85 q/ha which was found to be significantly superior to that of rest of the entries including checks. The lowest fruit yield of 242.94 q/ ha was obtained from DVRT-2 (OPC).

3.1.10.5 Root crops

Varietal evaluation trial on radish (IET)

This trial was conducted with 07 entries including 03 checks (Kashi sweta, Japanese white and Sabour Local) were tested in RBD Design and replicated thrice. The highest root yield of 416.46 q/ ha was recorded in the check variety Japanese White which was superior to that of rest of the entries. The lowest root yield of 232.50 q/ ha was recorded in the entry 2015/RADVAR-2.

Varietal evaluation trial on radish (AVT-II)

This trial was conducted with 07 entries including 02 checks (Kashi sweta and Japanese white) were tested in RBD Design and replicated thrice. The highest yield of 691.62 q/ ha was recorded in the entry 2013/RADVAR-4 which was statistically superior to that of rest of the entries. The lowest root yield of 304.80 q/ ha was recorded in the entry 2013/RADVAR-5.

3.1.10.6 Cucurbitaceous Crop

Varietal evaluation trial on bottle gourd (AVT-II)

This trial was conducted with 05 entries including one check Pusa Naveen in RBD design and replicated four times. The highest fruit yield of 519.73 q/ ha was recorded from the entry 2013/BOGVAR -2 which was significantly superior to that of all other entries. The lowest fruit yield of 310.37 q/ ha was recorded in the entry 2013/BOGVAR -3.

Evaluation trial on hybrid bottle gourd (AVT-II)

This trial was conducted with 04 entries and one check hybrid Santosh-20 in RBD design with four replications. The highest fruit yield of 588.97 q/ ha was recorded from the entry 2013/BOGHYB -3 followed by that of the 2013/BOGHYB-6 (567.51 q/ ha) which were significantly superior to rest of the entries including check hybrid. The lowest fruit yield of 437.38q/ ha was recorded in the entry 2013/BOGHYB -1.

Evaluation trial on hybrid bitter gourd (IET)

This trial was conducted with 05 entries and two hybrid checks Pusa Hybrid-2 and NDBH-167 in RBD design replicated thrice. The highest fruit yield 205.44 q/ha was recorded from the entry 2012/BIGHYB-2 which was at par with that of check hybrid NDBH-167 (188.52 q/ ha) and found significantly superior to rest of the entries. The entry 2014/BIGHYB -1 gave the lowest fruit yield of 139.03 q/ ha.

Evaluation trial on hybrid bitter gourd (AVT-I)

This trial was conducted with 05 entries and two hybrid checks Pusa Hybrid-2 and NDBH-167 in RBD design replicated thrice. The highest fruit yield 231.15 q/ha was recorded from the entry 2012/BIGHYB-5 which was significantly out yielded over rest of the entries, while the entry 2014/BIGHYB -1 gave the lowest fruit yield of 115.52 q/ ha.

Evaluation trial on hybrid bitter gourd (AVT-II)

This trial was conducted with 05 entries and three hybrid checks Pusa Hybrid-2, Vivek and NDBH-167 in RBD design replicated thrice. The highest fruit yield 20.65 q/ha was recorded from the check hybrid Vivek which was at par with that of NDBH-

167 (196.75 q/ ha) and 2013/BIGHYB -5 (188.56), which were significantly superior to rest of the entries. The lowest fruit yield of 98.97q/ ha was harvested in the entry 2013/BIGHYB -1.

Evaluation trial on hybrid cucumber (IET)

This trial was conducted with 05 entries including hybrid check PCUCH-3 in RBD design replicated four times. The highest fruit yield 189.70 q/ha was recorded from the entry 2013/CUCUVAR -1 which was significantly out yielded over rest of the entries, while the entry 2013/CUCUVAR -5 gave the lowest fruit yield of 69.10 q/ ha.

Evaluation trial on hybrid cucumber (AVT-II)

This trial was conducted with 09 entries including hybrid check PCUCH-3 in RBD design replicated thrice. The highest fruit yield 189.70 q/ha was recorded from the entry 2013/CUCUVAR -1 which was significantly out yielded over rest of the entries, while the entry 2013/CUCUVAR -5 gave the lowest fruit yield of 69.10 q/ ha.

Evaluation trial on hybrid ridge gourd (AVT-II)

This trial was conducted with 06 entries including two checks Pusa Nasdar and Sabour Local in RBD design in four replications. The highest fruit yield 170.99 q/ha was recorded from the entry 2013/RIGVAR-2 followed by that of the entry 2013/BIGVAR -6 (168.53q/ ha) which were significantly superior to rest of the entries. The lowest fruit yield of 70.86 q/ ha was recorded in the entry 2013/RIGVAR -1.

Evaluation trial on hybrid sponge gourd (AVT-I)

This trial was conducted with 09 entries including two checks PSG-40 and Kalyanpur Hari Chikni in RBD design replicated thrice. The highest yield of 211.55 q/ ha was recorded in the entry 2014/SPGHYB-2 followed by that of entry 2014/SPGHYB-1, which were statistically superior over rest of the entries. The lowest yield was noted in the check entry 2014/SPGHYB-3 (73.25 q/ ha).

Varietal evaluation trial on pumpkin (AVT-I):

This trial on was conducted with 07 entries including two checks Kashi Harit and Sabour Local-1 in RBD design replicated thrice. The highest fruit yield 308.4 q/ha was recorded from the entry 2014/PUMVAR -4 which was at par with that of the entry 2014/PUMVAR -2 (270.8 q/ ha). While, the entry 2014/PUMVAR -3gave the lowest fruit yield of 168.7 q/ ha.

3.1.10.7 Peas, Beans and Leafy Vegetables

Varietal evaluation trial on cowpea- bush type (AVT-I)

This trial was conducted with seven entries including two check varieties (Kashi Kanchan and Arka Garima) tested in RBD Design and replicated thrice. The highest pod yield 127.68 q/ ha was recorded from the entry 2014/COPBVAR-5 which was at par with the check Kashi Kanchan (126.22 q/ha). However, the lowest of 103.98 q/ha was recorded in the entry 2014/COPBVAR-1.

Varietal evaluation trial on yard long bean (IET)

This trial was conducted with six entries including one check variety (Lola) tested in RBD Design and replicated four times. The highest pod yield 145.50 q/ ha was recorded from the entry 2015/COPBVAR-5 which significantly out yielded rest of the entries as well as the check variety. However, the lowest of 59.19 q/ha was recorded in the entry 2015/COPBVAR-2.

Varietal evaluation trial on bathua (IET)

This trial was conducted with 06 entries including 01 check variety (Pusa Bathua) was tested in RBD Design with four replications. The highest yield of 738.19 q/ ha was recorded in the check variety Pusa Bathua which was statistically on par with that of the entry 2015/BATHVAR-5 (703.87 q/ ha). The lowest yield of 162.85 q/ ha was recorded in the entry 2015/BATHVAR-4.

3.1.10.8 State Plan Projects

Screening and identification of heat and drought tolerant genotypes in tomato (*Solanum lycopersicum* L.)

For screening of genotypes against drought stress 13 genotypes were planted in pots in October, 2015 with three treatments consisting of properly irrigated (T_1), irrigation withheld at flowering stage (T_2) and irrigation withheld at fruit development stage (T_3). The genotype EC 538380 was the best performer with 126.50 q/ha and 131.02 q/ha yield under T_2 and T_3 respectively whereas the check variety Arka Meghali produced only 25.36 q/ha and 22.00 q/ha respectively under the same conditions. Under the controlled irrigation condition in pot also the genotype EC 538380 was the highest yielder with 243.23 q/ha. For screening of genotypes for heat tolerance 15 genotypes were planted in RBD in March, 2016 and VRT-101A was found to be the highest yielder with 240.11 q/ha yield followed by CLN 1621L (203.30 q/ha) compared to an yield of only 21.88 q/ha in H-86 and 44.73 q/ha in Arka Vikas.The promising lines could be used as donors for imparting drought stress and heat stress tolerance in tomato.

Exploitation of genetic resources for varietal improvement in pointed gourd (*Trichosanthes dioica* Roxb.)

Thirty genotypes collected from different locations of Bihar and Uttar Pradesh were characterized for their qualitative and quantitative traits and evaluated for their yield and quality attributes during 2013-14 and 2014-15. On the basis of mean performance for yield and yield contributing parameters six outstanding genotypes, i.e., BRPG12-1, BRPG12-7, BRPG12-8, BRPG12-9, BRPG12-11 and BRPG13-27 were selected. The selected genotypes along with standard local checks viz. Rajendra Parwal-1 and Rajendra Parwal-2 were evaluated in randomized block design with three replications for their better yield and quality attributes. Results revealed that none of the genotype showed significant influence on days to flowering, however, early flowering was noted under genotypes BRPG 13-27 and BRPG 12-11 who took about 146 and 149.67 days, respectively. Genotype BRPG 12-1 being at par with BRPG 12-9 and BRPG 12-1 produced the flower at minimum node i.e. 9.22. The length of fruit varied significantly and maximum value was noted under the genotype BRPG 12-1, which was statistically at par with BRPG 12-9, BRPG 12-7, BRPG 12-11 and RP-1. The diameter of fruits of various genotypes was statistically at par to each other, however, maximum (3.53cm) diameter was recorded by the genotype BRPG 12-11.The genotype BRPG 12-9 being at par with RP-1, BRPG 13-7, BRPG 12-1, BRPG 13-27 recorded maximum (137.22) number of fruits per vine, while minimum was noted under BRPG 13-11 (94.44 fruits/vine). Average fruit weight was maximum in genotype BRPG 12-11, which was statistically at par with genotypes BRPG12-1, BRPG12- 7 and BRPG12- 9 and significantly superior over rest of the genotypes. So far as the TSS is concerned, non significant variation among the genotypes was noticed, however, the number of seeds per fruits varied significantly and minimum number of seeds was observed in the genotype BRPG 12-11 and Rajendra Parwal-2. The increasing number of seeds in promising genotypes may probably be due to greater size of fruits. Genotype BRPG 12-9 (5.5kg) followed by BRPG12-1(4.99kg) produced significantly maximum fruit yield per vine as compare to all other genotypes and surpassed the better local check (RP-1) by the margin of 47.99% and 32.77% respectively.

Varietal improvement in early cauliflower

Multi-location trial was conducted at three location viz., BAC, Sabour, PRC Mokama and KVK Jalalgarh of Bihar to identify the suitable genotypes. Significant differences were observed among the genotypes under study and the interactions between genotypes and location was also significant. BRECF 101-13 and BRECF 117-13 were found promising at BAC,

Sabour and PRC Mokama. Besides, BRECF 31-13, BRECF 09-13 were also promising at BAC Sabour and PRC, Mokama respectively. Performance of all the genotypes was at par at KVK Jalalgarh. Four promising genotypes were identified among them BRECF 31-13, BRECF 09-13 were identified at two locations.

Population improvement with respect to isolation of inbred lines in cauliflower

Inbred development programme was continued through selfing of segregating plants. Two lines for each segregating lines were planted at BAC Sabour. Besides, a trail was conducted to standardize the anther culture techniques in cauliflower. The experiment was conducted in CRD design with three replications with two genotypes Sabour Agrim and Pusa Kartik Sankar. Twenty three S_3 lines and thirty eight S_2 lines were selected last year. In the anther culture experiment, the genotypic responses with respect to different culture medium were found significant. Highest response was recorded by a culture medium composed of B5 salt + 100g/lt sucrose + 1mg/lt 2,4-D + 1mg/lt NAA + 1mg/lt BAP for development of androgenic callus in both the genotypes. Response of Pusa Kartik Sankar was higher than the Sabour Agrim. Selection of twenty three S_3 populations was done.

Varietal improvement in garlic for yield and storability

Survey and collection of a total of 142 genotypes of garlic has been done and are under study. It may be noted that 120 genotypes were collected from DOGR, Pune and also 22 local genotypes were also collected. Twenty six promising genotypes with respect to high yield and longer storability were observed on the basis of studies made so far. The experiment was laid out in RBD in three replications with these 26 genotypes. Morphological evaluation were done for the

High Yielding Hybrids Of Garlic

important yield and yield attributing characters like plant height, neck thickness, number of leaves per plant, length of leaf, breadth of leaf, yield per plant, diameter of bulb, number of cloves/bulb, length of clove , diameter of clove, average weight of clove and on this basis genotypes, BRG10, BRG13, 432, 496, BRG3, BRG1 and 444 were the high yielders. Bio-chemical studies with respect to the parameters like TSS, sulphur, potassium, phosphorus and phenols content of all the genotypes were performed and also biochemical basis of storability was studied. Genotypes, 96, BRG1, 444, 417, 453, BRG10, BRG9, 496 and 155 were found to be promising with respect to the said biochemical parameters. Post harvest storage study for all the genotypes was performed with respect to physiological loss in weight percentage and losses on storage due to pest and disease infestation. Genotypes, 496, BRG1, BRG13, BRG10, 444 and BRG8 were found to be promising with respect to storage in ambient situation. Maintenance and multiplication of the superior genotypes were also performed. Multi location study was also performed. For further evaluation experiment has been laid out and the crop is standing in the field Maintenance and multiplication the crops are also being done. MLT is underway at three locations in different zones. Farmers' field performance and their preference for the genotypes are also being studied.

Identification of marigold lines suitable for summer cultivation

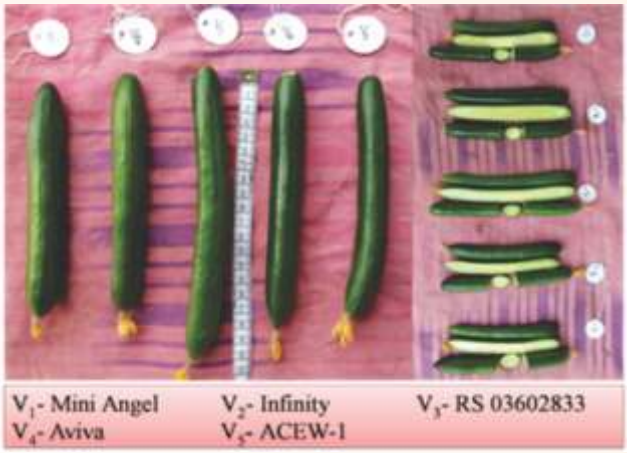
Total 20 genotypes were planted in Randomized Block Design with 3 replications. Diverse germplasm were collected from different institutes as well as farmers' field. Evaluation and screening of 20 genotypes were carried out for 3 years in

summer season at BAC, Sabour and Evaluation and screening of 7 genotypes were carried out for 2 years in summer season at ARI, Patna. Among all the genotypes BRMG 113 was found superior in terms of yield and yield attributing traits. It is an orange coloured double type genotype with medium flower diameter and good tempering ability. This genotype has shown good seed setting ability. BRMG 113 can be a suitable genotype of marigold for summer season for Bihar state.

Selection of suitable vegetable and flower cultivars for protected cultivation in Bihar

cucumber

Five cucumber cultivars under naturally ventilated poly house conditions. The cultivars evaluated were Mini Angel (V_1), Infinity (V_2), RS 03602833 (V_3), Aviva (V_4) and ACEW-1 (V_5) were evaluated in polyhouse. The range of vine length was from 3.15 m to 2.44 m. The longest vine was found from RS 03602833 (3.15 m) whereas the shortest from ACEW-1 (2.44 m). Cucumber cultivars showed significant variation for intermodal length. Minimum intermodal length (9.42 cm) was recorded in cultivars Mini Angel whereas maximum intermodal length (13.86 cm) observed in cultivar Aviva. Difference among the cultivars for number of days taken to first harvesting from transplanting in response to different cultivars was highly significant. The cultivar Mini Angel took minimum time (33.70 days) to get the first harvesting while, cultivar ACEW-1 took longer time (37.80 days) to get the first harvesting. Length and diameter of fruit showed significant variation among cucumber cultivars. Maximum fruit length and diameter were found from RS 03602833 (18.13 cm and 4.80 cm, respectively). Significant variation was recorded among cucumber cultivars performance in respect to the number of fruits per plant. Maximum number of fruits was found from Mini Angel (39.55/vine) whereas minimum was recorded form ACEW-1 (30.05/vine). Average fruit weight and yield per vine showed significant variation among the cultivars. Maximum average fruit weight (96.60 g) and yield (3.63 kg/vine) were recorded from cultivars RS 03602833 whereas minimum average fruit weight (79.41 g) and yield (2.59 kg/vine) were noted in ACEW-1.



Anthurium

Four anthurium cultivars *viz.*, Angel, Xavia, New Orange, and Evita, were planted in a randomized block design with five replications, at a spacing of 30.0 cm ×30 cm in beds under shade net house conditions. The range of plant height was from 69.98 cm to 39.9 cm. The tallest plant was found from Xavia (69.98 cm) whereas the shortest from New Orange (39.9 cm). Maximum leaf length (31.6 cm) and width (18.63) were found from Angel and Xavia, respectively, whereas, Minimum leaf length (10.4 cm) and width (6.25 cm) were recorded in New Orange. The longest stalk length of anthurium was observed in variety Xavia (53.35 cm) while the shortest was found in New Orange (13.3 cm). Maximum spathe length (13.65 cm) and width (9.25 cm) were recorded from Xavia and Angel, respectively, whereas, minimum spathe length (8.25 cm) and width (6.2 cm) were recorded in New Orange. Longest spadix (5.2 cm) and maximum diameter of spadix (3.1 cm) were observed in Xavia variety, whereas, minimum length (3.53 cm) and diameter of spadix (2.47 cm) were recorded form New Orange.

Development of parthenocarpic gynoecious lines in cucumber (*Cucumis sativus* L.) for protected cultivation

Seven genotypes were evaluated in the polyhouse (February, 2016 transplanting). Male flowers were induced in all the lines and selfing, crossing was done with the spray of 200 ppm silver thiosulphate solution. The quantitative and qualitative traits were recoreded. ACG-1 showed predominantly gynoecious trait. The genotype Mini Angel was earliest for fruiting (33 days after transplanting) and was

parthenocarpic in nature, ACEW-1 having long fruits and was parthenocarpic in nature, Aviva was having high fruit weight and was parthenocarpic in nature. Male flowers were inducted with the use of silver thiosulphate solution@ 200 ppm in Aviva in three days with one spray, ACG-1 in 14 days with two sprays, ACEW-1 in 11 days with two sprays, Mini Angel in eight days with two sprays. Male flowers were inducted irrespective of 2-4 leaf stage as the sprays were scheduled at mature stage in all the genotypes. Selfed and crossed progenies were developed with the help of inducted male flowers. Pvt. Sector hybrids (ACEW-1, Aviva, Hilton, Mini angel, RS-03602833, Infinity and NS-406), Public sector parthenocarpic hybrids (Pant

Parthenocarpic cucumber-2, Pant Parthenocarpic cucumber-3 and Kerala Parthenocarpic cucumber hybrid-1) and one gynoecious line (ACG-1) from Kerala Agricultural University, Vellanikkara etc. have been procured for evaluation. Male flower induction protocol has been standardized for seed production in parthenocarpic lines. Progenies have been developed by crossing. Evaluation is under progress.

Screening and selection of tomato genotypes suitable for summer season for Zone III B

Based on the analysis of the collected data for three years, the varieties Pusa Hybrid -1, Arka Ananya, Swarna Sampada, and Pusa Hybrid-8 showed the significant performance over check (Arka Vikas) in terms of yield with their average yield of 471.48 q/ha, 452.94 q/ha, 440.30 q/ha, and 427.38 q/ha respectively when sown in second week of October. Performance of varieties Arka Vikas and Pusa Rohini were also above the average performance of the varieties in the trial and were found to be economic in normal season.

When all the twelve entries were sown in the last week of January; performance of varieties Pusa Hybrid -1, Arka Ananya, Swarna Sampada, Pussa Hybrid-8, Pusa Ruby, Pusa Gaurav and Selection -18 were significant over check in terms of yield, but none of them were economic. Similarly, when all the twelve entries were sown in the last week of February, although performance of entries Swarna Sampada, Pusa Hybrid -1 and Selection -18 were significant over check, none of the varieties were economic. No fruiting was observed in Pusa- 120 when sown in or after last week of February. It may be concluded that the variety Pusa -120 is highly sensitive to temperature. It may be concluded that although performance of varieties Pusa Hybrid -1, Arka Ananya, Swarna Sampada, and Pusa Hybrid-8 showed the significant and economic performance in terms yield in normal season; none of the variety was economic when sown either in in the last week of January or in the last week of February.

Functional characterization of a germin like protein (GLP) from tomato in terms of disease resistance

The multigene family containing 15 putative GLP

genes in tomato was identified and analyzed. Among these 15, a potential candidate gene (*SlGLPH*) was cloned and the genetic construct for overexpression of the gene was prepared. *Agrobacterium*-mediated transformation of tomato and brinjal for overexpression of the gene was carried out. The gene was also expressed in bacterial system and the recombinant SlGLPH protein was optimized for purification through immobilized metal affinity chromatography, in presence of detergent. The different lengths of the upstream region of the gene were found to have differential promoter activity as observed through transient expression of reporter gene. Expression of the *SlGLPH* gene was found to be significantly increased after different abiotic and biotic stress treatments given to the tomato seedlings.

3.1.10.9 Pilot Projects

Development of bottle gourd inbreds

Ten inbred lines (S_7) of bottle gourd were evaluated against the checks Pusa Naveen and Narendra Rashmi in RBD design and replicated thrice. The highest fruit yield 540.52 q/ ha was recorded in the line BRBG-65 (43.67% yield improvement over best check Pusa Naveen). The lines BRBG-22-1 (501.73 q/ ha) (33.35% yield improvement over best check Pusa Naveen) and BRBG-23 (481.44 q/ ha) (27.96% yield improvement over best check Pusa Naveen) were also at par with BRBG-65. The lowest fruit yield of 136.29 q/ ha was recorded in the line BRBG-140.

Cherry tomato improvement programme

Sixteen lines of cherry tomato were evaluated using Swarna Ratan as check. The line P-7-4 was the highest yielder with yield of 2.13 kg/plant followed by P-7-8 (1.51 kg/plant yield) and P-5-6 (1.27 kg/plant yield) which was much superior to the check Swarna Ratan (0.78 kg/plant yield). P-7-4 also recorded the highest TSS 910.03%) along with P-7-5 (also 10.03% TSS) compared to a TSS of 7.05 of Swarna Ratan.

Okra improvement programme

For development of YVMV tolerant genotypes in okra the advance breeding lines (F_6 generation) have been evaluated in open field condition, of which four lines have been found to show high level of field resistance against YVMV along with good yield and quality. These lines have become stable and seed multiplication is being carried out. The best line will be submitted to AICRP on Vegetable Crops for multi-location testing.

Table 3.1 Varieties under pipeline: Entry promotion in AICRP-VC

Crop	Variety name	Year of submission	Stage	Specific traits
Cauliflower mid season	BRMCF-211	2013	AVT-II	High yielding, milky white compact curd, 800-900g curd weight
Tomato	BRDT-1	2013	AVT-II	Red flat round, high yielding, pericarp thickness high, suitable for processing and distant market
	BRDT-2	2014	AVT-I, promoted to AVT - II	Pink round, high yielding, suitable for table purpose, 60 -70g fruit weight, Avg. Yield: 425.49 q/ha
	BRDT-3	2014	AVT-I, promoted to AVT - II	Yellow, round, high yielding, suitable for table purpose, juicy, 50 - 60 g fruit weight, Avg. yield: 442.90 q/ ha
Bottle gourd	BRBG-5001	2015	AVT-II	High yielding, oblong fruits, suitable for summer and rainy season
Brinjal	BRBL-1	2015	IET, promoted to AVT -I	High yielding, green oblong, tolerant to shoot & fruit borer, very good cooking quality, suitable for Bhurta making and other culinary purposes.
Cherry Tomato	BRCT-1	2015	IET, promoted to AVT -I	Yellow cherry tomato, high yielding, cluster bearing, sweet and good for table purpose, high TSS – 6.8^0 Brix, Avg. yield: 345.29 q/ha.

Table 3.2 Varieties under pipeline: New nominations under AICRP-VC

Sl. No.	Crops	Name of entries	Specific traits
1.	Brinjal long variety	BRBL 02	High yielding, long, deep purple, high bearing, average fruit weight 65g, glossy, excellent cooking quality, field tolerance to Phomopsis blight and FSB
2.	Brinjal long variety	BRBL-07	High yielding, long, dark purple, average fruit weight 203g, glossy, soft, very less seeded, excellent cooking quality field tolerance to Phomopsis blight and FSB
2.	Brinjal long Hybrid	BRBLH-1	High yielding, long, dark pu rple, high bearer, average fruit weight 160g, soft, less seeded, excellent cooking quality
3.	Bottle gourd	BRBG-23	High yielding, bottle shape (40 45 cm long), Pyriform, long, 1.25 1.50 kg/fruit, light green with good appearance and better cooking quality, suitable for summer and rainy season, field resistant to Powdery mildew and Anthracnose diseases; Avg. yield 480 q/ ha
4.	Bottle gourd	BRBG-65	High yielding, Small, Uniform, Cylindrical shape, weight: 800 1000 g/ fruit, suitable for summer a nd rainy season, Very good cooking quality, late seed maturity, first choice for consumer preference; Avg. yield 540 q/ ha.
5.	Early Cauliflo wer	BRECF-101/13	Curd partially covered with inner leaves, compact creamy white in colour, 15 16 cm in diameter , 50% curd initiation at 100 - 105DAS, moderatly tolerant to black rot as well as DBM and *Spodoptera*
6.	Early Cauliflo wer	BRECF-117/13	Curd partially covered with inner leaves, compact creamy white in colour, 13 -14 cm in diameter, 50% curd initiation at 90-95DAS, moderatly tolerant to *Alternaria* and black rot as well as DBM and *Spodoptera*

3.2. Natural Resource Management

3.2.1 Agronomy

3.2.1.1 Sabour and ARI, Patna Trials for Rice

Under state agronomy trials, NVT-Mid & Late duration cultures and re-visit of fertilizer recommendation of rice in Bihar were conducted at five locations in zone II, IIIA & IIIB (Saharsa, Purnia, Sabour, Patna& Bikramganj). Under co-ordinated trials, NVT-IM (TP), IVT-RSL, CMT-SRI and RBCS-Climate Resilient Management Practices were conducted at ARI, Patna.

Nitrogen variety trials

Rice culture BRR 2005 was evaluated in comparison with standard check Rajendra Sweta for its response to graded levels of Nitrogen (50%, 100% & 150% RDN) at five locations (Patna, Bikramganj, Sabour, Saharsa & Purnia). Based on grain yield obtained over the locations, BRR 2005 (52.06 q/ha) was found promising. Nitrogen responded up to 150 kg N/ha in most of the locations. Five long duration rice cultures (BRR 2002,BRR 2013, BRR 2028, BRR 2030 & BRR 2031) were evaluated in comparison with popular check Rajendra Mahsuri-1for their response to graded level of nitrogen (50, 100 & 150% RDN) at five locations (Patna, Bikramganj, Sabour, Saharsa & Purnia). Based on grain yield obtained over the locations, BRR 2028(55.19 q/ha), BRR 2002(52.02q/ha) & BRR 2031(51.22 q/ha) were found promising. Nitrogen responded up to 150 kg N/ha in all the locations. Four AVT2 – IM (TP) rice cultures (IET 23272, IET 23666, IET 23680 & IET 24142) were evaluated against national, regional and local checks (NDR 359, KRH 2, NDR 8002, Akshaya dhan, Pant Dhan 19 and Rajendra Sweta) at ARI, Patna. None of the entries were found superior to the standard cheek NDR 8002 (63.46 q/ha). However, IET 23666 and IET 24142 were found superior to the local cheek Rajendra Sweta (45.68 q/ha).Nitrogen responded significantly up to 150 kg N/ha. However, highest grain yield (78.15q/ha) was obtained by the check NDR 8002 at 150 kg N/ha.

Two IVT-RSL cultures (IET 23561 and IET 23565) were evaluated against national, regional and local checks (Savithri, Dhanrasi, Pooja and Rajendra Mashuri-1) at ARI, Patna. None of the entries evaluated under IVT-RSL were found superior to the standard and local checks namely Pooja (48.89 q/ha) and Rajendra Mahsuri-1 (48.89q/ha). Nitrogen responded significantly up to 150 kg N/ha. However, Pooja recorded highest grain yield (64.07 q/ha) followed by Rajendra Mahsuri-1 (63.33 q/ha) at 150 kg/ha.

Re-visit of fertilizer recommendation in Bihar

Three rice varieties of different duration like early(Rajendra Bhagwati), medium-hybrid (Arize 6444 Gold) and long duration (Rajendra Mahsuri-1) were evaluated against five doses of NPK (F1-804020, F2-1045030, F3-1205040, F4-1405550 & F5-1606060) at five locations, i.e. Patna, Bikramganj, Sabour, Saharsa & Purnia. The yield response curve of the early, medium-hybrid and long duration rice varieties drawn for individual location and pooled data of all the locations indicated that the early duration rive HYV recorded optimum yield at F2 (10045030NPK kg/ha). However, medium duration rice hybrid responded optimum yield at F4 (1405550NPK kg/ha) and long duration rice variety responded optimum yield at F3 (1205040 NPK kg/ha).

System of rice intensification (SRI)

Three methods of crop establishment (SRI, DSRI & TPR) as main plot and six nutrient management practices (100% RDN, 50% Organic + 50% Inorganic, 100% RDN through organic, 150% RDN, No fertilizer and LCC based N management) in sub plot were evaluated at ARI, Patna. Among the methods of crop establishment SRI was found significantly superior over DSRI & normal manual transplanting. However, normal manual transplanting and DSRI were found at par. Among the methods of nutrient management, application of 150 % RDN (1806040 NPK) gave significantly higher grain yield (69.56 q/ha) over

other methods of nutrient management. LCC-based N management (100 kg N/ha) yielded (65.56 q/ha) at par to the rest methods of nutrient management. However, 50% organic + 50% inorganic yielded (65.22 q/ha) at par to 100% organic (64.42 q/ha) as well as 100% inorganic (65.53 q/ha) alone.

Climate resilient management practices

The results revealed that the treatment **T6-** Application of *Azospirilum* + PSB 3.5 kg each seed and soil + FYM 5 t/ha + 50 % RDN produced significantly highest grain yield (48.44 q/ha) at par to the treatment T5 similar treatment at T6 with brown manuring with *Dhaincha*+ residue mulch 2 t/ha in place of FYM (44.32 q/ha). Fifty percent reduction in Nitrogen application and incorporation of bio-fertilizers, brown manuring and residue mulching with or without FYM in soil helps in maintaining organic carbon, soil temperature, reduction in NO_3 loss, improvement in soil micro flora, etc. were found important strategies to mitigate the ill-effect of climate change in agriculture.

3.2.1.2 Rice Agronomy, BRU, Dhangain

Non Hybrid Rice Trials

RAU 724-48-33 produced significantly higher grain yield (64.44 q/ha) over check R. Bhagwati (46.39 q/ha) and it was at par with RAU 1116-48 (62.22q/ha) & BRR 2028 (58.89q/ha).

Hybrid Rice Trials

Loknath-510 out yielded significantly superior grain yield (83.61 kg/ha) over best check Arize 64.44(7278kg/ha) and also rst of the entries

Private Seed Testing Rice

BS 023 produced significantly higher grain (66.25 q/ha) over hybrid check Arize 6444 (56.67 kg/ha) and local check Kanak (51.25 q/ha). It was at par with PAC 835 (62.92q/ha) & DRRH-2 (60.42 q/ha)

3.2.1.3 AICRP on IFS

Identification of bio-intensive complementary cropping system

On the basis of six years of experimentation, it may be concluded that out of twelve rice based cropping systems tested, rice – potato + radish - onion + maize relay cropping and rice - maize + potato - sorghum + cowpea (F) systems were found to be the biologically efficient and profitable giving net returns of Rs.1,29,577/ha and 1,27,976/ha and producing rice - equivalent yields of 282.9 and 287.8 q/ha, respectively.These two cropping systems earned additional net return of Rs. 53,315ha^{-1} and Rs. 51,714ha^{-1} over existing rice - wheat system. Respective figures of system productivity and profitability of these two systems were 77.51and78.86 kg/ha/day and Rs. 355.0andRs. 350.62 /ha/day. Rice (hybrid) - maize + potato - sorghum + cowpea (F) system was found to be the most promising energetically producing 67,588 K Cal energy/ha.

Permanent plot experiment on integrated nutrient supply in rice-wheat crop sequence

The field experiment was initiated at this centre during 1984-85. There were 12 treatments of rice - wheat system, of which 4 treatments had different dose of N P K applied only in inorganic fertilizer forms (50 50; 50 100; 75 75; 100 100 %), 6 treatments related to integrated use of fertilizers and organic sources and one each of control and farmers practice of fertilization. The treatments were tested in R.B.D. with four replications. After 31th crop cycle, substitution of 50% N through F.Y.M.+50% NPK through inorganic fertilizers in rice and 100% recommended dose of N P K in wheat (T6) produced the highest grain yield of rice (55.1 q/ha), wheat (43.5 q/ha) and rice-equivalent yield (121.4 q/ha) as well as net return (Rs.73,572 /ha) of the system, which however, were at par with substitution of 50% N through green manuring and wheat straw in rice and these treatments proved significantly superior to the treatment receiving 100% recommended fertilizer dose in both the seasons. Organic carbon status and

P-balance in soil was positive in all the treatments except control plot and plots getting 50% NPK through fertilizers and its accumulation was higher when organic matter was incorporated in the soil. A marginal decline in available N and K status of soil was observed in the treatments receiving nutrients through fertilizers. Substitution of either 50% or 25% N through organic sources also helped in reduction in bulk density, formation of larger aggregates and improving microbial population and dehydrogenase activity of soil.

Development of organic farming package for system based high value crops

This experiment aims to develop organic farming package for scented rice-potato-onion cropping system. In this trial, substitution of 100% recommended N through different organic sources were tested with substitution of 50% N through FYM + 50% NPK through fertilizers and application of 100% recommended dose of nutrients through fertilizers for their production potential, quality, economics and soil health. After 11th year crop cycles, application of 1/3rd recommended N each through FYM + vermi compost + neem cake along with bio-fertilizer for N &P produced the maximum grain yield of rice (53.1 q/ha), potato tuber yield (212.7 q/ha) and bulb yield of onion (105.7 q/ha).However, the maximum rice-equivalent yield (279.8 q/ha) and net returns of Rs.1,47,522 /ha was realized when plots received 1/3rd recommended N each of FYM + vermi compost + neem cake along with intercropping of radish with potato and maize with onion, followed by application of 1/3 N each though FYM, VC & NC along with bio- fertilizers for N&P (.Rs.1,14,126 /ha).After eleventh crop cycles, the effect of organic farming package was better to integrated nutrient management as well as chemical farming with respect to crop yields and also improved physico-chemical properties of soil and quality of the produce.

Management of cropping system for resource conservation and climate change

This experiment was conducted to study the effect of resource conservation technology like reduced/minimum tillage, crop residue mulches and to design agronomically efficient and economically viable copping system for resource conservation and counteracting adverse effect of climate change. As such, four cropping systems viz., rice - wheat - moong (grain + residue incorporation); rice - potato - onion + maize (relay cropping); rice - maize + potato - cowpea (fodder); rice - cabbage - maize + moong along with minimum and conventional tillage were taken in main plot for testing. In sub plots, two fertilizer levels (75% of recommended and 25 % higher of recommended dose of fertilizers) along with no mulch and crop residue mulch application were also selected for testing. This experiment was laid out in split plot design with 3 replications.

Conventional tillage proved superior over minimum tillage practice, producing higher rice-equivalent yield (246.2 q/ha) and realizing higher net return (Rs. 1,18,705 /ha) from the system. Among four rice based cropping systems tested, rice - potato - onion + maize (relay cropping) noted to be the most productive (306.5 q/ha) and remunerative (Rs. 1,29,293/ha), followed by rice - maize + potato - cowpea fodder (275.3 q/ha, Rs. 1,21,019/ha) system. The effect of mulch was not found to be significant. However, application of 25% N though vermicompost + 75 % NPK through fertilizers gave significantly higher REY (246.1 q/ha) and net profit (Rs. 1,15,671 /ha) of the system as compared to recommended dose of fertilizers.

Development of integrated farming system model

Integrated farming system model was developed on 1.0 ha area during kharif, 2010. In this model components such as field crops (cereals, pulses oilseeds and tuber crops in 5916 m2, fodder in 1098 m^2 area and vegetables in792 m^2 area); fish production in 800 m^2 area including fruits like Guava,

Papaya on embankment of fish pond in 620 m2 area; were undertaken. Besides, 125 numbers of subabool (*Leucaenaleucocephala*) plants and 50 numbers of moringa were also planted along the boundary of field in 200 m^2 areas. Vermi compost pits (3 nos. of pits) were constructed near dairy shed for recycling of farm and animal wastes in 100 m^2 area. The poly culture fingerlings were released in the pond as per recommended stocking density of 10000 numbers per hectare of ponded water. Accordingly 800 numbers polyculture were released in the pond of 800 $m^{2.}$ Animal components such as two cross breed milch cows for milk production, Goatry (10 + 1 Black Bengal breed) for meat purpose, ducks for eggs and meat have been included in the system. All the farm and animal wastes were properly recycled in to system so that nothing goes waste and output of one enterprise worked as input for other enterprise.

The net income of Rs. 3,52,243/- was realized from Cropping+ dairy+ goatry + fishery including fruits + duckery + boundary plantation+ vermicompost, in which cropping systems, dairy unit, goat unit, fishery, boundary plantation and recycling of farm waste contributed Rs. 94,557/-, Rs.1,12,283/-, Rs.41,756/-, Rs.53,961/-, Rs.5,921/-, Rs.16,582/- and Rs.27,182/- respectively. Of the income obtained from different components, cropping, dairy unit, goat unit, fishery boundary plantation and recycling of farm waste contributed 26.8%, , 31.9%, 11.8 %, 15.3%, 1.68%, 4.7% and 7.7%, respectively to the total income of the system.

3.2.1.4 IRRAS (IRRI)

Effect of tillage, establishment methods, crop residue addition and bio-priming on sustainability and productivity of rice-lentil cropping system for rainfed drought-prone areas

The number of branches per plant, nodules per plant, dry weight of nodules per plant, grains per pod and also pods per plant were highest underDSR-ZTL+ 25% Crop residue + Bio-priming. DSR-ZTL+25% Crop residue + Bio-priming recorded significantly higher seed and biological yield with the value of 16.8 q/ha and 48.6 kq/ha, respectively over conventional system.The maximum system productivity of this Rice-Lentil system was 104.9q/ha under treatment .DSR-ZTL+ 25% Crop Residue + Bio-priming. This treatment also recorded maximum net return from rice-lentil system (Rs. 93782 /ha) followed by Rs 87,726 /ha in un-puddled transplanting rice succeeded by zero till lentil in sequence.

Study on comparative performance of lentil (rice-lentil system) in sequence with puddled and unpuddled transplanted rice conditions in drought-prone rainfed lowland ecosystem of Bihar

The difference between PTR and UPTR transplanting of rice was non-significant in relation to yield. The plant growth parameters, yield attributes, and yield along with the nodules per plant and the dry weight of the nodules per plant in lentil were superior in sequence with un-puddled transplanted rice over PTR-ZTL. . Zero tillage recorded higher yield attributing characters, seed yield and biological yield of lentil over conventional (Paira) system. The system productivity of 104. q/ha (mean value) was found with Sahbhagidhan under un-puddled condition followed by zero till lentil. The maximum B-C ratio was recorded under un-puddled transplanted rice (Sahbhagidhan) in sequence with zero-till lentil (3.39).

Evaluating different cropping patterns and tillage methods in rice based rainfed drought-prone situation

Tillage system had significant effect on lentil equivalent yield, adoption of zero tillage after Puddle rice (Shabhagidhan) recorded higher lentil equivalent yield (14.61 q/ha) as compared to conventional tillage (12.42 q/ha). Among cropping patterns rice – chickpea + mustard recorded significant higher rice equivalent yield as compared to other cropping patterns. BC ratio was maximum in rice - chickpea + mustard system (3.07) under zero tillage condition.

Effect of chemical weed management on growth and yield of Direct seeded rice

Crop grown under weed free condition produced the highest grain yield of 52.6 q/ha. Sole application of pendimethalin 1.0 kg ai/ha PRE (T_3) produced lowest grain yield (35.6 q/ha) among herbicidal treatments. Application of pendimethalin 1.0 kg ai/ha PRE *fb*bispyribac-sodium 25 g.ai/ha POE *fb*1 HW proved to be the 2nd best yielder (52.2 q/ha) next to weed free condition. Application of pendimethalin*fb* bispyribac- sodium with one hand weeding recorded lowest weed count, weed dry matter and higher weed control efficiency followed by application of penoxulam + cylofop as post emergence. Applicaion of pendimethalin 1.0 kg ai/ha PRE *fb* bispyribac-sodium 25 g.ai/ha POE *fb*1 HW recorded maximum gross income and net return followed by pendimethalin pyrazosulfuron + bispyribac sodium. Maximum BC ratio of 2.61 was recorded with pendimethalin pyrazosulfuron + bispyribac sodium and pinoxulam + cyhalofop. However, Application of pendimethalin was realized an essential component of weed management in any recommendation because it inhibits germination of many weeds.

3.2.1.5 Modeling the Studies on Extreme Weather Events and their Impact on Agricultural Ecosystems in Agro-climatic Zone (iii A& B) of Bihar

After determining the frequency and magnitude of extreme weather (heat and cold waves) events in agro-climatic zone IIIA & B. At present in the context of climate change, temperature is one of the most important environmental factors influencing the rice crop growth, development, and yield. While analyzing the impact of heat stress on rice and wheat yield, sensitivity analysis were carried out by creating the extreme temperature (heat wave and severe heat wave) scenarios in DSSAT v 4.6 model. The 2nd objective of the study was to provide an overview of the influence of elevated temperature on wheat and rice phonology and yield. Results revealed that duration of each phenological stage is influenced by temperature which has direct impact on yield. Heat stress caused significant reduction in phenological dates and final yield of wheat. The results showed that the days taken to attain anthesis, maturity and yield were less under elevated temperature of 5°C and above 5°C, when compared to phenological dates and yield of wheat crop exposed no heat stress (Normal). The study further inferred that among the different crop growth stages, anthesis to milk stage was most sensitive to heat stress, where physiological maturity got reduced to 9 days and yield was reduced to 29.05 per cent.

The grain yield gets declined at elevated temperature significantly than the normal. The above 5°C treatment recorded a grain yield of 3660 kg/ha, which was the lowest followed by 5°C with 3965 kg/ha compared to normal 5363 kg/ha. The yield reduction in rice due to elevated temperature was 26.0 and 31.75 per cent for 5°C and above 5°C treatments respectively. The elevated temperature on rice crop affects the crop duration by attaining the phonological stages earlier with low accumulated growing degree days. This reduction in grain yield may be due to the direct effect of temperature on rice development especially high temperature at flowering stage leading to spikelet sterility and, therefore, yield loss.

3.2.1.6 Conservation Agriculture (ca)

In Rice based cropping system, the maximum net return (Rs. 86993/ha/yr) and BC ratio (1.70)were recorded under Zero tillage whereas among cropping systems, rice-maize recorded highest rice equivalent yield (110.04 q/ha), net return (Rs. 98356/ha/yr) but rice-lentil recorded significantly higher BC ratio (1.72). In maize based cropping system, the maximum maize equivalent yield (91.82 q/ha/yr) was recorded under permanent bed. Among cropping system significantly highest benefit cost ratio were recorded under maize-chickpea system (1.49) and

it was at par with maize-winter maize system. However maize equivalent yield (120.67 q/ha) and net return (Rs. 93807/ha/yr)was recorded significantly highest under maize-maize cropping system.

3.2.1.7 Sustainable and Resilient Farming System Intensification (SRFSI)

The overall aim of the project is to reduce poverty in the EGP by improving the productivity, profitability and sustainability of smallholder agriculture. Under this project during 2014-15, on station trial at BPSAC, Purnea, long term trial, zero tillage trial on maize and wheat at farmer's field were conducted. Zero tillage trial Zero tillage trial on Rice-wheat system were conducted on 15 farmer's field at 3 nodes (Tikapatti, PuraniGarel and Dogachhi) and rice – maize were conducted on 7 farmers field at 2 nodes (Dogachhi and Kathaili).The maximum grain yield (32.3 q/ha), effective tillers/m^2 and 1000-seed weight was recorded under ZT wheat as compare to conventional wheat. In ZT maize trial, The maximum grain yield (84.35 1/h), stalk yield, no. of cobs/plant and no. of rows/cob were recorded under conventional maize as compare to ZT maize.

3.2.1.8 Studies on the Agro Ecosystem Restoration in Rice- Wheat Cropping Sequence through Agronomic Management Practices in the Perspective of Climate Change

System Productivity and profitability was maximum under Direct Seeded Rice followed by Zero till Wheat. Methane and nitrous oxide are the key determining factor of GWP under rice and wheat system, respectively. DSR followed by zero till wheat system emitted less GHGs hence, resulted less GWP. Cumulative emission was also lowest under the same system. Green-house gas Index was also minimum under the same system. Management practices did not show any significant change in non-labile pools of carbon.

3.2.1.9 Precision Nitrogen Management for Improving Productivity and Nitrogen Use Efficiency of Rice-Wheat Cropping System

Maintenance of SPAD value 38 in rice and ≥42 in wheat through N application at 20 kg ha^{-1} in each top dressing is recommended to improve grain yield of rice-wheat cropping system under alluvial soil. The SPAD based real time N management was effective in saving of nitrogenous fertilizer up to 24% in rice and 27% in wheat without deteriorating the grain yield over conventional fixed time N management in the cropping system.

3.2.1.10 Modeling the Impact of Temporal Variability on Rice-wheat Production System and its Adaptation to Climate Change

Under four different dates of rice transplanting the grain yield was highest (5985 kg/ha) under 15th July transplanting. Among the varieties, highest yield (6486 kg/ha) was obtained with the variety RajendraMahsuri under 15th July transplanting. Among the different dates of sowing for wheat, 15th November sown crop recorded the highest yield (4617 kg/ha). Among the varieties HD 2967 recorded the highest yield (4923 kg/ha) under 15th November sowing. With 2°C increase in temperature during panicle initiation to anthesis stage in rice resulted in higher grain yield reduction for 30th June transplanting compared to 15th July transplanting. The impact of temperature rise during anthesis period of wheat was more for timely sown condition compared to late sown condition.

3.2.1.11 Predicting regional crop yields and predictor variables affecting yields using modeling approach for stochastic crop decision planning in Agro-climatic zone of IIIA and B Bihar

Yield forecast models have been developed for rice and wheat crops for nine districts *viz*. Bhagalpur, Banka, Jammui, Patna, Gaya, Rohtas, Nalanda, Jahanabad falling in agro-climatic zone IIIa and b of Bihar. The developed models have less MBE (below ±5%) and RMSE (below ±12%) and reasonably good R^2 (between 63 and 97%). The models were validated with ±10% error in all the nine districts of southern Bihar. Therefore, it could be used for yield forecasting satisfactorily for both crops and in all the nine districts of agro-climatic zone-IIIA and B. Further, by and large, the

maximum and minimum temperatures in combination with relative humidity have formed most important agro-meteorological indices, which can be useful in forecasting of yield of rice and wheat crop in these regions.

3.2.1.12 Collection, Characterization and Evaluation of Agro-forestry Species Suitable for Agro-climatic Zone III (A) of Bihar

Grain yield of soybean sown as intercrop under mahogany plantation was found highest. Conventional tillage showed better results than zero tillage. Finger millet exhibited superior yield over rice bean. Finger millet and rice bean produced higher yield under green semal forest. Total soil organic carbon content was found maximum in sahjan, jamun, eucalyptus, prosopis and karanj forest while minimum value was noted from semal, arjun, mahogany, neem and kadam forest. Soil carbon content was observed maximum in sahjan, jamun, eucalyptus, prosopis and karanj while minimum content was noted from semal, arjun, kanakchampa, kadam and mahua.

3.2.1.13 Development of Forage Based Cropping System for Quality Fodder Production in Agro Climatic Zone III (A) of Bihar

The results under evaluation of production potential and feasibility of different forage based cropping system round the year showed that multicut Sorghum– Berseem- Maize.+ Cowpea (T4) produced significantly higher green fodder yield (119.6 t/ha) over other treatments.Inclusion of perennial grasses with annual grasses provides continuous supply of green fodder round the year. Among the perennial grasses HybridNapier (Swetika) was found higher yielder and better adaptability in terms of growth and fodder yield. Sorghum + cowpea (22) followed by Sorghum + cowpea (21) (T8) produced significantly higher green fodder yield (53.6 t/ha) followed by Sorghum+ ricebean (52.2 t/ha) in 21.Maximum BC ratio (2.80) and LER (1.46) was recorded with Sorghum + cowpea (22).

3.2.1.14 Millet Agronomy

Survey, collection and evaluation of small millet varieties for rainfed area of South Bihar

Total eleven finger millet varieties were evaluated in RBD and 3 years pooled mean data resulted that the grain yield(q/ha) of GPU 67(20.96), RAU-8 (19.26)and GPU28 (19.0) were found at par but significantly superior over remaining varieties. Total Six Kodo millet varieties were evaluated in RBD and 3 years pooled data resulted that the grain yield (q/ha) of JK155 (16.78) JK439(16.27) and JK 65 (15.51) were found at par which were significantly superior over JK 13(14.94) and JK 41(14.21) and local (12.77). Different Sawa millet varieties were evaluated and 3 years pooled data resulted that the grain yield(q/ha) of RAU 3 (17.36), VL207 (16.57) and VL 172 (16.35) were found at par to each other but significantly superior over local (15.03).Total nine pearl millet varieties were evaluated for rainfed area of South Bihar in RBD design and pooled data resulted that Pusa Hybrid 1201 (30.67 q/ha) and Pusa Hybrid 1202 (28.77 q/ha) Proagro 9450 (34.15 q/ha) and Proagro 9444 (32.09 q/ha) were at pat but superior over others varieties.Evaluation of pearl millet varieties intercropped with pigeon for rainfed area of South Bihar Proagro 9444 and Proagro 9450 found suitable than other hybrids. Different small millets intercropped with pigeon pea 3 years pooled data resulted that maximum pigeon pea equivalent yield was recorded under finger millet + pigeon pea (31) 17.76 q/ha which was at par with Finger millet + Pigeon pea (41) 17.18 q/ha but both were best over remaining treatments which was 27.65 and 23.80 % higher than sole Pigeon pea crop.

Evaluation of finger millet short and medium duration, Foxtail millet and Proso millet varieties to different level of fertility

The yield (q/ha) of medium duration finger millet varieties to different levels of fertilizers were evaluated in FRBD design and 3 years pooled data resulted that GPU 67(21.79) was superior over RAU 8(18.78), GPU 28(19.16) and VL

149(16.98). And 100% RDF (19.71) found at par with 125%RDF (20.65) and both were superior over 75%RDF (17.24). The yield (q/ha) of Short duration finger millet varieties to different levels of fertilizers were evaluated in FRBD desing and resulted that GPU 45 (18.46) was superior over VL 352(16.92), VR 708(16.49), and RAU-3 (15.10). And 100 % RDF (16.98) found at par with 125% RDF(17.76) and both were superior over 75% RDF(15.49).The yield (q/ha) of Foxtail millet varieties to different levels of fertilizers were evaluated and resulted that SIA 3085 (13.54) was superior over SIA 326 (12.55), PS 4 (11.65) and Local (10.62). And 100% RDF (12.24) found at par with 125%RDF (12.84) and both were superior over75% RDF(11.19). The yield (q/ha) of Proso millet varieties to different levels of fertilizers were evaluated and resulted that TNAU 151 (12.07) was superior over TNAU 145 (11.54), GPUP 21 (10.78) and Local (9.77). And 100% RDF (11.18) found atpar with 125%RDF (11.72) and both were superior over75% RDF (10.22). Total fifteen AVT finger millet varieties were evaluated in RBD and resulted that the grain yield (q/ha) of AVT 4 and AVT 5 produced significantly higher yield (22.8 and 21.86 q/ha) over remaining varieties. Total eleven AVT (E&M) finger millet varieties were evaluated in RBD and resulted that the grain yield (q/ha) of AVT(E&M)2 (22.88) found at par to AVT(E&M) 5 (22.19), AVT (E&M) 6 (22.01) and AVT (E&M) 4 (21.39) but significantly superior over remaining varieties during year 2015.

3.2.1.15 Diversification and Intensification of Rice-wheat Cropping System for Higher Productivity and Profitability

Onion-Onion-Bottle gourd (T_6) recorded significantly higher rice equivalent yield (369 q/ha) over all the crop sequences, which is 229% higher over existing rice-wheat cropping (112.2q/ha). The same, Onion-Onion-Bottle gourd (T_6) recorded highest system productivity (101.1kg/ha/day) followed by okra-cabbage-bottle gourd (80.6kg/ha/day).Maize-potato-onion reported highest number of weed population (636 m^{-2}) followed by onion –onion –bottle gourd (599 m^{-2}).*Cyperusrotundus* reported as major weed in all three seasons followed by *Coronopusdidymus* in *rabi* and *Eclipta, Phyllanthus* and *Amaranthus* in summer season.Significantly higher organic carbon, available nitrogen, phosphorus and potassium reported in okra-tomato-cowpea crop sequences, followed by okra-brinjal-cowpea and onion-onion-bottlegourd.

3.2.1.16 Collection and Evaluation of Suitable Cluster bean Verities for Koshi Region of Bihar

Cluster bean variety (RGC-1033) produced significantly higher grain yield and also fetched significantly higher net returns and BC ratio. In terms of total biomass yield BG-I proved significantly better followed by BG-2. The lower days to maturity was taken by Gujarat Gaur-2.The house agreed with the findings. Sowing dates of a crop should also looked after in this region.

3.2.1.17 Gramin Krishi Mausam Sewa Project

Weather forecast and Agro advisory is given on every Tuesday and Friday for 17 districts of zone III A and zone III B of Bihar. Weather forecast by SMS on mobile of 5,32,600 farmers in 17 districts of Bihar is given regularly till date more than 1,59,99,360farmers of Bihar has been benefited. E -agromet has been started to prepare agro advisories. Every day, daily weather data and weather forecast is given to the newspapers like Dainikjagran, Prabhatkhabar, Hindustan, Nayibaat, Rashtiya Sahara and DainikBhashkar. Weekly weather forecast is given in HAPPENING of BAU in every week for all zones of Bihar. Fortnightly weather forecast is given in BAU EK NAJAR in Hindi every fortnight for all zones of Bihar. Agromet Advisories has been prepared considering the sensitivity of the crops to the present as well as forecast weather. Agro advisory bulletin is sent to all KVK's, NGO's, ATMA, Annadata programme for farmers through ETV, office of District agricultural officer,

all newspapers published in the area, All India radio, though e mail. It is also sent to the kisan helpline, technical cell, VC cell and Director Extension in BAU, Sabour. It is uploaded to the web site www.bausabour.ac.in of BAU, Sabour and Indian meteorological department www.imdagrimet.gov.in.

3.2.1.18 AICRP-Wheat, Sabour

Performance of new wheat genotypes at different nitrogen levels under rain fed conditions.

Five wheat genotypes (K8027, C306, K1317, HD3171 and HD2888) were evaluated under three different levels of Nitrogen i.e., 40 kg N ha^{-1}, 60kg N ha^{-1} and 80 kg N ha^{-1} and it was observed that the yield obtained under 80 kg N ha^{-1} (28.31q ha^{-1}) and 60 kg N ha^{-1} (28.52 q ha^{-1}) were statistically at par. Among the four wheat genotypes under test the Wheat genotype HD2888 produced maximum grain yield (28.73qha^{-1}) being at par with the grain yield obtained from wheat genotypes K8027 (27.90 q ha^{-1}) and K1317 (27.1q ha^{-1}) and intern were significantly superior to the grain yield recorded under in other two wheat genotypes.

To evaluate the performance of WB Bio fortified) wheat genotypes at different Dates of sowing (Timely & Late)

Seven Bio fortified wheat genotypes were assessed for their performance under timely (23.11.15) and late sown (15.12.15) irrigated condition. Timely sown Bio fortified wheat genotypes significantly performed by recording mean grain yield of 45.38 q ha^{-1} to the mean grain yield obtained under late sown conditions (41.01qha^{-1}).New Bio fortified wheat variety HPBW102recorded highest mean grain yield (46.7 q ha^{-1}) and was statistically at par with the mean grain yield recorded from wheat genotype HPB01 (43.7) intern were significantly superior to mean grain yield obtained under rest of the wheat genotypes under test. However, the lowest mean grain yield of 40.51qha^{-1}was recorded from the wheat genotype GW322.

Performance of wheat genotypes at different nitrogen levels under late sown irrigated conditions

Four late sown wheat genotypes(BRW967, BRW 934, HI1563 and HD2985) were evaluated for their performance under three different levels of nitrogen i.e., 80 kg N ha^{-1},100 kg N ha^{-1} and 120 kg N ha^{-1} and was observaed that the yield significantly increased with increasing levels of Nitrogen up to 120 kg N ha^{-1} (39.09 q ha^{-1}) which was significantly superior to the mean grain yield recorded under 100 kg N ha^{-1} (37.25 q ha^{-1}) and 80 kg N ha^{-1} (32.89 q ha^{-1}). Among the wheat genotypes under test the genotype BRW 967 produced maximum mean grain yield (38.4 q ha^{-1}) being statistically at par with the grain yield obtained from the genotype BRW934 (37.7q ha^{-1}) and intern were significantly superior to the rest of genotypes under test.

Precision nutrient management in wheat

Experiment was conducted with different nutrient management practices i.e. current recommendation (150:60:40 kg N:P_2O_5:K_2O ha^{-1}) with top dressing after irrigation, Current recommendation with top dressing before irrigation, SSNM based on Nutrient Expert and SSNM based on nutrient expert (full P K and 70% N) + remaining N as guided by Green Seeker, and nutrient enriched conditions were tested under different tillage options i.e., zero tillage and conventional tillage and observed that different tillage did not differ significantly among themselves in recording mean grain yield of wheat. However, conventional tillage recorded non-significantly higher mean grain yield (44.56 q ha^{-1}) than that of the zero-tillage (44.01q^{-1}).Among the different nutrient management practices, SSNM based on nutrient expert (full P K and 70% N) + remaining N as guided by Green Seeker recorded higher mean grain of 49.44 q $ha^{-1}$and was statistically at par with the mean grain yield of SSNM based on Nutrient Expert (45.41q ha^{-1}) and intern were significantly superior to the mean grain yield obtained under rest of the nutrient management practices.

Management of lodging and yield maximization using nutrient expert (SPL-2)

Wheat variety HD2967 recommended for timely sown irrigated conditions of this zone was assessed for lodging and yield maximization using nutrient expert and two spraying of Chlormequat (Lihosin) @ 0.2% of commercial product at first node stage (45DAS) & at flag leaf stage (80DAS) along with two sp ray of combination of Chlormequat (Lihosin) @ 0.2% and Tebuconazole(Folicur-430SC) at node and flag leaf stage, recommended dose of fertilizer and NE targeted yield of 6t/ha and 7t/ha. The result revealed that the maximum mean grain yield(47.6qha^{-1}) was recorded from the plots where NE targeted yield7tha^{-1}(140 kg N ha^{-1}: 68 kg P_2O_5 ha^{-1}: 101kg K_2O ha^{-1}) and two spray of Chlormequat chloride @ 0.2% and Tebuconazole (Folicur) was applied at first node stage(45DAS) and at flag leaf stage (80DAS) was applied and intern was statistically at par with mean grain yield(46.3qha^{-1}) obtained from the plots where NE targeted yield 6t ha^{-1}(120kg N ha^{-1}:63kgP_2O_5:82kg K_2O ha^{-1}) and two spray of Chlormequat chloride @0.2% and Tebuconazole (Folicur) was applied at first node stage (45DAS) and at flag leaf stage (80DAS) and were significantly superior to the mean grain yield recorded from the rest of the treatments. It was further observed that the plants of Chlormequat treated plots were comparatively shorter in height.

3.2.1.19 AICRP-Wheat, BRU, Dhangain

Timely sown irrigated: Entry NE-IR-102 produced significantly higher grain mean yield (46.25 q ha^{-1}) over rest of the entries except NE-IR-105 (45.10 q ha^{-1})

Multilocational varietal trial on wheat

Late sown irrigated condition: Significant higher grain mean yield (45.68 q ha^{-1}) was obtained from variety BRW 967 and it was at par with BRW 3777(41.98 q ha^{-1}) and best Check BRW 934 (40.43 q ha^{-1}).

State level of wheat varieties timely sown irrigated condition

Significant higher grain mean yield (36.94 q ha^{-1}) was obtained by the variety BRW 3708 and was at pat with HD 1939 (33.88 q ha^{-1}), NW 5054 (33.61 q ha^{-1}) and PBW 343 (32.50 q ha^{-1}).

Late sown irrigated condition

Significant higher grain mean yield (39 q ha^{-1}) produced by DBW 107 & it was par with BRW 934 (38 q ha^{-1}) HD 2985 (37.53 q ha^{-1}) Baz (36.33 q ha^{-1}), NW 2036 (36 q ha^{-1}), WR 544 (35.66 q ha^{-1}), NW 1014 (35.33 q ha^{-1}), DBW14 (35.16 q ha^{-1}) & HI 1563 (33.66 q ha^{-1})

3.2.1.20 Maize Agronomy

Evaluation of multi-location trials on fertility levels under high plant density on rabi maize productivity in Bihar

Based on multi-location results, it was concluded that significantly highest grain yield (122.04 q ha^{-1}) obtained with cultivar DKC 9155 (isobilateral leaf) remained at par with DKC 9135 (119.37 q ha^{-1}). Highest fertility level of F_3 (180:112.50:75) produced significantly higher yield (120.26 q ha^{-1}) over lower levels of fertility. The plant geometry at 50 x 20 cm produced significantly higher yield (114.71 q ha^{-1}) but remained at par with when planted at 40 x 20 cm (112.93 q ha^{-1}) spacing. Significantly highest net return (Rs 126119/ha) and B: C ratio (2.94) were obtained with cultivar DKC 9155 (isobilateral leaf) at par to DKC 9135 and both were superior over and DHM 117 cultivar. Fertility level F_3 (180:112.50:75) produced significantly higher net return (Rs 123534/ha) and B: C ratio (2.75) over lower levels of fertility. The plant geometry at 50X20 cm produced significantly higher net return (Rs 117804/ha) and B: C ratio (2.75) and remained at par to net return (Rs 115265/ha) to 40 X 20 cm plant spacing. Highest N, P and K uptake kg/ha were noticed with cultivar DKC 9155 which remained at par with DKC 9135. Fertility level of F_3(180:112.50:75)

recorded significantly higher N, P and K uptake kg/ha but at par to F_2 (150:93.75:62.5) fertility. The plant geometry at 50 x 20 cm removed significantly higher N, P and K uptake kg ha^{-1} but remained at par with 40 x 20 cm spacing.

3.2.1.21 AICRIP on Linseed

Varietal trial on linseed (IVT-I): Entry 150210 produced significant higher grain mean yield (20 q ha^{-1}) and at par with entry 150201 (18.51 q ha^{-1}) and 150214 (17.77 q ha^{-1}).

Initial varietal trial-utera) (IVT-U): Significant higher grain mean yield (9.67 q ha^{-1}) was obtained from entry 150304 and it was at par with 150302 (9.00 q ha^{-1}) and 15030 (8.84 q ha^{-1}).

State varietal trial on linseed - SVT-I

Significant higher grain mean yield 23.25 q ha^{-1} was obtain from the entry BRLS 102 (15402) over best check Shekher 15407 (18.17 q ha^{-1}) and at par with BRLS 101 (15401) 21.42 q ha^{-1}

Comparative assessment of the effect of weather parameters on linseed crop production in response to climate change scenario

The highest yield (1465 kg ha^{-1})and its parameters like capsules per plant and seeds per capsule were found for the genotype BRLS-101, when sown in first date of sowing (25th November, 2015), which was found significantly superior to other varieties and later dates of sowings. The interaction effect showed significantly highest seed yield (1954 kg ha^{-1}) by the genotype, BRLS-101, when sown in first date of sowing, which was significantly superior to other varieties and later dates of sowings. Among the varieties, the highest grain yield (1574 kg ha^{-1}) was recorded by Shubhra, when sown in first date of sowing followed by Shekhar (1463 kg ha^{-1}).

Impact of hydrogel in increasing productivity of linseed

Hydrogel could not increase the yield of linseed significantly, compared to the control treatment. However, seed yield of 1525 kg ha^{-1}, recorded with hydrogel @ 2.5 kg ha^{-1} differed significantly with hydrogel @ 1.25 kg ha^{-1}, yielding 1376 kg ha^{-1}.There was no significant difference in grain yield was observed between the carriers.The interaction effect of hydrogel and carrier also revealed no significant difference in grain yield of linseed.

Evaluation of nitrogen response of promising genotypes of linseed (BRLS-101 and BRLS-102)

The genotypes BRLS-101 and BRLS-102 are highly responsive to N levels with an optimum yield levels at 99.8 and 101.4 kg N ha^{-1}, compared to Shubhra (90.8 kg N ha^{-1}) and T-397 (88.4 kg N ha^{-1}).With the optimum N levels for the genotypes and varieties, the optimum yields of 1766, 1772, 1374 and 1132 kg ha^{-1} was obtained with BRLS-101, BRLS-102, Shubhra and T-397 respectively.

Yield maximization of linseed through improved agro-techniques

With improved agro-techniques, the varieties Shubhra and Ruchi registered seed yields of 1406 and 1321 kg ha^{-1}, with net returns of Rs. 33205 and Rs. 29635 ha^{-1} respectively under Sabour condition.

3.2.1.22 Mustard State Varietal Trails

MSVT-I (multilocational state varietal trials : New Set (1st year) - Significant higher grain mean yield 15.37 q ha^{-1} was obtained from the entry MSVT 15-4 over all entries except MSVT 15-12 (14.05 q ha^{-1})

Indian mustar irrigated: Continued trial (2nd year): Entry No. MSVT 15-14 gave significantly higher grain mean yield (24.39 q ha^{-1}) over rest of the entries except MSVT 15-17 (21.83 q ha^{-1})

Indian mustard irrigated:

(MSVT-I) 3rd year - Entry No. MSVT 15-21 produced significantly higher grain mean yield (18.52 q ha^{-1}) over rest of the entries but at par with MSVT 15-24 (16.87 q ha^{-1}) and MSVT 15-23 (16.37 q ha^{-1}).

3.2.1.23 Evaluation Of Chickpea Varieties

Significant higher gain mean yield (23.52 q ha^{-1}) was obtained from variety DCP 92-3 and it was at par with JCP 105 (22.59 q ha^{-1}), BG 372 (21.85 q ha^{-1}), Samrat (21.30 q ha^{-1}), C235 x BGM 402 (20.74 q ha^{-1}) & KWR 108 x Annagiri (20.19 q ha^{-1})

3.2.1.24 Evaluation of Lentil Varieties

Variety SBL – 2 produced significant higher grain mean yield (20.95 q ha^{-1}) over rest of the varieties but it was at par with IPL 406 (20.47 q ha^{-1}) and NDL-1 (19.52 q ha^{-1}).

3.2.1.25 State Level Testing of Summer Mungbean

Varity IPM 2-14 gave significant higher grain mean yield (20.00 Q/ha) over rest the varieties but at par with IPM 205-7 (18.44 q ha^{-1}) and Pusa Vishal (18.06 q ha^{-1}).

3.2.1.26 Mitigation of High Temperature Stress in Late Sown Wheat through Exogenous Application of Synthetic Compounds

Pooled data of 3 years (2013-14 2014-15 & 2015-16) revealed that foliar spray of KNO_3 @ 0.5% both at booting and anthesis stage significantly increased the grain yield of late sown wheat (32.18 qha^{-1}) as compared to no foliar spray (28.38 qha^{-1}) and was found to be statistically at par with the treatments where the foliar spray of KNO_3 (@ 1%) was done only at anthesis stage (31.70 qha^{-1}) and the foliar spray of $Cacl_2$ (@ 0.1%) was done at both booting and anthesis stage (32.05 qha^{-1}) and a single foliar spray of $CaCl_2$ (@ 0.2%) was done at anthesis (31.73 qha^{-1}). These in turn significantly superior from other treatments of foliar spray.The extent of increment of yield was found to be around 10-11% on average as a result of foliar spray of synthetic compounds (KNO_3& $CaCl_2$). The treatments recorded significantly higher yield also significantly reduced electrolytic leaf leakage and proline content in flag leaf both at anthesis and grain filling stage as well as maintained higher level of chlorophyll content. Thus these treatments significantly improved high temperature stress characteristics of late sown wheat.

3.2.1.27 Effect of Pre and Post Emergence Herbicides for Control of Smell Melon (*ghurmi*) {*cucumis Melo* Var. *Dudaim* (naud.)} in Summer Green Gram for *Koshi* Region of Bihar

Treatment (T_8) Pendimethalin (PE) 1.5 litre a. i./ha + Imazethapyr (POE) 60g a. i./ha. was gave significantly higher grain yield, weed control efficiency and weed index over all the treatments except Treatment (T_7) Pendimethalin (PE) 1.5 litre a. i./ha + Imazethapyr (POE) 40g a. i./ha which was showing at par result with T_8.

3.2.1.28 Evaluation of Suitable Varieties And Management Practices Regarding Non-grain-Setting In Wheat for *Koshi* Region of Bihar

In case of timely sown varieties; Sabour Samridhi was significantly superior over all the varieties in all the locations of Koshi zone-II. In case of late sown varieties; Sabour Shrestha was significantly superior over all the varieties in all the locations of Koshi zone-II.In case of management practices; M_4 [RDF (NPK) + foliar spray of boron @ 0.025% + Zn @ 0.1% at pre flowering stage] gave the higher yield for timely & late sown varieties in all the locations.

3.2.2 Soil Science and Agricultural Chemistry

3.2.2.1 Preparation of Microbial Culture Library of Bihar

Yield parameters, soil microbial and soil chemical status resulted superior by the combined application of 75% RDF (N) along with PSB, *Azospirillum*, BGA and KSB, justified the relevance of co inoculation along with supplementation of synthetic fertilizer with biofertilizers in rice and PSB, Azotobacter , ZnSB& KSB in wheat crop. Residual effect of BGA inoculation has well been reflected in succeeding wheat crop.The isolated rhizobia from zone IIIB proved compatible after inoculation in vegetable pea, gram and lentil under pot experimentation. Rhizobia, inoculated with rice straw mulching proved best but the isolates from horse gram &berseem did not show the compatibility.Wide microbial variation has been observed in soils, collected from Maranchi village, Tal, Mokama. Introduction of Zn solubilizer in conjunction with nano clay polymer composite (NCPC)Zn induced an enhanced effect on microbial density, enzyme activity , yield parameters and also on available Zn content enhancement under rice rhizosphere under 1st

dissertation M.Sc (Ag) research work.Combined inoculation of two KSB produced an enhanced effect on bio-availalable K-content from waste mica in maize rhizosphere and boosted this nutrient content in leaf, grain & stone as well as resulted higher biomass yield under 2nd dissertation M.Sc (Ag) research work.Seven novel phosphate solubilizers have been isolated and sent for 16s rDNA sequencing and their efficiency tested under normal and stressed condition in doctoral research programme and finally, their effect will be studied under rice rhizosphere in relation to phosphorus dynamics.

3.2.2.2 Extent, Distribution and Mitigation of Arsenic and Fluoride Contamination in Bhagalpur District, Bihar

Revalidation of results obtained under pot experiment has completed at villages of Nathnagar and Pirpainty Blocks with rice test crop where Arsenic in water found more than permissible limit. Results of revalidation experiment confirm the pot experiment results. GPS based survey and collection of water, soil and plant samples from villages of Bhagalpur district has completed. Arsenic content in water of some villages of Kahalgon, Nathnagar, Sultangaj and Pipainty block were found more than permissible limit. Result of second year pot experiment on Arsenic mitigation options were confirmed the first year results that FYM application in arsenic contaminated soil restrict uptake of Arsenic and also crop yield. Fluoride content of water sample were found maximum and more than permissible limit in kolkhurd village of Jagdishpur block and also detected in some villages of Shahkund and Nathnagar blocks.

3.2.2.3 National Project on Management of Soil health and Fertility (NPMSHF)

About 70% Sample collection work of Bhagalpur district were completed Soil samples of Rangra, Gopalpur, Nawgachia, Sabour, Jagdishpur, Nathnagar, Shahkund, Sultanganj,Goradih, Kharik, Bihpur and Narayanpur, were analyzed and found soil reaction varied from slightly acidic to alkaline, about 60% of soils are low in organic carbon status, about 90% low in available Nitrogen content, about 45% low in available Phosphate and about 30% low in available Potash DTPA- Fe, Mn, and Cu content of soils were found sufficient but some of soils were found low in Zinc content. Available Boron content of soil samples of Kharik, Bihpur and Narayanpur block were analyzed and found 42% low, 36.% medium and 22% high whereas, Available Sulphur content were found 14% low, 09% medium and 77% high.

3.2.2.4 Changes in Dynamics of Soil Carbon Under Conservation Tillage in Rice and Maize Based Cropping System Rice Based Cropping System

Organic carbon (0.57%), water holding capacity (60%), mean weight diameter (2.52 mm) and GMD (1.19 mm) was found maximum in zero tillage system followed by permanent bed.Conventional tillage having maximum value DR and ER were prone to erosion.Rice- lentil system recorded maximum organic carbon (0.58%), and mean weight diameter (2.43 mm).The retention of crop residue results in increased soil enzymatic activity. The trend for enzymatic activity was in the order of ZT > PB > CT.Mycorrhiza fungi infection was higher in PB than ZT and CT systems.

3.2.2.5 Maize Based Cropping System

Maximum Organic carbon (0.58%), WHC (59%) and MWD (2.12mm) were recorded in ZT system, whereas EC (0.31ds/m) were recorded maximum in permanent bed. Higher value of DR and ER in CT showing the tendency of erosion.Micro-flora density was found to be highest under ZT in rabi season while it was at its best in PB during kharif season. The soil enzymatic activity followed the same trend similar to that of rice based cropping system under different tillage. The trend for enzymatic activity was in the order of PB > ZT >CT.Mycorrhiza fungi infection was also higher in case of PB than followed by ZT and CT systems. Mycorrhiza fungi infection was higher in case of Maize – maize cropping system.

3.2.2.6 Mapping of Fertility Status of Agricultural Farms of Different Colleges of the University

The mapping of the fertility status of the farms of MBAC, Agwanpur, RRS, Agwanpur, RRS Sisai farm, Agwanpur, BRC,Islampur, CoH Noorsarai and BAC, Sabour has been completed. Data on boron has been taken and map of MBAC Agwanpur is completed.

3.2.2.7 Spectral Signature Capture of Problematic Soils for the Preparation of Spectral Database of Bihar through Hyper-Spectral Remote Sensing

Tal land

Maximum analyzed samples under *tal* land, soils are neutral in nature and available NPK status is low to medium. Tal land soil appears in bluish tone in False Coulour Composite image (NIR, Red and Green bands).Reflectance of *tal* soils is high in NIR and red band. based on interpretation of thermal imagery of land sat TM (band No.-6) under LST analysis signature of tal soils has been traced out .Generally, emitted energy from *tal* and *diara* land is high in thermal band (1040-1250mm) comparison to old alluvial soil (surrounding). Based on NDVI, visual interpretation of satellite images and field surveyed report, tree less ecology was traced out.

Red soils

Maximum analyzed samples under red soils environment are acidic in nature and available NPK status is low to medium. Red soil appears in green tone in FCC image (NIR, Red and Green bands).Reflectance of red soil is high in NIR and SWIR bands. Based on PCA image of SWIR, NIR and Red spectral bands, signature for red soil patches has been traced out. Results indicate that the layer stacked image of SWIR, NIR and Red bands, directly affect soil pH and available nitrogen under red soil environment. Soil acidity (Red soil patches) appeared green in layer stacked NIR, Red and Green bands (FCC image) however, the same patches were perceived red in RGB bands. They appeared cyan in PCA classified image. NDVI indicated the signature of tree species/vegetation adjoining of red soil patches. High brightness in images indicated low moisture content which was confirmed by NDWI. High range of pixel values (reflectance) in 0-255 of 8 bit was marked in Near Infra Red comparison to red and green bands. Thermal response of red soil patches was low comparison to clay soils in band no.6 of Landsat TM data. Clay soils appeared blue in layer stacked NIR, Red and Green bands. However, the same patches were perceived light magenta in RGB bands but appeared pink in PCA classified image and blue (distinct tone) in converted IHS to RGB image. NDVI indicated the tree less ecology. High brightness in images indicated very low moisture content. High range of pixel values (reflectance) in 0-255 of 8 bit was marked in green comparison to red and NIR. Thermal response of clay soils was high comparison to red soils in band no.6 of Landsat TM data. Sand spread over cultivated land appeared white in layer stacked NIR, Red and Green bands but appeared white in PCA classified image. NDVI indicated the tree less ecology. High brightness in images indicated the low moisture content. High range of pixel values (reflectance) in 0-255 of 8 bit was marked almost same in green, red and NIR bands. Thermal response of sand spread over cultivated land was high in band no.6 of Landsat TM data. Variation of tones in different bands governed by reflectance of targets that provided a clue for the signature capture of heavy clay soils, red soils, wet land and sand spread over cultivated land and their spectral data bases. He reported about some new observations such as conversion of Intensity, Hue and Saturation (IHS) to red, green and blue (RGB) under spectral enhancement technique provided a distinct tone (blue) for the signature capture of heavy clay soils. He said that PCA is highly useful for the signature capture of red soil patches but not suitable for the signature capture of clay soils. Both NDVI and NDWI, are the indices that were applied for signature capture of sand spread over cultivated land and provided satisfactory results. In

conclusion he said that application potential of his findings in terms of long term potential is specific location based soil surveying and mapping and immediate potential is that these research findings may be helpful for the signature capture of clay soils, black cotton soils, red soils and sand spread over cultivated land.

3.2.2.8 Studies on Soil Quality Index (SQI), Carbon Sequestration Potential and Organic Matter Dynamics Under Long Term Rice Based Diversified Cropping System

This project was planned to focus on three programmes namely i) Soil quality index as affected by continuous application of organic manure and mineral fertilizer under long term fertilizer experiment (28 years) of Bihar Agricultural University, Sabour. ii) Soil carbon sequestration potential of rice based diversified cropping system and iii) Soil organic matter fraction and pools of carbon under long term organic farming system. Under SQI, the physical, chemical and biological parameters under both rice and wheat have been worked out. Parameters like dehydrogenase, alkaline phosphatase and FDA are found to be the key drivers influencing the sustainability of rice yield; whereas the yield of wheat were found to be driven by glucosidase, FDA, CEC and K availability in soils. The soil quality ratings were higher in integrated fertilizer treatments, the lower SQI rating were associated with treatments receiving only inorganics suggesting the common fertilizer management practices may not be sustainable. The regression and PCA based SQI for NPK + FYM was found to be 0.789 and 0.728 respectively. The study on soil carbon sequestration potential of rice based diversified cropping system was aimed with the objectives (i) To evaluate the soil carbon balance under rice based diversified cropping system as influenced by management practices, (ii) To assess the structural control on soil carbon stabilization and (iii) To assess the potential of carbon sequestration in soil as influenced by management practices. Rice-wheat-mung bean contained highest aggregate associated carbon followed by Rice-Cabbage-Maize+ Mung bean, Rice-Potato-Onion+Maize and Rice-Maize+Potato-Cowpea. Rice-Wheat-Green gram attributed highest particulate organic matter (POM) content and also retained highest carbon within the aggregated. Reduction in tillage practices significantly increase carbon retention among all the cropping system. The study on soil organic matter fraction and pools of carbon under long term organic farming system was aimed (i) to investigate the changes in the different fractions of organic matter influenced by different management practices and (ii) to assess the various soil carbon pools. The results revealed that the effect of long-term organic amendments on some sensitive indicators of soil carbon pools. Organic manures addition increased the amount of labile carbon by 54.5-77.3 % as compared to chemical fertilizer applied alone in soil depth 0-10 cm. The amount of carbon pools decreased on increasing soil depth (0-10 cm> 10-20 cm> 20-30 cm). In the soil depth 0-10 cm, carbon management index values were 1.80-1.62 times more in organic manure added treatments as compared to chemical fertilizer applied alone. Sensitivity index of labile carbon for different treatments showed positive values, which indicates positive impact of the management practices on soil organic matter content and on the soil quality. The management practices are approaching towards natural ecosystem.

3.2.2.9 Composting and Enrichment of Agro-waste for Enhanced Nutrient Availability through Microbial Consortia

54 farmer's composting sites (prevailing practices) have been surveyed across 6 blocks namely Goradih, Sanhaula, Kahalgaon, Kharik, Naugachhia and Ranga in Bhagalpur and decomposed compost samples have been collected. Samples of maize stalk have also been collected from Rangra block. All the samples were analysed for their O.C., N, P. K, S and micronutrients like Cu, Mn, Fe, Zn by standard and recommended methods. Farmers of Rangra block

use maize stalk as bedding material for composting. Among all the blocks, compost samples of Rangra block showed lower C/N ratio (<26). Preparations of 6 composting pits have been completed in Kumadpur village of Rangra block. Chopped maize stem and other materials are being prepared for filling of composting pits.

3.2.2.10 Studies on Sporocarp Viability, Nutritional Management, Nitrogen Release from *Azolla* and Development of *Azolla* Based INMS Module for Higher Storability of *Kharif* Onion.

Sporocarp formed only in those *Azolla* plants having well developed cushion like root system. Delayed and poor Sporocarp formation observed during 2016. Sporocarp in *Azolla pinnata* did not formed during 2016, probably due to high maximum temperature during winter. Among different techniques of sporocarp storage, incubation of sporocarp bearing bimass in fertile soil and its storage under refrigerated conditions was found to be the best to maintain viability of sporocarps. *Azolla microphylla* was found to be superior than*Azolla pinnata* for sexual propagation point of view. *Azolla* can successfully be propagated from sporocarp even after 1-2 month of its storage. Submergence of soil for thee weeks increases availability of N and this increase became more pronounced if *Azolla* is cultivated in the same field. About 75% of nitrogen present in *Azolla* becomes available within 90 days of its incorporation in soil.Phosphorus nutrition was found to be beneficial to increase biomass production and NDVI value of *Azolla*. Mulching of *Azolla* @ 0.56 Kg/m^2 twice (35 and 70 DAT) increased yield and storability of kharif onion significantly over recommended package and practices and potassium was found to be novel element to increase storability of onion.

3.2.2.11 Evaluation of Arbuscular Mycorrhizal (am) Fungi on Phosphorous Dynamics And Microbial Activity in Rhizospheric Soil Under Maize Crop.

The maximum solubilisation of phosphorus of fixed P (Al/Fe and Ca-P) found with theapplication of *Glomus mossae*. The maximum phosphorous uptake (18.60 kg ha^{-1} and 17.00 kg ha^{-1}) were recorded in both the years (2014-15 and 2015-16) under the application of treatment T_2(G. mosseae + 75% P + 100% NK). The co-inoculation of G. mosseae along 75% P + PSB and ZSB significantly increased the zinc content in grain and similarly the application of this treatment significantly increased the zinc and phosphorous uptake by plant and grain when compared with control treatment.

3.2.2.12 Bioremediation of Arsenic from Contaminated Soils and Water of Bihar

Two bacterial isolates (As 17 &As 14) were isolated from arsenic contaminated soil of Bihar (Jagdishpur). The 16s rDNA sequencing of As 17 &As 14 showed sequence similarity with *Pseudomonas plecoglossicida* and *Lysinibacillus boronitolerans,* respectively. The sequences were submitted to NCBI and GenBank accession numbers were obtained. The pot experiment using added dose of arsenic (0, 5, 10, 15 and 20 ppm) were performed. A control set without added dose of arsenic was also kept. The rice seedling (Sahbhagi) were inoculated with As17 or As14 or FYM or As17 + FYM and transplanted in pot containing added dose of arsenic. Severe phytotoxic symptoms were observed in control set of experiment treated with 10, 15 and 20 ppb of arsenic. However, significantly less phyotoxix symptoms were observed in treatments (As17 or As17 + FYM). Straw and grain yield were significantly higher in treatment As17 or As17 + FYM compared with control set in all the added doses of arsenic.Arsenic content in seed and straw were significantly lower in treatment As17 or As17 + FYM compared with control set in all the added doses of arsenic.

3.2.3 Horticulture (Fruit and Fruit Technology)

3.2.3.1 All India Coordinated Research Project on Fruits

Mango

• In "Pruning for rejuvenation of overcrowded orchards"experiment, among the different

treatments, maximum fruit yield (8.31 t/ha)was obtained in heading back up to the crowded branchlet and centre opening with the application of paclobutrazol(3.5 ml/m^2.) during off season of fruiting . However, the highest average fruit weight (307.00 g) was recorded in treatment of heading back up to secondary branchlet without application of Paclobutrazol.

• In the experiment entitled "Fertigation scheduling for quality fruit production of mango", among the different treatments, highest fruit yield (75.00 kg/plant) was recorded in 75% of recommended dose of fertilizers (1000:500:1000 of N:P_2O_5:K_2O per tree) through drip irrigation at different stages (after harvest, during flowering and at marble stage) due to higher fertilizer use efficiency than the conventional method.

• In the experiment of "Development of organic package of practice for mango", among the different treatment combination, maximum fruit weight (227.07 g) and fruit yield (7.51 t/ha) noticed in treatment T_5- Vermi compost @ 50 kg/tree + Azospirillium culture + PSB @ 250 g/tree. In the experiment entitled "Effect of micronutrients on yield and quality of mango", The maximum fruit yield (5.69 t/ha), fruit length (9.17 cm) and fruit width (6.91cm), pulp: stone ratio (7.42) and TSS (20.37 ºBrix) were recorded in treatment T6- RDF + 100 g Zinc sulphate + 50 g Copper sulphate + 50 g Borax (soil application) in basin after harvest + Foliar spray of 0.2 % Zinc sulphate + 0.1% Boric acid (2 sprays at just before flowering and marble stage).

Litchi

The results of experiment on "Evaluation of PGR and promising chemicals for early flowering in litchi" revealed that the foliar spray of Ethrel @ 400 ppm causes 5.00 days advancement of flowering (anthesis) as compared to control. However,

• the treatment K_2HPO_4 (1%) + KNO_3 (1%) gave maximum fruits/panicle (21.67) with highest fruit weight (21.54 g), yield (93.33 kg/tree) and TSS (21.54 °B).

• the treatment K_2HPO_4 (1%) + KNO_3 (1%) gave maximum fruits/panicle (21.67) with highest fruit weight (21.54 g), yield (93.33 kg/tree) and TSS (21.54 °B).

• In the experiment entitled "Evaluation of substrate dynamics for IPNM in litchi", highest yield (74.33 kg/plant) was recorded with treatment T_7 - ½ RDF + 50Kg FYM+ Azotobactor (250 g) followed by T_8 - ½ RDF + 50Kg FYM+ Vermi-Compost (69.00 kg/plant). The maximum fruit and pulp weight (22.93g and 15.79 g, respectively) and TSS (20.70 °B) was recorded in T_7 - ½ RDF + 50Kg FYM+ Azotobactor (250 g).

Guava

• In the experiment of "Ultra high density planting for higher productivity in guava", plants have been planted at a spacing of 1 × 1 m, 1.5 × 1.5 m, 2 × 1 m and 2 × 1.5 m in a plot size of 6 × 6 m, with an objective to get higher yield per unit area. Among all the treatments, maximum number of fruit/plant was obtained from plants at 1.5 × 1.5 m spacing (T_2).

• The results of the experiment entitled "Evaluation of substrate dynamics for IPNM in guava" revealed that the cv. Allahabad Safeda had maximum plant height (4 m) under the treatment T_5 (250:100:250 g NPK + 5 kg FYM enriched with Trichoderma). However maximum no. of fruits per plant (43.0) was found in T_6 (250:100:250 g NPK + 5 kg FYM enriched with Azospirillum) with maximum TSS in T_5(250:100:250 g NPK + 5 kg FYM enriched with Trichoderma).

• Under the experiment of "Development of organic package and practice for guava"maximum plant height (3.80 m) was noted in plants of treatment T_2(FYM @ 30 kg/tree + Azospirillum culture + PSB @ 250 g/tree). However, maximum no. of fruits per plat (36.0) and fruit weight (163.22) was in found in T_7 (Vermi compost @ 30 kg/tree + Azotobacter + PSB @ 50 g/tree + vermiwash), respectively while maximum TSS (11.80 °B) in T_6 (Vermi compost @ 30 kg/tree + Azospirillium culture @250 g/tree + PSB @ 250 g/tree + vermiwash).

• In the experiment of "Input use efficiency in HDP in guava"planting was done as per technical programme during the month of July, 2016 and growth of these plants is found satisfactory till date.

3.2.3.2 All India Coordinated Research Project on Palms (Coconut)

• The results of the experiment entitled "Studies on fertilizer application through micro irrigation technique in coconut" revealed that fertigation levels significantly affected the growth parameters of palms. Maximum plant height (435 cm) was noted in T5 (100% RDF fertigation) followed by T4 (75% RDF through fertigation) and T6 (100% RDF through soil application) with plant height of 392.20 cm, and 356 cm respectively. However, it was recorded minimum (238 cm was)in T1(No fertilizer application). Similar trend was also noted regarding number of functional leaves produced per plant with maximum in T5 (100% RDF fertigation) and minimum in T1 (No fertilizer application) treatment. The number of plants under flowering was also recorded maximum under T5 treatment.

• Under the experiment of "Development of coconut based integrated cropping system models for different agro climatic regions", Coconut+ banana + guava +turmeric + Cow pea + pea cropping system was adopted in this region. Treatment wise biomass production and yield of different inter crops were estimated. It was recorded that there was highest biomass production in 75% RDF + 25% organic or green manure followed by 50% RDF of inorganic fertilizer + 50% organic and green manure and minimum biomass production was recorded in 100% organic management. As a far yield is concerned maximum yield was recorded with 50% RDF of inorganic fertilizer + 50 % organic and green manure Better soil microclimate and moisture availability under organic management might have improved the plant growth in later period of flowering and fruiting resulting in better yield under this treatment. The number of plants under flowering was maximum in T2 treatment (50% RDF of inorganic fertilizer + 50 % organic and green manure).

3.2.3.3Non-Plan Projects

To standardize improved production technology, plant perpetuation and disease management in strawberry in subtropical climate of Bihar.

• Among the mulches, maximum root zone temperature at different soil depth was noted in transparent mulch followed by black plastic mulch and the minimum temperature was recorded in plants with no mulch. Maximum plant height of 21 cm was noted in transparent mulch but the highest yield per plant of 321 g was noted with black plastic mulch.

• Altogether 11 varieties of strawberry (Douglas, Sweet Charlie, Chandler, Fortuna, Winter Dawn, Festival, Missionary, Camarosa, Senga Sengana etc.) were tested during this year. Among them, var. Sweet Charlie, Fortuna, Festival and Chandler had the yield of 289.2 g, 270.62 g, 265.8 g and 268.56 g per plant, respectively. The highest TSS of 10.9ºBrix was recorded in var. Fortuna and it was 10.45ºBrix in var. Sweet Charlie.

Effect of pre harvest treatments on postharvest life of strawberry fruits.

Among the different treatments, preharvest spray of salicylic acid (1 mM) was found superior by in reducing disease incidence (9.85%) and weight loss (14.27%) of fruit compared to control, during storage at 2°C up to 15 days.Fruits sprayed with 1 mM salicylic acid (SA) maintained highest anthocyanins (27.17 mg/100g), total phenolics (2.074 µg GAE/g) and total antioxidant capacity (20.73 µmol TE/g) than control and other treatments. TSS content did not differ among the treated and control fruits while salicylic acid treated fruits maintained higher acidity than control after 15 days of storage.

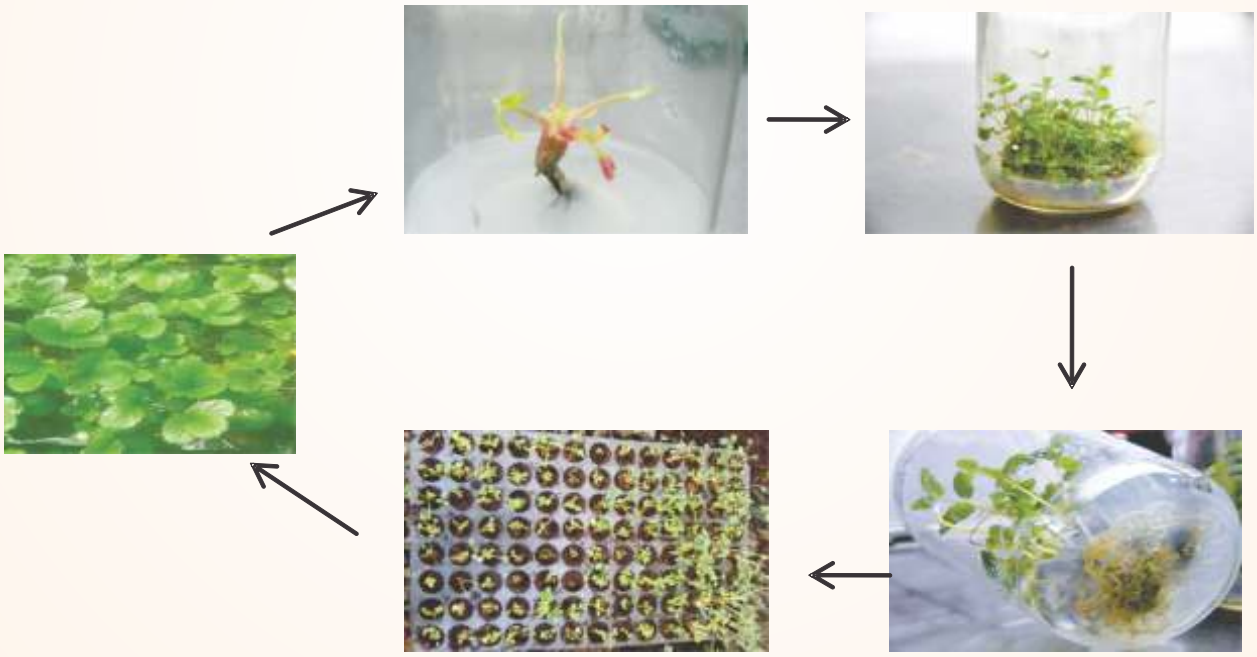
Molecular characterization of litchi [*Litchi chinesis* Sonn.] genotypes using RAPD and SSR markers.

Simple and efficient method for extraction of genomic DNA from litchi was standardized.

Eleven SSR markers studied reflected low polymorphism but effective variation. Among 35 primers studied eleven RAPD resulted amplification of 68 polymorphic fragment products. Percentage of polymorphism for RAPD were observed 76.47%. Two major clad were observed in dendrogram derived from UPGMA cluster analysis. Genotypes Ojhouli and Sabour Madhu appeared to be genetically very similar. Genotypes Kasba and Dehrarose were found to be genetically distant. PCA reflected very narrow genetic diversity among all litchi genotypes.

Development of micropropagation protocol for mass multiplication of strawberry.

An efficient and effective regeneration protocol for strawberry cv. Chandler was developed. Almost no phenolic exudation (+) and maximum percent regeneration was found, when MS medium was supplemented with ascorbic acid 200mg/l. BAP 2.0 mg l^{-1}+IAA 0.5 mg l^{-1} was found most effective with regard to number of days (12.3) required for shoot induction and length of shoots (7.8 cm) where as maximum number of shoots was achieved with BAP 3.0 mg l^{-1} +IAA 0.5 mg l^{-1}. Half strength MS media with IBA 1.5 mg l^{-1} was found significantly higher over all other auxin treatments for various rooting parameters. Plantlets obtained through *in vitro* propagation exhibited 50-70 percent survival during acclimatization in different potting mixtures. This protocol has a potential for allowing a large scale multiplication of this important and new crop in Bihar.



Development of micropropagation protocol in strawberry

Preliminary study on the physiological disorders of fruits grown in Bihar

Survey in Patna region for physiological disorders in fruits reveals that potassium deficiency is prominently seen in the mango varieties in the region. The correction measures adopted for this purpose.

Light annual pruning and chemical treatment for improving fruit yield and quality of mango

The experiment revealed that the 25 % pruning along with 3.0 g a.i./sq.m/plant Paclobutrazol and 2% Potassium Nitrate is the best treatment in respect to yield (713.33 fruits / plant). Vegetative growth was found higher under non treated plant and no changes were observed in quality parameters of fruits under the treatment of 3.0 g a.i./sq.m/plant Paclobutrazol and 2% Potassium Nitrate application.

Precise fertilizer management through fertigation in Kinnow mandarin and sweet orange

Maximum increase in plant height (36.75 cm), canopy volume (45.13 cm^3) and maximum number of fruits/tree (43.67) were recorded with 120% of recommended dose of fertilizer in sweet orange. Similar trends were also observed in Kinnow mandarin. In respect of quality parameters, higher TSS/acid ratio (33.65), ascorbic acid (51.74 mg/100g) and total sugar (6.91%) were recorded in 120% of recommended dose of fertilizer in sweet orange and similar trends were obtained in Kinnow mandarin.

Screening of mango seedling for abiotic stress (water logged condition)

Mango seedling exposed to 30 days non waterlogged condition had higher growth rate with increased tree height compared to waterlogged condition. The presence of hypertrophied lenticels is a common anatomical change observed in all mango grafts under waterlogged condition with maximum (23.76 number) in polyembryonic mango rootstock namely Kurukkan and minimum (15.67 number) in monoembryonic rootstock namely Bombay. Total phenolic content in plant was recorded maximum in Kurukkan (67.62 mg g^{-1} FW).

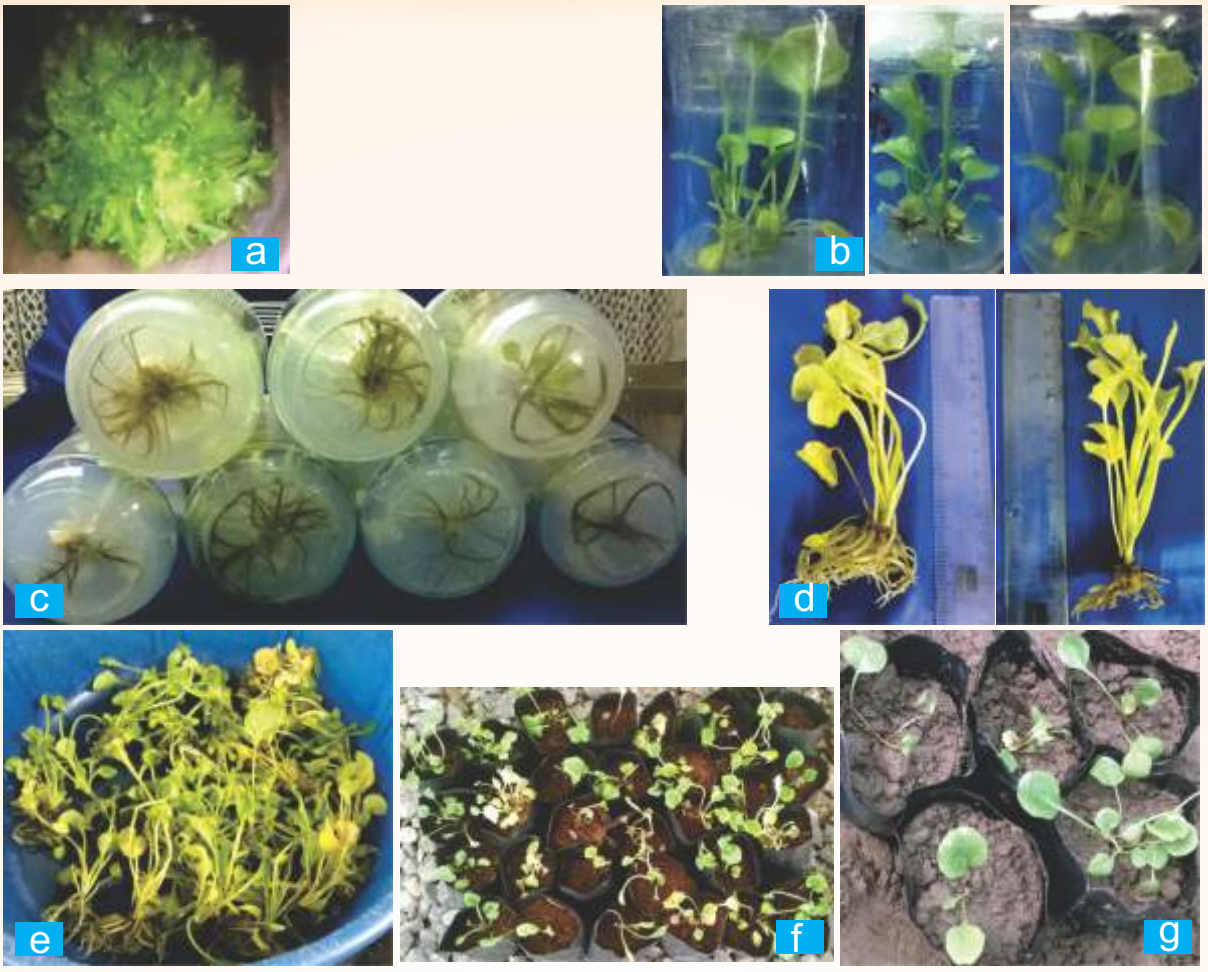
Rootstock studies in mango

The germination percentage from theseed obtained from CISH Lucknow and IARI, New Delhi was recorded very low. Seedling growth of Peach (4 seedling), Vellai Collumban (2 seedling) and Bappakai (4 seedling) was found satisfactory and they are in progress.

3.2.4 Vegetable and Floriculture

3.2.4.1 Development of Micropropagation Protocol for Mass Multiplication of Gerbera (*gerbera Jamesonii*)

Capitulum were taken from gerbera variety, *viz*. Patrizia having diameter of 0.5-0.7 cm were washed with few drops of Teepol for 15-20 min and then they were immersed in a solution of carbendazim and mancozeb for 2-3 hr. and washed thoroughly with distilled water. Then capitulum were subjected to different media for multiplication.Immature capitulumwere found to be the best explants. For pre-treatment Bavistin (0.1)% + Ridomil (0.1%) + 8HQC (200mg/l) for 2hr gave the best results. Surface sterilization with 0.1% $HgCl_2$ for 5 minutes significantly reduced microbial contamination and gave the highest explant survival.Best establishment occurred on vitamin supplemented with MS medium where it was increased by 10 times. Modified MS media supplemented with 10 mg/l BAP + 1.00 mg/l IAA produced the maximum no of quality shoots. Best elongation was found on MS medium supplemented with 1.0 mg/l GA_3. Best rooting occurred on1/2MS medium supplemented with 1.0 mg/l IBA + sucrose 50g/l.Protocol for mass multiplication of Gerbera cv. Patrizia has been standardized and may be used commercially.



In Vitro plant regeneration in Gerbera cv. Patrizia. (a) Shoot Proliferation.(b) Shoot elongation. (c) Rooting. (d& e) Rooted plants ready to transfer. (f& g) Primary hardening.

3.2.4.2 Intercropping of Vegetables in Mango Mother Plant Orchard

Local variety of garlic, pea (Azad P-1), carrot (Pusa Kesar), Palak (All Green), coriander (Pant Haritima), onion (Patna red), radish (Snow white) and French bean (P-44)were grown in mango mother plant orchard to identify suitable vegetable intercrops which may be grown with mango mother plant orchard during *Rabi* season to fetch additional income to the orchard growers. The highest B:C ratio was obtained in onion 4.0 which yielded 199.33 q/ha.In garlic yield of 65.33 q/ha was obtained with B:C ratio of 2.2. Likewise, in pea yield and B:C ratio were 55.67 q/ha and 1.2, in carrot yield and B:C ratio were 62.22 q/ha and 2.0, in palak yield and B:C ratio were 199.33 q/ha and 2.5, in coriander yield and B:C ratio were 49.22 q/ha and 1.7, in radish yield and B:C ratio were 188.00 q/ha and 2.0, in French bean yield and B:C ratio were 50.56 q/ha and 1.4 respectively. The highest net income of Rs 3,06,484/- with highest cost benefit of 1:4.0 was obtained in case of onion (Patna Red) inter cropped with the mango mother plant orchard on the basis of two years trial.

3.2.4.3 Weed Management in Onion

Eight different treatments were used to find out the efficient method of weed control.T_1 comprised of Weed Free (Manual), T_2 of Two hand weedings at 20 & 40 days after transplanting, T_3 of Application of Glyphosate1 kg a.i./ha at 15 days before transplanting, T_4 of Pre emergence application of Pendimethalin 1 kg a.i./ha 3 days within transplanting, T_5 of Post emergence application of Oxyfluorfen 250 g a.i./ha at 20 Days after Transplanting, T6 of

combination of T_4 and T_5, T_7 of combination of T_3, T_4 and T_5 and T_8 of weedy check. It was observed that application of glyphosate 1 kg a.i./ha at 15 days before transplanting, pre emergence application of pendimethalin 1 kg a.i./ha 3 days within transplanting, post emergence application of oxyfluorfen 250 g a.i./ha at 20 days after transplanting fetched the highest B:C ratio (3.03) and yield of 251.44 q/ha compared to manual weed free crop which yielded 254.00 q/ha but B:C ratio was 2.25.

3.3 Crop Protection

3.3.1 Plant Pathology

3.3.1.1 Rice

Host plant resistance studies

Such studies conducted at ARI, Patna involved the screening of entries for sheath blight resistance and screening of entries for bacterial leaf blight (BLB) resistance. The experiments were conducted in different nurseries namely, NSN1, NSN2, DSN & NHSN. The important objectives of theses screening were (i) to identify resistant entries to sheath blight disease from the promising cultures, included in advanced and initial variety trials, and (ii) to identify entries resistant to BLB from the promising cultures included in advanced and initial variety trials. Salient results from these studies were:

NHSN Trial: Among 145 entries evaluated, only 9 entries showed resistant reaction (disease score 0 – 3) to both diseases.

NSN-1 Trial: Out of 373 entries evaluated 17 entries showed resistant reaction (disease score 0 – 3) to both diseases.

NSN-2 Trial: Out of 663 entries evaluated, only 56 entries showed resistant reaction (disease score 0 – 3) to both diseases.

DSN Trial: Out of 109 entries evaluated, only 12 entries showed resistant reaction (disease score 0 – 3) to both diseases.

Field monitoring of virulence

Repeated monitoring of field virulence in *Xanthomonas oryzae* pv. *oryzae* were performed to characterize the virulence spectrum of bacterial leaf blight (BLB) pathogen in the rice eco-system. Out of 31 entries evaluated against the BLB disease, only 2 entries showed resistant reaction (disease score 0 – 3) to the BLB pathogen.

Production Oriented Survey of rice, conducted in the zone IIIB of Bihar

Production Oriented Survey (POS) was conducted under the agro-climatic zone IIIB of Bihar involving the districts of Gaya, Jehanabad and Patna, during the rice crop season of 2016. In the beginning of the rice crop season 2016, there was shortage of rainfall, hence, the farmers had faced problem in raising the seedlings. Later on, the scenario had changed and there was sufficient rainfall during the rice crop season 2016. By chance, no natural calamity appeared during this crop season. Due to the favorable weather condition, there was good crop stand, in almost all areas surveyed. In certain patches, due to sudden outbreak of flood, the standing crop was damaged. Sheath blight, BLB & false smut diseases appeared in the crop fields. As per observation of diseases, it revealed that the BLB disease was found to be the pre-dominant disease in the areas surveyed, which was followed by sheath blight and false smut diseases. Simultaneously, there was incidence of stem borer and leaf folder. Stem borer appeared profusely in this crop season. But, as the crop condition was good, it could not cause considerable yield loss.

Evaluation of Paddy Germplasm

3.3.1.2 Wheat

Wheat disease monitoring nursery (WDMN)

Out of 20 varieties none of the varieties were found free from leaf blight and their severity varied from 13-69. Three varieties have shown resistant reaction towards foliar blight diseases (severity score below 35). Stem, leaf and yellow rust diseases did not appear during 2015-16 in WDMN.

Initial plant pathological screening nursery (IPPSN)

Out of 1766 entries none of the varieties were found free from leaf blight and their severity varied from 12–79. Stem, leaf and yellow rust did not appear this year (2015-16) in Initial plant pathological screening nursery.

Management of foliar blight of wheat through chemicals

Out of 10 treatments, three foliar sprays of Dithane M 45 @ 0.25% at boot leaf or at the time of initiation of disease on Flag -2 leaf followed by second and third spray at 10 days intervals each (three sprays) was found superior, followed by foliar sprays of Folicur @ 0.1% at boot leaf or at the time of initiation of disease on Flag -1 leaf followed by second spray at 20 days interval (two sprays) as compared to all treatments and their severity of leaf blight varied from 13–79. Stem, leaf and yellow rust diseases did not appear this year (2015–16) in this trial.

Loose Smut

Leaf Blight

Loose Smut

Blighted Field

Brown Rust

Brown Rust

Symptoms of diseases affecting wheat crop in field conditions

3.3.1.3 Pulses

Disease biology and field evaluation of commercial fungicides to chickpea charcoal rot fungus *Macrophomina phaseolina*

Different isolates of *Macrophomina phaseolina* were sampled and screened against several fungicides under *in-vitro* condition. Significant effect of concentration ($P<0.05$) on isolate was observed. Further, susceptible cultivar of chickpea was selected through laboratory screening (towel paper method), and through screening in the developing sick-plot where laboratory multiplied inoculum was incorporated for disease generation. Further, the selected cultivar was used to screen most aggressive isolate using pathogen metabolite test against spectra of isolates. Effect of inoculum as seed contamination and as soil perpetuation was tested where seed and soil-borne inoculum was found to be equally affecting the disease. However, integration of both leads to significant disease acceleration ($P<0.05$) suggesting management before sowing as a critical way to rid-off from this disease. The two-year field experiment was conducted to screen a number of commercial formulations. The formulations were chosen on the basis of the mode of action. Azoxystrobin, a mushroom synthesised fungicide, was found to be most effective chemical that consistently produced significantly lowest diseased plants ($P<0.05$). Two methods of fungicide application were used: seed treatment and drenching at two-month old plant. Drenching of fungicides rendered significantly lower disease appearance in the tested field ($P<0.05$). This is possibly the nature of disease that appears late in the season. Moreover, fungal populations were counted from the infected plants of treated plots and compared with disease dynamics. Seed yield was also undertaken as another component to measure impact of disease.

Evaluation of IVT, AVT1 and AVT2 (desi, kabuli, rainfed and late sown) entries against

1. AVT1 (Desi): Seven test entries were evaluated in which PG170 and GNG2264 exhibited moderately resistant reaction against the disease.
1. AVT2 (Desi): Six entries were evaluated in which only JG36 showed moderately resistant reaction.
2. IVT (Desi): Twenty seven test entries evaluated in which H12-26, GNG2302 and JG74315-2 were found moderately resistant.
3. AVT1 (Late sown): Nine seven entries were evaluated in which only RSG963 exhibited moderately resistant reaction.
4. AVT2 (Late sown): Three test entries evaluated in which IPC2010-62 was found moderately resistant.
5. IVT (late sown): Twenty two entries were evaluated in which RSG963 and BG3068 were found moderately resistant against the disease.
6. AVT1 (Rainfed): Four test entries were evaluated in which only CSJ515 exhibited moderately resistant.
7. IVT (Rainfed): Twenty three entries evaluated in which GJG1316, BG3066 and NBeG738 were found moderately resistant.
8. Mechanical harvesting: Thirteen entries evaluated in which DBGV3104, BG3070 and CSJ1001 were found moderately resistant.
9. AVT1 (Kabuli): Nine entries evaluated in which IPC2011-179 and GNG2285 were found moderately resistant.
10. AVT2 (Kabuli): Four entries evaluated in which only GNG2228 was found moderately resistant.
11. IVT (Kabuli): Fourteen test entries evaluated in which only HK13-114 was found moderately resistant.
12. AVT1 (ELSK): Five entries evaluated in which only PhuleG12407 was found moderately resistant.
13. IVT (ELSK): Nine entries evaluated in which NBeG731 and CSJK24 were found moderately resistant.
14. Check lines: Twenty four entries evaluated in which HK2, Pusa372 and BDG128 were found moderately resistant against the disease

Evaluation of IVT, AVT1 and AVT 2 (desi, kabuli, rainfed and late sown) entries against stunt disease

1. AVT1 (Desi): Seven test entries were evaluated in which GL10006and PhuleG12107 exhibited moderately resistant reaction.

2. AVT2 (Desi): Six entries were evaluated in which only NBeG452 showed moderately resistant reaction.

3. IVT (Desi): Twenty seven test entries evaluated in which GNG1958, NBeG807, H12-01 and CSJ855 were found moderately resistant.

4. AVT1 (Late sown): Nine seven entries were evaluated in which only BG3054 exhibited moderately resistant reaction.

5. AVT2 (Late sown): Three test entries evaluated in which RSG963 was found moderately resistant.

6. IVT (late sown): Twenty two entries were evaluated in which H12-62, BG3067 and NBeG505 were found moderately resistant.

7. AVT1 (Rainfed): Four test entries were evaluated in which only RSG931 showed moderately resistant reaction.

8. IVT (Rainfed): Twenty three entries evaluated in which NBeG740, RSG888, H-12-20, GJG1307, GNG2294, CSJ515, CSJ872, PhuleG13107, DIBG202, RSG931 and CSJ870 were found moderately resistant.

9. Mechanical harvesting: Thirteen entries evaluated in which DBGV3205, PhuleG08108, CSJ1002, BG3061 and PG173 were found moderately resistant.

10. AVT1 (Kabuli): Nine entries evaluated in which only CSJK96 was found moderately resistant.

11. AVT2 (Kabuli): Four entries evaluated in which none of the entry was found moderately resistant.

12. IVT (Kabuli): Fourteen test entries evaluated in which only HK13-114 was found moderately resistant.

13. AVT1 (ELSK): Five entries evaluated in which only BG3059 was found moderately resistant.

14. IVT (ELSK): Nine entries evaluated in which only NBeG458 was found moderately resistant.

1. Check lines: Twenty four entries evaluated in which JG16, RSG945, GCP101, IPCK02-29, DCP92-3, Pusa547, Pusa372, HK2 and PG186 were found moderately resistant against the disease.

Disease development as influenced by different dates of sowing under changing climates

Date of sowing (1st November): Stunt disease incidence was recorded 18.6-40.1%, maximum in JG315 followed by BG256 and minimum in JG62. Date of sowing (15th November): Stunt disease incidence was recorded 16.9-39.8%, maximum in JG315 and minimum in JG62. Date of sowing (30th November): Stunt disease incidence was recorded 16.3-31.3%, maximum in JG315 and minimum in JG62.

Tropical Legume on Chickpea

Drought tolerant (Kabuli-rainfed) trial

Total sixteen entries evaluated in RBD design with three replications in which none of the entry was found superior over the best check KAK2 (698 kg/ha). However, entries ICCIL08007 (685 kg/ha) and ICCIL08012 (660 kg/ha) were found at par with the best KAK2.

Drought tolerant (Desi-rainfed) trial

Total twenty six entries evaluated in RBD design with three replications in which entries ICCIL04019 (943 kg/ha) and ICCIL04001 (921 kg/ha) were found at par with the check JG11 (935 kg/ha).

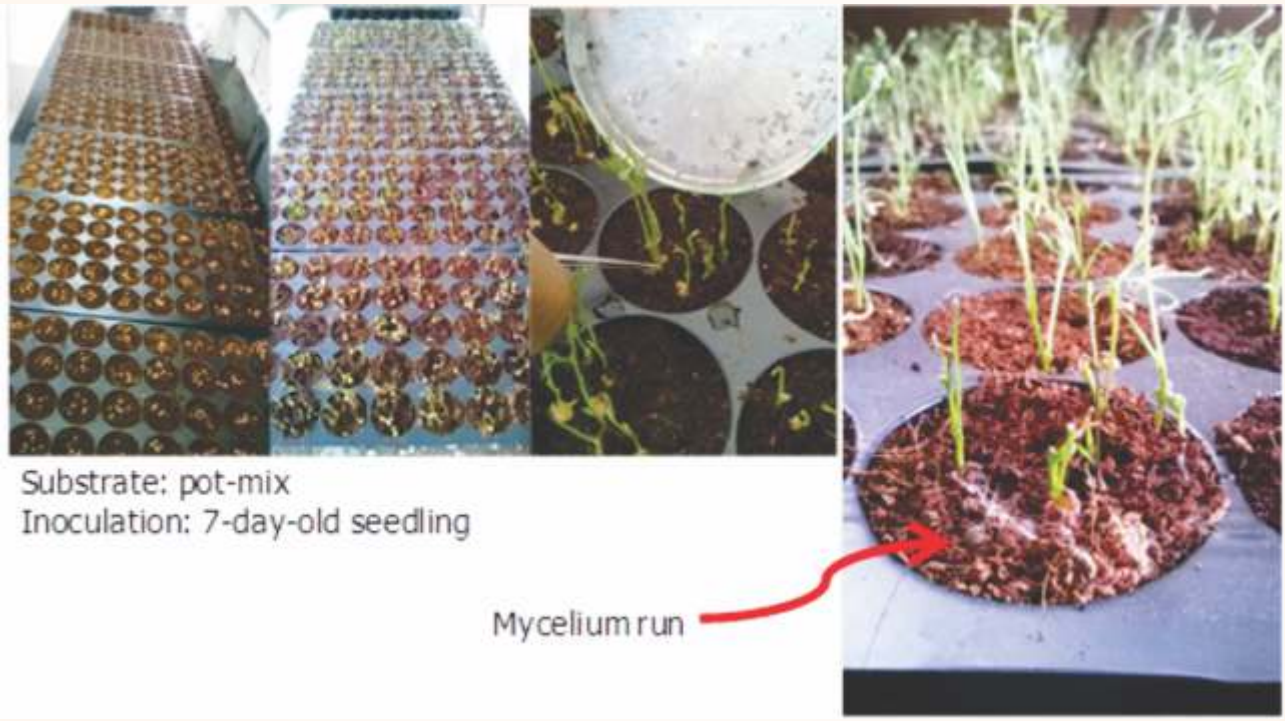
Heat tolerant trial

Total thirty entries tested for heat tolerant under late planting condition in RBD design with three replications in which none of the entry was found significantly superior to the best check JG14 (785 kg/ha) while one entry ICCV0311(748) was at par with the best check JG14.

Nanoclay application inhibits infection of *Sclerotium rolfsii* in lentil

Collar rot of lentil, caused by *Sclerotium rolfsii*, is a dreaded disease that appears at seedling to reproductive stage and cause significant loss to lentil cultivation in tropical to subtropical region. Due to limited disease management options, the growers rely on conventional fungicides, which are not only hazardous but also many pathogens develop resistance to such chemicals. To identify a different alternative, we tested nanoclay having fungicidal property in order to manage this soil-borne fungus.

One-week-old seedlings of lentil variety Noori, grown in organic potting mix, were inoculated with suspension of actively-growing mycelium at the collar region. Application of laboratory synthesized nanoclay was done on periodic basis starting at 3h before inoculation (In_{-3}), at the time of fungus inoculation (In_0), and 3h (In_3), 6h (In_6) and 24h (In_{24}) after inoculation. Nanoclay application significantly reduces disease severity with an application at In_{-3} of pathogen inoculation, but its efficacy significantly diminished when applied at In_6 or onward of pathogen inoculation. Our attempt highlights the potential of nanoclay as an alternative to conventional fungicides in management of collar rot infection in lentil.



Impact of nanoparticle on lentil collar rot

3.3..1.4 Oilseed

Biochemical and molecular mechanisms of vilruence and pathogenecity in necrotrophic interactions

Experiment was performed to find out variation in the population of *Alternaria brassicicola.* Among different isolates of *Alternaria brassicicola* collected from Bhagalpur, Banka and Munger; variation was found based on colony colour, melanin content and sporulation capacity. Out of the two genotypes of *Brassica carinata*; genotype BCN 341165 showed very small lesion size after infection by *Alternaria brassicicola*, which was selected for further study as a resistant genotype. There was delay in the spore germination and decrease in percent spore germination on Carinata genotype when compared to Brassica genotype.

Research on nanopathology

Nanoparticle-governed physiological and biochemical deviation in two foliar phytopathosystems

The effect of laboratory synthesised silver nanoparticle (AgNP) and copper nanoparticle (CuNP) were examined on two different foliar phytopathosystems viz.,barley-*Bipolaris sorokiniana* and mustard-*Alternaria brassicicola*. Leaves were adjusted into four treatments; crude leaf (CL), nanoformulation applied (NF), pathogen inoculated (Path), and nanoformulation applied and then pathogen was inoculated (NF+Path). No proper trend of total phenols production was determined in barley-*B. sorokiniana* pathosystem. However, nearly 50% lower quantity of total phenols was estimated in AgNP+Path in mustard-*A. brassicicola* with lower lesion size suggesting protection to infection, or the NF has manipulated the defence mechanism for this pathosystem. Our study collects basic information, and we are looking for unveiling of mechanism involved of such NFs under *in-planta* interaction.

3.3.1.5 Jute

Survey and surveillance of pests and disease of jute

During 2016-17, a survey was conducted at four locations *viz*., Jute Research Station Farm, Katihar and three villages of different blocks i.e. Mansahi, Sonaili, Dandkhora of Katihar district to assess the extent of incidence of disease in jute. The four major diseases were recorded *viz*., stem rot, root rot, mosaic and Anthracnose at all four locations. Maximum disease incidence of stem rot and root rot was recorded [7.50 percent disease incidence (PDI) & 9.40 PDI] at Mansahi and Dandkhora respectively during last week of July and continued. Anthranose was very low, however, varied from 1.86-2.60%. The incidence of mosaic was 7.80%, 5.50%, 4.94% and 7.00% at Mansahi, Katihar, Sonaili and Dandkhora, respectively during 105 DAS.

Screening of jute germplasm against diseases

The incidence of disease was varied from nil to high. Out of 77 lines of white jute (*C. capsularis*) evaluated against stem rot, root rot and mosaic, the incidence of root rot was maximum recorded 13.44% in CIN-57 followed by 12.37% in CIN-39 as compared to 4.91% in check variety, JRC-698. Similarly incidence of stem rot was varied from nil to high but most of the affected lines were below 10%. The highest stem rot disease incidence was recorded 15.50% in CIJ-08 followed by 12.45% in CIN-66 in comparison to 5% in check variety, JRC-698. Total 27 lines showed immune reaction to the stem rot disease. There were a total of 22 lines which were found to be completely immune to both root tot and stem rot disease incidence under this particular field condition. The very high incidence of mosaic was reported, that showed more than 20% and up to 100% of disease. The line CIN-03, CIN-44, CIN-57, and CIJ-16 was most susceptible with 100% mosaic infestation.

Evaluation of some new fungicide molecules offering better chemical management for *Macrophomina phaseolina* induce disease complex in jute

Among all treatments, T3 and T7 were found most effective for both stem rot root rot diseases. The Stem rot incidence and percent disease incidence (PDI) was recorded 2.11% and 1.91 in T7 followed by 2.24% & 2.04 in T3 and root incidence was also low with 2.15% in T7 followed by T3 after 90 days of sowing and also exhibited highest fibre yield 29.17 q/ha and 28.67 q/ha, respectively. Almost all treatment had showed significant effect in reducing the incidence of root rot and stem rot while highest disease incidence was recorded in control T8. Because of unavailability of fungicide in T5, this treatment should also be treated as control.

Evaluation of elite olitorius jute line against stem rot under sick plot conditions

Total 23 lines were evaluated against stem rot and root rot under sick plot conditions. Fifteen lines

showed PDI less than 5.0, they were v1, v2, v4, v5, v6, v9, v10, v12, v13, v14, v18, v19 v20, & v21 and rest germplasm showed stem rot between 5.0 to 8.0.these line may be potential germplasm line for development of stem rot resistant variety. The line v1, v2, v5, v6, v12, v13, v14 were recorded free of root rot disease. The highest stem rot disease incidence was recorded 9.41% in v23.

3.3 .1.6 Fruit

Investigation on genetic diversity of *Fusarium mangiferae*: The inducer of mango malformation Mango malformation disease samples have been collected from different mango orchards viz. Bhagalpur, Banka, Munger, Aurangabad, Gaya, Nawada, Kishanganj, Nalanda, Araria, Purnea, Madhepura, Supaul, Katihar, Saharsa, Muzaffarpur, Vaishali, Patna, Ara, Buxar and Darbhanga etc. for isolation, purification, identification and maintenance of *Fusarium mangiferae* pathogen. During morphological study of the *Fusarium mangiferae* the typical characters of the isolate Darbhanga has been observed as Conidiophore: Pink mild olivaceous brown, simple, septate, erect or curved and Conidia: Slender, falcate ellipsoidal Pink to dark brown. DNA extraction is being done from mycelial mat of the *Fusarium mangiferae*.

New and emerging diseases of mango

Anthracnose and blossom blight were the major diseases of mango. Wilt is also an emerging problem in mango. Cost effective management strategy has been developed for post-harvest anthracnose of mango by preharvest and postharvest treatments. Preharvest spray of Hexaconazole (0.1%) three times followed by hot water treatment was found to be most effective in managing postharvest anthracnose in mango. Identification and characterization of pathogens associated with stem end rot in mango. *Diplodia theobromae* was isolated from stem end rot affected mango fruit. Standardization of hot water treatment technique (HWTT) to manage postharvest anthracnose as well as fruit flies in mango has been done. Hot water dip at 52°C for 10 min is affective for managing postharvest anthracnose as well as fruit fly in mango.

New and emerging diseases and pests of guava

Anthracnose and wilt in post monsoon period is the major diseases in anthracnose. It was observed that fruit fly complex, fruit borer and mealy bug were major insect pest in guava orchard.

Management of guava anthracnose and canker

Three sprays of Carbendazim + Mancozeb at 0.2 % at an interval of 15 days starting at bud initiation stage were most affective in managing anthracnose in guava.

Host-parasite interaction and management strategy for Panama wilt of banana

Combine population of *Fusarium* and root knot nematode (RKN) induces more wilt disease incidence (58%) in banana crop. Alpan is a highly resistant but seeded fruit and low productivity and Basrai is a highly susceptible cultivar. Exogenous application of dead *Foc* will be induces resistance against banana wilt. Application of neem cake and *Trichoderma* are most effective (70% and 72%, respectively) to control the Panama wilt of banana disease in the field condition.

Application of neem cake and Trichoderma is most effective tom anagement of Panama wilt of banana disease in the field condition

3.3.2 Entomology

3.3.2.1 Pulses

Influence of tillage and residue management on macro fauna with special reference to herbivores and natural enemies in pulse based cropping system

In this experiment we focused on the three main objectives and those are (i) understanding the interaction of tillage and residue retention on insect pests and its natural enemies, (ii) to study the influence of intercropping on foliage macro fauna, and (iii) to study the influence of intercropping on insect pest and its natural enemies. The main plot treatments were T1: fresh bed residue removal, T2: fresh bed residue incorporation, T3: fresh bed residue retention and sub plot treatments were C1: pigeon pea + maize (1:1), C2: pigeon pea + sesame (1:2), C3: pigeon pea + groundnut (1:2), C4: pigeon pea + black gram (1:2), C5: pigeon pea + finger millet (1:2). The experimental findings revealed that a total of eleven (11) families insect pests and natural enemies were recorded in pigeon pea based cropping system. The families were tortricidae, cucurculionidae, coccinellidae, acrididae, membracidae, coreidae, formicidae, tephritidae, chrysopidae and araneae. Regarding diversity of insect pests and natural enemies in pigeon pea based cropping system is concerned; the maximum (Shannon index-2.24; Simpson index-0.12) diversity was recorded in residue retention plot followed by residue incorporation (Shannon index-2.02; Simpson index-0.07) and residue removal plot (Shannon index-1.89; Simpson index-0.06). There is no significant difference in species richness among the three different tillage systems. However, insect pests and natural enemy population in different tillage system maximum population was recorded in residue retention plot followed by residue incorporation and residue removal plot. Among the different intercropping systems, maximum number of insect pests and natural enemy population was recorded with pigeon pea + blackgram and pigeon pea + groundnut based intercropping system. Minimum insect pest population was recorded with pigeon pea + finger millet based intercropping system.

3.3 .2.2 Oilseed

Studies on ecological approaches for sustainable management of mustard aphid

Three experiments entitled 'Screening of germplasms against mustard aphid', 'Evaluation of different botanical extracts against mustard aphid' and 'Study on the effect of border planting on the conservation of natural enemies' were conducted at BAC, Sabour farm during *rabi* 2015-16. From the first experiment; four mustard germplasm namely, IC385686, IC 491089, IC 312545 and IC 312553 shown tolerance to mustard aphid. In the second experiment, spraying of *Lantana camara* leaf extract (1%) contained least level of aphid population which was statistically at par with the chemical spray. Yield data also suggested that the *Lantana camara* was best among several botanicals and also it yielded at par with the chemical treatment i.e. Thiamethoxam 25 WG. In the third experiment, the treatment containing safflower as border crop attracted maximum number of coccinellid predators. leaf extract (1%) contained least level of aphid population which was statistically at par with the chemical spray. Yield data also suggested that the *Lantana camara* was best among several botanicals and also it yielded at par with the chemical treatment i.e. Thiamethoxam 25 WG. In the third experiment, the treatment containing safflower as border crop attracted maximum number of coccinellid predators.

Promising germplasm of mustard

Different Coccinellids predators of safflower

3.3 .2.3 Vegetable

Bio-efficacy of cassava based bio-pesticides on insect pest complex of brinjal

The experimental findings revealed that Cassava biopesticide (Nanma) @ 10 ml/lit was found to be the most (6.70% and 11.00%) effective in reduction of shoot as well as fruit damage and obtained highest yield (no. basis and wt. basis) with 342 q/ha. However, whitefly and leaf hopper population are concerned, least (7.67 and 3.37 /5 leaves) population was recorded with Dimethoate 30 EC @ 2ml/l followed by Quinolphos 25 EC @ 3ml/l.

Management of shoot and fruit borer, *Leucinodes orbonalis* in brinjal grown under protected and open conditions

Among the two different condition, minimum fruit infestation was recorded (No. basis: 2.89% and Wt. basis: 3.71%) with protected condition than open condition. Yield (no. basis and wt. basis) was recorded highest (60.00 kg) in protected condition. Whereas, sucking pest population is concerned, both leafhopper and whitefly population were maximum in protected condition than open condition. Natural enemy (spider) was observed in both the condition.

Field evaluation of different insecticide use strategies as resistance management and control tactics for shoot and fruit borer in brinjal

The results in terms of yield (no. basis and wt. basis) and shoot damage indicated that rotational strategy (Rynaxipyr 20 SC @ 0.4 ml/l followed by Emmamectin benzoate 5 SG @ 0.5 g/l, spinosad 2.5 SC @ 1.5 ml/l, chorpyriphos 20 EC @ 2 ml/l, cypermethrin 25 EC @ 0.5 ml/l) was found to be the most significant in reduction of shoot as well as fruit damage (7.00% and 8.67%) and also obtained highest (360 q/ha) yield. It was followed by sequential strategy *i.e.* Emmamectin Benzoate 5 SG@ 0.5 g/l and Rynaxpyre 20 SC @ 0.4 ml/l. Based on the overall mean population of coccinellids, it was apparent that all the newer molecules were safer to the predator as they were statistically on par with untreated check whereas, Chlorpyriphos 20 EC @ 2 m/l and Cypermethrin 25 EC @ 0.5 ml/l was found to slightly toxic to coccinellids.

Evaluation of new alternatives to neonicotinoid insecticides against sucking insect pests of okra

The present study was clearly indicated that, Flonicamid 50 WG @ 0.4 ml/l and Flonicamid 50 WG @ 0.3 ml/l were found to be the most effective in reduction (whitefly: 1.87 & 1.93 per 3 leaves; leafhopper: 2.37 & 2.47 per 3 leaves) of whitefly and leafhopper population and it was followed by Flupyrifurone 200SL @ 2.5 ml/l and Flupyrifurone 200SL @ 2.0 ml/l. The highest yield was obtained with Flonicamid 50 WG @ 0.4 ml/l (98 q/ha), which was at par with Flonicamid 50 WG @ 0.3 ml/l (95 q/ha). However, all the newer molecules were found safer to coccinellids.

Biological and molecular characterization of whitefly and thrips transmitted viruses in chilli crop

An externally funder project entitled "Biological and molecular characterization of whitefly and thrips transmitted viruses in chilli crop (SERB-DST Govt. of India) is running under the department. The project focused on characterization of virus in chilli crop. Tomato leaf curl Joydebpur virus (ToLCJV) is reported to be infecting majority of chilli crop. Sequence data of whole genome (2.7 kb) were submitted in NCBI data base. Leaf samples collected across the Northern India, we have detected this virus through specific primer of ToLCJV that target the CP gene. Moreover, association of beta-satellite are detected in few samples and found severe degree of symptom. Transmission efficiency of this virus was tested in different chilli cultivars ranges from 30 to 70%.

3.3.2.4 Management of Mango Hoppers Using Entomopathogens

Among the tested bio-pesticides, the application of spray of IIHR formulations of *Metarhizium anisopliae* (oil formulation @ 0.5 ml/l) showed the lowest hopper population (2.00) on seventh day of fifth spray. However, the insecticides module.

showed highest reduction in hopper population which was at par with spray of IIHR formulations of *Metarhizium anisopliae*

Documentation and monitoring the population of pollinators in mango

Syrphid fly, giant honey bee, stingless bee, housefly, dipteran flies were identified as major insect pollinators of mango. Peak population of pollinators was noticed on 9th SW (8.4 pollinaors/panicles).

Gamma rays induced sterility in fruit fly, *Bactrocera zonata* for the development of micro SIT in mango Samples of *Bactrocera zonata*, *B. dorsalis*, *B. cucurbitae* and *B. tau* were collected from different locations of the state. The collected samples were processed for the isolation and characterization of gut bacteria. In addition, the protocol for rearing of fruit flies with the help of artificial diet under laboratory conditions is also under process.

Survey and surveillance of emerging pest and their natural enemies in litchi

Litchi fruit and shoot borer complex, litchi looper, leaf roler, ash weevil, red weevil, litchi mites were the major insect pest recorded in litchi orchards. Among natural enemies coccinellid beetle, spider, canthoconid bugs and praying mentid were noticed during the survey.

Survey and surveillance of pollinators in litchi

Syrphid fly, honey bee, stingless bee, housefly were identified as major insect pollinators. The maximum activity with highest number of pollinators was recorded in the 13 SW (49.2 pollinators/panicles/week/tree). Although a low population was recorded on 10 SW (5.2 pollinators/panicles/week/tree), but in general it was observed that the south direction was more preferred by the pollinators followed by east and west.

Management of litchi fruit borer

Flubendiamide, Spinosad & Novaluron were statistically at par as compared to other insecticides. Flubendamidiamide followed by Spinosad and Novaluron were found most effective in reducing pest infestation 6.4% result in higher yield 84.3 kg/tree compared to other insecticides.

Eco-friendly management of banana scarring beetle through bio pesticide and mechanical barrier in Koshi region of Bihar

In bio pesticide, NSK powder has more effective @ 15 g per banana whorl in management of scarring beetle. In mechanical barriers, pp bag followed by jute bag is more effective in controlling scars and also increase weight of bunch of banana. Use of bio pesticides (neem oil, Azadirachtin 0.1%) in vegetative stage and mechanical barriers in flowering stage (newly emerged flower) is more effective than use of bio pesticide only.

Banana Fruit bunch covered with PP bag

Mass multiplication of *Trichogramma* spp. and entomo-pathogenic nematodes

The cultures of *Corcyra cephalonica*, *Trichogramma chilonis*, *T. japonicum* and *Steinernema* sp. were maintained under laboratory conditions throughout the year. *T. chilonis* evaluated against *Chilo partellus* in maize and

Conopomorpha spp. in litchi was found effective in reducing infestation of target pests up to 8.9 and 17.5 percent over the control, respectively. Tricho-cards and two formulations (sponge bit and sodium alginate based) of EPNs were prepared. Indigenous population of *Steinernema* sp. evaluated against 3rd instar larvae of *Plutella xylostella* was found most effective at the population level of 10 IJs/ larva.

Research on EPNs

Samples were collected from different field crop and orchards, for the isolation of local population of Entomo-pathogenic nematode (EPN). Inoculation and maintenance of the EPNs culture on *Corcyra cephalonia* larvae for mass production for further use. Bio-efficacy of local population of *Steinernema* sp. against *Plutella xylostella* was carried out and found most effective at the inoculum level of 10 IJs/ larva. Two formulations of EPNs (Calcium Alginate gel capsules and sponge bit based) were prepared and their shelf life is being tested

3.3.3 Nematology

The soil samples were collected from rice, wheat, maize, banana, and several vegetables crops, prevailing in three districts *viz.,* Bhagalpur, Purnea and Katihar. Samples were processed and plant parasitic nematode (PPN) populations were assessed. The survey revealed that the important nematodes like *Meloidogyne incognita*, *Meloidogyne javanica*, *Hoplolaimus* spp. *Helicotylenchus* spp. and *Tylenchorhynchus* sp. were prominent and recovered in 164 soil samples collected from different crops of Bihar. *Pratylenchus* spp. was found to be associated in the soil samples collected from banana and maize crops. Root knot nematode *Meloidogyne graminicola* was found to be associated in the sample collected from rice fields.

3.4 Product Development & Marketing

3.4.1 Food Science and Technology

3.4.1.1 Alleviation of Senescence-linked Oxidative Damage for Improved Postharvest Quality of Banana

Freshly harvested green mature banana fruits were subjected to postharvest treatments with the following molecules. Nitric Oxide and Hydrogen Sulfide. The initial screening was performed with the several concentrations (0, 0.5, 1.0, 1.5, 2.0 mM) of postharvest treatments. On the basis of visual observations the best concentration was selected for further study as 0.5 mM (Hydrogen Sulfide) and 1.0 mM (Nitric oxide). Likewise there were three treatments along with control (water). The treated fruits were stored at ambient temperature 28-32 ° C and RH 65-75%. Afterwards the further analyses will be performed with the selected treatments. The study provides insight into better understanding of the role of NO and H_2S in antioxidant response in banana fruits at ambient storage. Both treatments maintained higher antioxidant status related to untreated controls. They significantly reduced malonodialdehyde, hydrogen peroxide, and superoxide anion to levels below control fruits during storage. NO and H_2S could alleviate oxidative stress through promoting antioxidant defense systems, and thus contributed to the delayed ripening in banana fruits. NO and H_2S may maintain postharvest quality by postponing the senescenal changes in banana fruits.

At laboratory

NO at 7th Day

H_2S at 7th Day

Control at 5th Day

3.4.1.2 Application of Essential Oils for Extending the Shelf Life of Tomato, Mango and Guava

Fruits (Guava) harvested at proper maturity (collected from horticulture field) and were washed thoroughly with sterilized water and initial weights were taken. Fruits were treated with different concentrations of essential oil (Thymol and Eugenol) for 10 min. Fruits were air dried and kept in open condition. Various physico-chemical and sensory observations were recorded time to time. Eugenol 1000 ppm and Thymol 100 ppm were found better over other treatments with respect of shelf life. Sensory qualities were found good up to third day of treatment. No disease infestation were observed in treated fruits

Control

Thymol 100 ppm

EUGENOL 1000 ppm

3.4.2 Agricultural Engineering

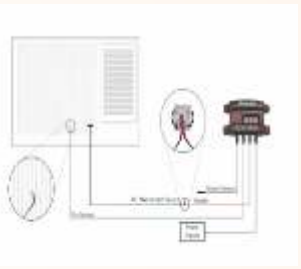
3.4.2.1 Development of Cold Storage Facility in the Maize Section

The Cool room has been created in a vacant room in the department of Agricultural Engineering. Initially the room was having two nos. of doors, which was not suitable for the construction of cool room, due to heat losses from two doors. Keeping above in view, one door was closed with various insulation materials. In mean-time salwood was as columns of various sizes for the outer construction of the cool room as well as front room, and clamped with each other to provide stability to the entire structure.

The various dimensional parameters of the structure is as below:

- Coolroom Outer Dimension: 80”×101”×123”
- Coolroom Inner Dimension:69.25”×92”×115”
- Cool room door dimension: 1.25”×36”×78”
- Front room dimension : 56”×101” ×80”
- Floor area: 55 sq-ft
- Temperature range: 1-4 ^{0}C.

Working of COOL Bot



Installation of COOLBot system

3.4.2.2 Development of Maize Cum Potato Planter Attachment With A Power Tiller

i) Design and development of different component of a potato planter like hopper, tuber cups, cup belt, duct, furrower and bund former have been completed.

ii) Higher the speed of the belt, the more uniforms the deposition of the potatoes at zero horizontal velocity.

This was due to the fact that the opening, allowing the potato to drop, is created quicker.

This leaves less effect of shape of the potato and the positioning of the potato on the cup.

iii) Maize cum potato planter attachment with a power tiller has been developed.

Table 3.3 Specification of maze cum potato planter

Particulars	Units
Diameter of ground wheel	**15”**
Distance between ground wheels	24”
Frame s ize	30×18”
Diameter of furrow wheel	13.5”
Width of bund former	Front -18” Back – 8”
Hopper size	Top -16.5×15.25” Bottom -8×2.5” Depth-14.5”
Thickness of shaft	1.25”
No. of cups to lift potato	24 (variable)
Distance between cups	6”(var iable)

3.4.2.3 Design & Development of Cereal Flaking Machine and Study on Flaking Mechanism

i) The physio-chemical properties of Maize & Sorghum have been analyzed & protein content (g/100g) was found 9.2 & 7.75 respectively. Sphericity of Maize & Sorghum was found 62.6 per cent & 71.25 per cent respectively.

ii) Hydration characteristics of Maize & Sorghum was studied on different temperature (30°C, 50°C, 60°C, 80°C & at room temp) & different soaking time (30, 60, 90, 120, 150, 180, 210 & 240 minutes) & the hydration behavior of maize & sorghum shows a linear correlation between moisture content on different temp and soaking time.

iii) Work is under progress, and an available machine is going to be tested under this.

3.4.2.4 Postharvest Losses Prevention in Rice and Lentil in Bihar

In this project two districts Bhagalpur and Banka were identified, and in each districts two block has been chosen i.e., Goradih and Kharik blocks in Bhagalpur district and Rajuan and Chanan blocks in Banka district. 8 villages in each block were identified to provide all the proven post harvest technologies to minimize post harvest losses in Rice and Lentil. So, at total 32 villages have been identified for this work. The data collected from survey work for the assessment of postharvest losses has been compiled in the provided software and has been completed as per the given format. In technology intervention a STR dryer has been fabricated for the drying of cereal crops as well as pulses crops. The fabricated STR has been tested for Paddy and Maize crop and the technical dimension of STR dryer with testing results has been described below.

Technical Details of STR dryer

1. Power Source: Ag. Residue / Coal
2. Diameter: 110 cm (outer), 30 cm (inner)
3. Height: 130 cm
4. Fan (AC & DC, 230 V) : 23 cm (blade dia.), rpm=1400
5. Power source for Fan : Solar Panel / Electrical
6. Drying Time: 2-10 Hours
7. Capacity: 200 - 500 Kg.
8. Connecting Pipe : 185 cm (length), 12.5 cm (diameter) & insulated with Teflon sheet

Table 3.4 Result of STR dryer testing

Parameters	Paddy Crop		Maize Crop
	Rajendr a Sweta	Sabour Surbhit	DHM117
Initial Weight (Kg)	434	490	480
M.C (w b, %)	12.50	11.75	13.50
Outside RH (%)	58	65	61
Wet bulb Temp (^{0}C)	27	28	26
Dry bulb temp (^{0}C)	34	36	35
Warm Air Velocity (m/s)	10.5	12.5	11.5
Final Weight (Kg)	422.5	481	464
Final m.c (wb, %)	10.11	10.15	10.50

3.4.2.5 Mechanization Gap Study in Different Farm Operations in Bihar

Approval has been taken from JDA (Engg) regarding the prepared proformas for farm power availability and mechanization gap study. List of surveyors from all 12 districts has been

i) received as nominated by respective DAO. Guidelines and workplan for the surveyors has been prepared.

ii) One day training was organized for surveyors (Ag. Coordinators/Technical Asstt.

i) Manager/Kisan salahkar) from selected districts on 19th Nov & 27th Dec 2016 for filingup of two different proforma on farm power availability and mechanization gap study respectively.

ii) Survey works under selected 12 districts are under progress. Surveyors have been instructed to submit the survey data after completion of each block of respective districts for further compilation of final report.

3.4.3 Vegetable and Floriculture

3.4.3.1 Value Addition of Flowers through Dehydration Techniques

Hot air oven drying at 50°C for 24 hrs, microwave oven drying in the microwave oven for 2 minutes at 50°C temperature, press drying method, where flowers/leaves are kept directly between blotting sheets placed between two flat boards of wood and corner screw are tightened for 7-10 days at room temperature have been utilized for drying of flowers and foliage. Sixty novel flowers/weeds/plant parts suitable for dry flowers have been identified. Flowers comprised of Straw flower, Paper flower, Calendula, Corn flower, Rose, Gomphrena,

Dog flower, Ursenia, Gerbera, Gulmohar, Verbena, Cineraria, Phlox, Lupin, Tulip. Leaves of Dracaena, Thuja, Fern, Lupin, Nasturtium, Coreopsis, Amhertia, Ficus, Bambusa, Chrysanthemum have been found suitable. Grasses likeDoob grass, Brumus, Briza, Goose grass, Crab Grass and weeds, *viz*., Ageratum, *Sorghumhalepense*, *Phalaris minor*, *Digeriaarvensis*, *Napier* grass, Gajri grass, Crab grass, Parthenium leaves, Krishna Neel grass have been identified promising for dry flowers. Ocimum inflorescence, candytuft peduncle, tassels of maize, wheat panicles, coleus inflorescence, bract ofHeliconia, Delonix seed cover and Fennel flowers have also been found to perform well for production of dry flower and foliage products. Best drying methods have been identified for different flowers and plant parts which are as follows:

Flower/plant part/weeds/grasses	**Best drying method**
Dendrobium spp., Ur senia, Coreopsis, *Digeriaarvensis,* gajri , krishneel *grass,* Coleus and tulsi inflorescence	Press drying at room temperature 5-6 days (summer) 9-10 days (Winter)
Bottle brush, Brumus, Briza and goose grass, Fennel flowers, candytuft peduncles, Napier Gra ss, Heliconia Bracts	Air drying at 35 -40^{O} C for7-8 days (summer)
Larkspur and Lupin (12 hrs.), Gerbera (16 hrs.), Dog flower and Salvia (10 hrs.), Gaillardia (14 hrs.)	silica gel drying in hot air oven drying 45^{O}Cand press drying in microwave oven (180 seconds)/Press drying in room temperature for 7-8 days
Candytuft (10 hrs.), Gulmohar, Verbena	Silica gel drying in hot air oven at 50^{O}C (12 -16 hrs)
Tulip (16 hrs.)	Silica gel 16 hrs. in hot air oven --40^{O}C
Parthenium leaf	Microwave drying (45^{O}C)80 sec., press drying 7 -8 days
Leaves of Lupin, Amhertia and Nasturtium	Press drying in room temperature (30-35^{O}C) 5-6 days
Chrysanthemum leaves	Microwave drying at 50^{O}C for 120 seconds

Production of dry flower products, *viz*., sceneries with different themes, pen stand, book mark, coaster, table mats, file covers, paper weight, photo frames, greeting cards and dry flower arrangement have been initiated in BAU campus. Benefit cost ratio of the value added products have been calculated and found to range from 1.75 (for laminated greeting card and pen stand) to 3.33 (for 10" × 8" sceneries with fine work). Wild/ unutilized/extra produced flowers or even weeds merged with waste house-hold materials can be transformed into value added products by using simple dehydration techniques. These methods are so easy that it can be practiced by illiterate womenfolk or even by physically challenged group. A cottage –scale industry based on floral craft can come up as self employment of unemployed youths for earning extra income in the family especially to the farmer family to reduce financial stress during crop failures.

3.5. Social Science

3.5.1 Agricultural Extension Education

3.5.1.1 Assessment of Production System Constraints and Development of Research And Extension Recommendation Domains for the Major Farming Systems of Zone II and III A

The project is being implemented to develop the research and extension priorities for the university. Selection of the districts for the survey work and the development of survey schedule is complete and the data collection process is underway. It was observed that Rice-wheat based cropping system is predominant in study area, followed by Maize based cropping system. In few districts like Katihar, Kishanganj and Purnea; Makhana was the predominant crop. Litchi and Mango are the major horticultural crops in the study area. Hence, the further study will be focused on the production systems that include above said crops. Collection of the data from the farmers is under progress in this project.

3.5.1.2 Impact of Successful Self Help Group of Bhagalpur District of Bihar

The Project was implemented to assess the impact of already developed Self-Help Groups which is successful in Bhagalpur district. It also developed a model SHG by keeping in mind all the positive factors/qualities of those successful SHGs where women groups are running their enterprises smoothly. The in-depth study has been carried out by knowing the working pattern of 5 SHGs. The impact study has been done by knowing all type of impacts accrued in the life of SHG members. A SHG model has been developed for the further promotion of SHG at Raipur village in Sabour block having maturity of two years has been made having 12 group members nearby, with an objective of to motivate them as well as to establish certain enterprise with the financial support they are getting with the organization with which they are connected from last two years. It has been concluded that there was an urgent need to motivate and aware those women in respect of their recognition in their family as well as in the society especially who are involved in SHGs by different training programme related to their enterprises.

3.5.1.3 Manage-bau Collaborative Research Project

Videos for Farmers By Using Mobile Phones With Low Cost Sd Cards

The project is implemented to understand farmers' agricultural video viewing behaviour, to assess the level of awareness, knowledge and level of adoption of farm practices due to digital videos and to evaluate the cost-effectiveness and impact of the digital videos on farmers' farm productivity. SD card were distributed to the 2500 farmers in the state of Bihar through 25 KVKs under the jurisdiction of BAU, Sabour. The SD card contains 20 technical videos in agriculture collected from various sources. The development of questionnaire and data collection is under process for the project.

3.5.1.4 Participatory Video Production for Reaching the Unreached

The overall objective of this project is to develop participatory video and analyse the impact of the videos among the farmers. A total of seven participatory videos have been developed while 3 videos are in the pipeline. After completion of the development of all 10 videos, impact analysis will be conducted.

3.5.2 Agricultural Economics

3.5.2.1 Production and Marketing of Onion in Bihar

The project aims at studying the production and marketing scenario of Onion in Bihar with study site of Nalanda and Sheikhpura district in Bihar. The sample size is 120 farmers for which multi stage sampling technique is adopted for study. The study revealed that the mean value of area and production and productivity of onion continuously increased from first decade to the fourth decade (Study period: 1975-2014). During the whole study period mean value of production increased more than compared to area and productivity.

From this, we can conclude that farmers of Bihar state were growing more onion from last four decades because of its high value and high foreign earnings capability. Greater increase in area during fourth decade was mainly due to vast increase in area of onion from year 2007 to year 2008. Because of the rise in prices of onion during October, 2005 attributed mainly due to delayed sowing of kharif onion in major producing States.

whole period to be 21.91('000 ha), 302.10 ('000 MT) and 10.50 (Tonne/ha) respectively.

However, the policy decision to import onion again led to steep fall in the prices of onion. The prices of onion during October and November, 2005 were in the range of Rs.1000-1500 in major markets and declined to Rs.300-500 during January and February, 2006. Again prices of onion during from 2007 to December, 2010 revealed that, the price touched a high of more than Rs.6000 in the case of major market of India

(Gummagolmath 2012). Mean value of area, production and Productivity were found during

Table 3.5 Mean of area, production and production of onion in Bihar

Period	Area ('000 ha)	Production ('000 MT)	Productivity (t ha^{-1})
1975 -1984	13.52	98.05	7.24
1985 -1994	15.23	131.6 3	8.65
1995 -2004	16.98	151.20	8.83
2005 -2014	41.90	827.54	17.28
1975 -2014	21.91	302.10	10.50

Table 3.6 Standard Deviation of area, production and production of onion in Bihar

Period	Area	Production	Productivity
1975 -1984	1.12	14.00	0.75
1985 -1994	1.60	13.52	0.37
1995 -2004	2.95	40.30	1.12
2005 -2014	18.44	497.18	6.46
1975 -2014	14.63	385.30	5.05

Table 3.7 Coefficient of variation of area, production and production of onion in Bihar

Period	Area	Production	Productivity
1975 - 1984	8.32	14.28	10.30
1985 - 1994	10.48	10.27	4.23
1995 - 2004	17.35	26.65	12.71
2005 - 2014	44.01	60.08	37.41
1975 - 2014	66.78	127.54	48.13

The standard deviation of area, production and productivity of onion was found to continually increase from first decade to fourth decade. But value of SD was found more during the fourth decade i.e. 2005-2014. It was due to sudden increase in area in the year 2008 (51.6 thousand hectare) from 2007 (14.6 thousand hectare). It was

Table 3.8 Compound growth rate of area, production and production of onion in Bihar

Period	Area	Production	Productivity
1975 -1984	1.7	2.6	0.9
1985 -1994	2.6	2.3	-0.3
1995 -2004	-3.5	-2.7	0.8
2005 -2014	17.5	34.4	14.4
1975 -2014	3.2	5.8	2.5

The coefficient of variation of area and production and productivity of onion was found to continuously increase from first decade to fourth decade. Based on the value of the coefficient of variation, greater instability was observed in fourth decade followed by third, second and first decade and lowest instability in area of onion was observed in first decade while lowest instability in production and productivity of onion was found during the second decade. In whole study period coefficient of variation of area, production and productivity of onion were found 66.78, 127.54 and 48.13 respectively. This means that higher instability was found in production of onion followed by area and yield of onion. Table 5.4 indicates that compound growth rate of area, production and productivity of onion. The project concludes that the growth performance of onion in Bihar during the last four decade gained the area at the compound growth rate of 1.7% per annum. The production of onion registered highest growth rate during this decade that was 2.9 %, despite an increase in productivity at slow pace. During the second decade performance of the onion in area and production was much better than first decade but onion lost the productivity at the compound growth rate of 0.3%

due to either price of onion which was very high in 2007 adding more area in next year 2008 by the state. Standard deviation of area, production and Productivity found during period were 14.63, 385.30 and 5.05 respectively

per annum. During the third decade performance of onion was very poor and onion lost the area and production with compound growth rate 3.5 % and 2.7 per annum due to the area of onion in 2001 was reduced than compared to 2000 due to price reached at recorded level (Rs 26.32/ kg) in 1998 and after 1999 to 2000 it started declining due to market interventions involved in stabilization of price through procurement of onion when/ where the price were low and distribution to consumer at reasonable price when the ruling retail market price were high and due to low price of onion in 2000 the area of onion in 2001 was reduced than compared to 2000. During the fourth decade performance of onion was recorded much better and onion gained area, production and productivity at a compound growth rate 17.5%, 34.4% and 14.4% per annum during the study period. It was due to increase in area in the year 2008 (51.6 thousand hectare) just from 2007 (14.6 thousand hectare) because of the rise in prices of onion during the year 2006 and 2007 mainly due to delayed sowing of kharif onion in major producing states. Finally, onion gained the area, production and productivity at a compound growth rate 3.2%, 5.8% and 2.5% per annum. Similar trends were found in the calculated value of the mean, standard deviation, coefficient of variation and compound growth rate during the study period.

3.5.2.2 Market Mapping Rural Entrepreneurship Development through Market Linkage

The project aims to study the rural entrepreneurship development through market linkages. The identified channels for marketing of fruits and vegetable in study area were Farmer-Commission agent - Large Retailers- consumers However for dairy, *sudha* dairy was main collection centre located in some villages only at lower cost than market.It has been observed that only 25 per cent of total produced reached into the market, 50 per cent get

consumed and remaining 25-30 percent get wastage. The major problem faced by the farmers were receiving low price of produce, not aware about market, market information, poor linkage or no integration in the market, or among the producers. Factors such as poor road infrastructure, illiteracy, financial constraints, poor communication means and lack of access to information, all limited their access to markets. These smallholders depend on traditional means of communication and sell their produce at the farm gate and local markets. This has not been fruitful for these poor farmers as traders, intermediaries and other stakeholders in the chain take a large share of their produce. As a result, rural farmers remain poor and agriculture contributes little to their income, economy and welfare. The study concludes that the producers' share in wholesale price continues to be small (about 35 %) with the major share going to market intermediaries as marketing cost, because of inefficient supply chains. Therefore, supply chain management may be a powerful tool in linking farmers to the markets for sustainable income generation.

3.5.2.3 Impact of Withdrawal of Fertilizer Subsidy on its Consumption & Crop Production in Bihar

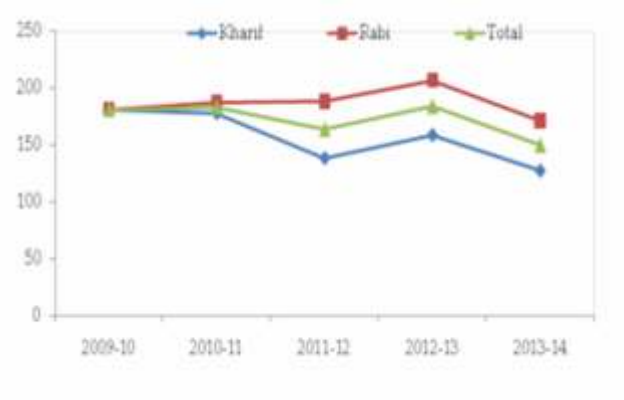
The study was conducted in five districts of Bihar state selected purposively, i.e. those where constituents Agriculture/Horticulture Colleges of BAU are located, viz. Bhagalpur, Purnea, Saharsa, Nalanda and Buxar. Further the sample farmers were selected with the help of Multi-Stage Sampling Technique. The study was conceived in order to study the impact of withdrawal of fertilizer subsidy on its consumption and crop production in the state of Bihar. The progressive agriculture has an important role to play in the economic growth of any country. It helps in initiating and sustaining the development of other sectors of the economy. After independence the Govt. of India adopted a positive approach and specific programmes like new agriculture technology were introduced. The Indian farmers being poor were not in a position to buy these expensive inputs in the form of new technologies. Then scheme of subsidies on the purchase of various agriculture inputs introduced. The present study was envisaged to look into different aspects including farmers' opinion after the withdrawal of subsidy. Based on the results, the conclusion drawn is that the amount of subsidy on fertilizer has increased during post liberalization period, i.e. from Rs. 4389 crores in 1990-91 to Rs. 72970 crores of rupees in 2014-15. In terms of percentage it has increased by 1562 per cent since 1990-91.

Table 3.9 Central subsidy on fertilizer (Rs crore)

Year	Subsidy (Rs Crore)	Percent increase to period /previous year	Percent increase to 1990 -91
1990 -91	4389	-	-
1995 -96	6735	53.45	53.45
1999 -2000	13244	96.64	201.75
2004 -05	15879	34.03	261.79
2009 -10	61264	-36.58	1295.85
2014 -15	72970	7.35	1562.57

The study highlights the existence of fair degree of equity in distribution of fertilizer subsidy among farm size. The small and marginal farmers have a larger share in fertilizer subsidy in comparison to their share in cultivated area. Therefore reduction in fertilizer subsidy would likely to have adverse impact on fertilizer consumption, crop production and income of marginal and small farmers as they do not benefit from higher output prices but do benefit from lower input prices. In view of increasing population, urbanization, industrialization as well as other developmental activities, the number of marginal and small holding at national as well as state (Bihar) level has increased to 84.9 and 96.3 per cent, respectively and the average size of holding has decreased to 1.16 ha (India) and 0.39 ha (Bihar). The marginal and small farms are considered as subsistence farms as do not yield surplus. Therefore the situation is becoming more challenging to meet the increasing demand of food and other articles from declining land and operation holding. Per hectare use of N, P and K has increased in Bihar as well as at national level. In the year 2010-11, quantity of potash recorded significant increase in Bihar as well as at national level due to which the NPK ratio improved towards balance. Earlier the farmers of Bihar were using higher dose of nitrogen as comparison to P and K. The fertilizer application in *kharif* and *rabi* season has decreased during 2009-10 to 2013-14 periods. In *kharif*, the decrease was 29.68 per cent while in *rabi* season it was 5.40 per cent. The NPK ratio was imbalance (14.8:1.7:1.0) in 2004-05 in the state, which to 8.4:2.6:1.0 in 2011-12.

The study examined that per ha use of fertilizer under paddy and wheat cultivation has increased during the period; 1991-92 to 2006-07 on all category of farms. In terms of per cent potash has registered higher increase by all categories of farms in both the crops. It is interesting to note that the marginal and small category farmers have registered higher increase as compared to other category of farms in both the crops



Season-wise Fertilizer Consumption (Bihar)

Marginal and small farmers used more balance dose of fertilizer as compared to large farmers in both the crops. The large farmers were found using higher quantity of nitrogen though it has decreased between the two periods. While comparing data of paddy and wheat it revealed that all categories of farmers were using higher dose of nitrogen fertilizer in increasing order of size of farms, i.e. higher quantity by large farmers and lower by marginal farmers. The knowledge about the fertilizer being made available to farmers on subsidy was found with 49 per cent of sample farmers. The highest level of 65 per cent was with Nalanda farmers followed by Buxar (60 per cent). As far as withdrawal of subsidy is concerned only 16 per cent of the farmers were having knowledge about the Government's decision about the withdrawal of subsidy on fertilizer. Twenty eight per cent farmers felt that the fertilizer dose would be reduced while 17 per cent felt crop area would be reduced, if subsidy withdrawn. The 89 per cent of farmers were of the opinion that the Government should not withdraw subsidy on fertilizers. With the progressive reforms in fertilizer policy, fertilizer consumption, food grain production rose significantly, simultaneously subsidy also increased manifold over the years. However, crop response to plant nutrient has gradually dropped which may due to many factors including fertilizer/nutrient management

Table 3.10 Consumption of fertilizer (all crops)

Year	Kg/ha			Ratio		
	N	P	K	N	P	K
	BIHAR					
1990-91	41.6	11.1	4.3	9.7	2.6	1.0
1995-96	59.7	12.6	4.7	12.7	2.7	1.0
1999-2000	70.2	21.0	6.5	10.8	3.2	1.0
2004-05	78.5	9.0	5.3	14.8	1.7	1.0
2010-11	121.1	38.7	20.8	5.8	1.9	1.0
2011-12				8.4	2.6	1.0
	INDIA					
1990-91	44.4	17.9	7.4	6.0	2.4	1.0
1995-96	53.0	15.6	6.2	8.5	2.5	1.0
1999 2000	61.3	25.3	9.0	6.8	2.8	1.0
2004-05	61.4	24.3	10.8	5.7	2.3	1.0
2010-11	86.2	42.1	18.3	4.7	2.3	1.0
2011-12				6.7	3.1	1.0

4. EXTENSION EDUCATION

Directorate of Extension Education is responsible for planning, organizing, coordinating, monitoring and evaluation of the extension activities of the university through its associated colleges, research stations and Krishi Vigyan Kendras (KVKs) spread across three agro-climatic zones (II, IIIA & IIIB) of Bihar. Extension education is the continuous effort comprising of demonstration, field trials, farmers' fair and such other activities for well acquaintance of the farmers with the recent technologies generated to increase agriculture production and productivity. Keeping in view the needs of farmers, the Directorate of Extension Education along with constituent units of the university is actively involved in transfer of proven and appropriate technologies to the farmers, livestock owners, rural youth, extension functionaries of state government and other personnel engaged in developmental and professional activities in the field of agriculture and allied sectors through its well planned, skill-oriented and need based programmes. The Directorate of Extension Education acts as bridge between the agricultural scientists, farmers and other stakeholders who are involved in the extension activities. Therefore, the role of the Directorate is two fold, *i.e.* to transfer of technologies from farm scientists to the end users through field functionaries and to find out and communicate the agricultural problems faced by the farmers to the scientists.

4.1 Front Line Demonstration

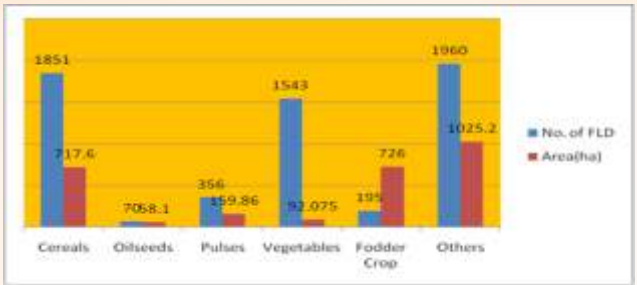
Front Line Demonstrations (FLDs) are the unique approach to facilitate the direct interaction between researchers and farmers as the scientists are directly involved in planning, execution and monitoring of the demonstrations for the technologies developed by them. FLDs provide an opportunity to get direct feedback from the farmers about the crops and technology being developed and demonstrated by research institutions. This enables the scientists to improvise upon the research programme accordingly. In FLDs, the subject matter scientists provide technological inputs to extension scientists to organize the demonstrations. Thus, FLDs provide an opportunity to researchers and extension personnel to understand the farmers' resources and constraints. This is further instrumental in refinement and modification of the technologies so as to make technologies readily adaptable at farmers' fields.

Front Line Demonstration in Lentil

Frontline Demonstrations (FLDs) were conducted by KVKs to demonstrate the production potential of newly released crop varieties, production technologies, Animal Husbandry and other agriculture related enterprises. These demonstrations are enriched by training and field days for extension The FLDs were conducted in all the twenty KVKs on various crops including cereals, oilseeds, pulses, vegetables, fodders and other crops as well. Altogether 5975 FLDs were conducted in 2778.835 ha area (Table 4.1).

Table 4.1 Front Line Demonstrations conducted through KVKs on different crops

Name of KVK	Cereals		Oilseeds		Pulses		Vegetables		Others		Fodder Crop	
	No. of FLDs	Area (ha)	No. of FLDs	Area (ha)	No. of FLDs	Area (ha)	No. of FLDs	Area (ha)	No. of FLDs	Area (ha)	No. of FLDs	Area (ha)
Araria	32	13.0	-	-	40	16.5	84	7.3	347	181.2	-	-
Arwal	270	125.5	-	-	40	6.0	38	3.0	46	26.0	-	-
Aurangabad	36	15.0	15	5.5	46	16.0	30	0.5	-	-	-	-
Banka	134	45.7	11	35.0	-	10.0	225	8.8	300	41.0	19	42.0
Bhagalpur	155	71.0	-	-	69	27.5	134	3.27	-	-	-	-
Gaya	101	35.8	-	-	-	-	18	2.0	-	-	-	-
Jehanabad	49	15.44	-	-	-	-	46	0.88	55	21.25	88	509.0
Katihar	103	31.0	-	-	15	2.5	20	1.4	80	16.0	-	-
Khagaria	32	13.6	-	-	-	-	-	-	-	-	30	150.0
Kishanganj	135	51.08	25	10.0	-	-	161	4.5	292	403.5	-	-
Lakhisarai	177	50.65	-	-	21	7.36	-	-	-	-	-	-
Madhepura	167	47.03	-	-	-	-	302	11.5	84	12.0	-	-
Munger	60	17.0	-	-	-	-	55	7.16	45	10.0	-	-
Nalanda	32	30.0	-	-	-	-	59	12.5	200	160.0	-	-
Patna	75	18.0	16	6.4	41	14.0	10	0.3	44	1.25	-	-
Purnea	21	10.0	-	-	-	-	76	3.0	50	12.0	-	-
Rohtas	50	16.0	-	-	10	20.0	155	16.0	56	18.0	-	-
Saharsa	36	18.0	-	-	17	6.0	9	1.0	8	19.0	-	-
Sheikhpura	90	44.8	-	-	24	10.0	60	6.0	180	48.0	1	20.0
Supaul	96	49.0	-	-	33	24.0	61	3.0	173	56.0	57	5.0
Total	**1851**	**717.6**	3	1.2	**356**	**159.86**	**1543**	**92.11**	**1960**	**1025.2**	**195**	**726**
			70	**58.2**								
										Total number of FLD	**5975**	
										Total area of FLD (ha)	**2778.87**	

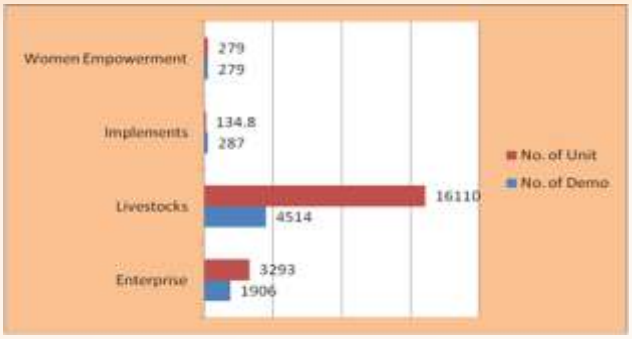


Number of FLDs on different crops and its area (ha)

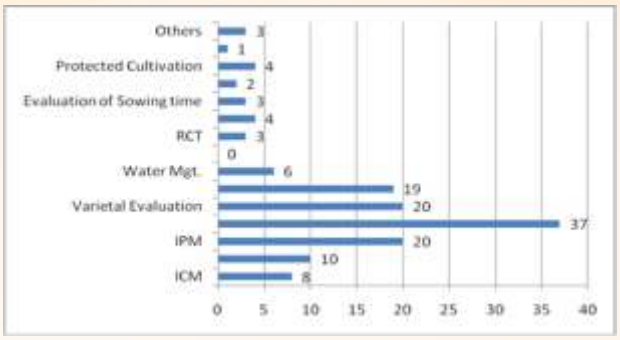
FLD are also conducted on different farm enterprises, livestock, implements and women empowerment. A total 6986 such demonstrations were conducted and 19816.8 units were created.

Table 4.2 Front Line Demonstrations conducted through KVKs on agriculture and allied fields

Name of KVK	Enterprise		Livestock		Implements		Women Empowerment	
	No. of Demo	No. of Unit	No. of Demo	No. of Unit	No. of Demo	No. of Unit	No. of Demo	No. of Unit
Araria	20	20.0	-	-	-	-	-	-
Arwal	68	68.0	230	230.0	-	-	-	-
Aurangabad	135	135.0	44	44.0	-	-	-	-
Banka	200	200.0	438	4069.0	14	3.5	108	108.0
Bhagalpur	664	2055.0	1699	2330.0	20	10.0	25	25.0
Gaya	100	100.0	160	20.0	-	-	-	-
Jehanabad	23	23.0	120	802.0	41	16.3	-	-
Katihar	110	100.0	30	1500.0	-	-	-	-
Khagaria	63	63.0	253	500.0	6	2.4	-	-
Kishanganj	35	35.0	436	1510.0	-	-	-	-
Lakhisarai	3	3.0	-	-	-	-	31	31.0
Madhepura	-	-	247	2000.0	-	-	-	-
Munger	40	40.0	-	-	85	53.0	-	-
Nalanda	41	41.0	315	820.0	-	-	15	15.0
Patna	80	80.0	-	-	-	-	-	-
Purnea	95	95.0	254	1145.0	-	-	-	-
Rohtas	80	80.0	253	1105.0	-	-	100	100.0
Saharsa	105	105.0	10	10.0	37	16.0	-	-
Sheikhpura	34	40.0	25	25.0	-	-	-	-
Supaul	30	30.0	-	-	84	33.6	-	-
Total	**1906**	**3293**	**4514**	**16110**	**287**	**134.8**	**279**	**279**
					Total number of FLDs		**6986**	
					Total No. of units		**19816.8**	



Number of FLDs conducted and its unit (ha)



OFT conducted on various aspects of crop production

FLDs were also conducted at IARI Post Office project unit at Kishanganj for the crops of mustard, spinach, fenugreek, carrot and radish. For the technology PM-28(mustard) 5 demonstrations were conducted in 3 ha area. Similarly, FLD was conducted for PEB (fenugreek), Pusa Viristhi (carrot) and Pusa Chetaki (radish).

4.2 On-Farm Trials

Agricultural research has traditionally been

On Farm Trail in Wheat

undertaken on research stations where facilities for experimentation are usually available and accessibility to researchers is favourable. It was assumed long time ago that the best technology in research stations is also the best one in the farmers' fields. Number of On-Farm Trials (OFTs) are conducted by different KVKs of the university in different thematic areas *viz.* ICM, IDM, IPM, INM, varietal evaluation, weed management, water management, storage techniques, RCT, farm technology, evaluation of sowing time, crop production, protected cultivation., etc. The thematic areas of livestock OFT were dairy management, animal nutritional management, feed and fodder management, disease management and breed evaluation. In total 183 OFTs were conducted, out of which maximum OFTs were conducted in INM (37) followed by IPM (20), varietal evaluation (20) and weed management (19).

4.3 Cluster Frontline Demonstrations

Cluster FLD was conducted for rapeseed and mustard varieties *viz*. UTRA, RNG-48, Rajendra Suflam and Pusa Mahak. Altogether 1411 CFLD were conducted in 575 ha area and maximum yield increase (103%) was observed in RNG-48 variety

Cluster FLD on Chickpea

at Sheikhpura KVK. Three varieties (Krisha, RT-351 and Tilotama) of sesame were demonstrated in 100 ha area in 223 plots and maximum yield increase was noted in Tilotama variety. The CFLDs were also conducted for soybean (var. PS-1042), linseed (var. Shekhar, Shubhra, Azad Alsi-1) and sunflower (var. KBSH-41 Subrid). Altogether 2454 CFLDs were conducted in 1053 ha land for the aforesaid crop varieties. CFLD also conducted for lentil (var. HUL-57, Arun and IPL-406) , green gram (var.- IPM-2-3, HUM-16, SML-668), pigeon pea(var.- BSMR-736, Malviya-13, PUSA-9, LRG-41), field pea (var.- HUDP-15, TUSIA) and chick pea (var.- BGM-547, GNG-1581) and for these crop altogether 4024 demonstration was conducted in 1463.5 ha land.

Table 4.3 On Farm Trials (OFTs) conducted through KVKs on various aspects of crop production

Name of KVK	Thematic area																
	ICM	IDM	IPM	INM	Varietal evaluation	Weed mgt.	Water mgt.	Storage technique	RCT	Farm technology	Evaluation of sowing time	Crop production	Protected cultivation	Nursery raising	Others	Total	Result awaited
Araria	-	-	2	1	1	-	-	-	-	-	-	-	-	-	2	6	2
Arwal	1	-	2	1	1	-	-	-	-	-	-	-	-	-	-	5	-
Aurangabad	-	-	-	-	1	2	-	-	2	2	-	-	-	-	-	7	3
Banka	-	1	-	2	-	3	-	-	-	-	-	-	-	-	-	6	-
Bhagalpur	-	-	-	2	1	-	-	-	1	-	-	-	-	-	-	4	7
Gaya	-	1	2	2	1	1	-	-	-	-	-	-	-	-	-	7	2
Jehanabad	1	2	2	1	-	1	2	-	-	-	1	-	-	-	-	10	1
Katihar	-	-	-	2	-	1		-	-	-	-	1	1	-	-	5	5
Khagaria	1	1	-	1	-	2	-	-	-	-	-	-	-	-	-	5	-
Kishanganj	-	1	2	3	2	1	-	-	-	-	-	-	-	-	1	10	5
Lakhisarai	1	-	4	1	3	1	-	-	-	-	-	1	-	-	-	11	-
Madhepura	2	-	1	3	1	1	-	-	-	-	1	-	-	-	-	9	-
Munger	-	-	-	1	-	1	2	-	-	-	-	-	-	-	-	4	1
Nalanda	-	-	2	3	2	1	-	-	-	-	-	-	-	-	-	8	-
Patna	-	1	1	2	2	-	-	-	-	-	-	-	-	-	-	6	2
Purnea	-	-	2	2	-	-	-	-	-	-	-	-	2	-	-	6	-
Rohtas	-	-	-	2	-	1	-	-	-	1	1	-	-	-	-	5	4
Saharsa	1	1	-	2	1	1	2	-	-	-	-	-	1	-	-	9	4
Sheikhpura	-	2	-	2	2	1	-	-	-	-	-	-	-	-	-	7	-
Supaul	1	-	-	4	2	1	-	-	-	1	-	-	-	1		10	2
Total	**8**	**10**	**20**	**37**	**20**	**19**	**6**	**0**	**3**	**4**	**3**	**2**	**4**	**1**	**3**	**140**	**38**

Table 4.4 On Farm Trials (OFTs) conducted through KVKs on livestock and allied areas

Name of KVK	Thematic Area											
	Livestock					Home Science			Enterprises	Others	Extension	Total
	Dairy & mgt.	Nutrient mgt.	Feed & fodder	Disease mgt.	Breed evaluation	Drudgery reduction	Food & nutrition	Value addition				
Araria	-	-	-	-	-	-	-	1	1	-	-	2
Arwal	1	-	-	1	-	-	-	-	-	-	-	2
Aurangabad	-	-	-	-	-	-	1	-	-	-	-	1
Banka	-	-	4	1	-	-	-	-	-	-	-	5
Gaya	1	1	-	-	-	-	-	1	1	-	1	5
Jehanabad	-	-	2	-	-	-	1	-	1	-	-	4
Katihar	-	-	-	-	-	-	-	1	-	-	1	2
Kishanganj	-	-	2	-	-	-	-	-	-	-	-	2
Lakhisarai	-	-	-	-	-	-	-	2	-	-	-	2
Madhepura	-	1	1	-	-	-	-	-	-	-	-	2
Munger	-	-	-	-	-	-	-	2	-	-	-	2
Nalanda	1	-	-	1	-	-	-	-	1	-	-	3
Purnea	1	-	-	1	-	-	-	-	-	-	-	2
Rohtas	-	1	-	-	-	2	-	-	-	-	-	3
Saharsa	-	-	-	-	-	-	-	1	-	-	-	1
Sheikhpura	-	1	-	1	-	-	-	-	-	-	-	2
Supaul	-	-	-	-	2	-	-	-	-	-	1	3
Total	4	4	9	5	2	2	2	8	4	0	3	43

Table 4.5 Cluster frontline demonstrations conducted on oilseed and pulse crops

Oilseed crop	No. of Cluster FLD	Area (ha.)
Oilseed crops		
Sesame	223	100
Soyabean	50	20
Sunflower	372	170
Linseed	398	170
Rapeseed & Mustard	1411	575
Total	**2454**	**1035**
Pulse crops		
Pigeon Pea	692	232.00
Lentil	1586	623.75
Field Pea	466	150.25
Chick Pea	897	327.50
Green Gram	383	130.00
Total	**4024**	**1463.50**

4.4 Pre-*Rabi* and Pre-*Kharif* Samellan

Fulfilling the fourth mandate of KVK to act as knowledge resource center, pre-*kharif* and pre-*rabi Krishak Samellan* has been organized in all the KVKs of Bihar Agricultural University. The celebration of *Krishak Samellan* has provided a platform to bring number of stakeholders like farmers, extension workers, input dealers, scientists and other stakeholders under one umbrella. The following activities are adopted in the celebration of these events:

Planning and pre-inception meeting with all stakeholders

Celebration of Pre-*Rabi Kisan Sammelan*

Mobilization/publicity of technology week before the celebration

Display of different scientific know-how through suitable exhibition materials *viz.*, posters, objects, charts, models and live demonstrations etc.

Interaction between scientists, farmers and other stake- holders

Brainstorming of the farmers solving their problems

Media backstopping, sensitization of media about KVK work.

In addition to this, for further enrichment and boosting of knowledge, the KVKs are organizing film shows for the farmers during these events. The *Kisan Goshthi* are organized on regular basis for need based topics like field crop production, horticulture production, women empowerment, animal husbandry and agri-entrepreneurship development. The unique feature of *Kharif* and *Rabi Krishak Samellan* is the focus on best fit approach rather than best technology approach and

convergence of different stakeholders. It has proved to be indeed a great learning experience for the farmers. It is also helping in formulating and designing the research priorities of the university.

Table 4.6 indicates KVK wise details of pre-*Kharif* and *Rabi Krishak Samellan* organized at KVKs of the university.

Table 4.6 Pre-*rabi* and Pre-*kharif* Samellan organized by KVKs

Sl. No.	KVK	Date of Programme	No. of Farmer	Name of the public representative
1.	Nalanda	01.04.2016	405	Sri Kaushlendra Kumar, Hon'ble Member of Parliament, Nalanda
2.	Bhagalpur	05.06.2016 & 05.12.2016	366 &330	Sri Shailesh Kumar Urf BuloMandal, Hon'ble Member of Parliament, Sri Ajay Kumar Mandal, Hon'ble MLA- Nathnagar & Sri A.K. Choudhary, Commissioner, Bhagalpur
3.	Araria	05.12.2016	547	Mr. Amod Kumar Sharan (ADM, Araria) and JDA, Purnea
4.	Arwal	05.12.2016	542	Dr. Ram Kishore Sharma, Member BPSC, Patna
5.	Lakhisarai	05.12.2016	235	Dr. R. P Sharma, Assoc. Dean-cum-Principal, BAC, Sabour
6.	Patna	05.12.2016	423	Dr. R. P Sharma, Assoc. Dean-cum-Principal, BAC, Sabour
7.	Rohtas	05.12.2016	1139	Dr. Ashok Kumar, MLA, Sasaram
8.	Saharsa	05.12.2016	502	Dr. Umesh Singh, Regional Co-ordinator (Zone-II) -cum - Principal, MBAC, Agwanpur, Saharsa, Sri VidyanandYadav, SarpanchOkahi, Saharsa
9.	Munger	11.02.2017	550	Smt. Veena Devi, Member of Parliament,Munger
10.	Aurangabad	11.03.2017	858	Sri Sushil Kumar Singh, Member of Parliament, Aurangabad
11.	Katihar	14.02.2017	666	Sri Tariq Anwar, Member of Parliament, Katihar, Sri Satyanarayan Prasad, Ex-MLA & Sri Abul Shakur, Ex-MLA, Katihar
12.	Kisanganj	17.02.2017	527	Md. Asrarul Haque, Member of Parliament, Kishanganj
13.	Gaya	18.02.2017	435	Sri Hari Manjhi, Hon'ble Member of Parliament, Gaya
14.	Madhepura	18.04.2016 & 22.02.2017	694 & 602	Sri Rajesh Ranjan Urf PappuYadav, Member of Parliament, Madhepura & Smt. Pawan Rekha Devi, Pramukh, Madhepura
15.	Jehanabad	25.02.2017	314	Sri Arbind Kumar Singh,PD, ATMA, Jehanabad
16.	Khagaria	25.02.2017	515	Choudhary Mehboob Ali Kaisar, Hon'ble Member of Parliament, Khagaria
17.	Purnea	02.03.2017	323	Sri Santosh Kushwah, Ho'nble Member of Parliament, Purnea

Table 4.6 Pre-*rabi* and Pre-*kharif* Samellan organized by KVKs (Contd.)

18.	Banka	25.03.2017	820	Sri Jay Prakash Narayan Yadav, Member of Parliament, Banka
19.	Supaul	26.03.2017	648	Smt. Ranjit Ranjan, Hon'ble Member of Parliament, Supaul
20.	Sheikhpura	29.03.2017	1450	Randhir Kumar Soni; MLA Sheikhpura, Shivli Yadav, Chairman, Zila Parishad, Sheikhpura
Total			**12891**	

Over 12891 farmers were registered and these farmers were informed about advanced agriculture techniques.

4.5 Scientific Advisory Committee Meet

Scientific Advisory Committee is an important event of *Krishi Vigyan Kendras*. The KVKs must organize regular meeting of SAC members to get their action plan modified and approved incorporating newer areas of functioning. As the members of SAC represent interdisciplinary field of agricultural development including finance and mass media, mutual exchange of ideas and experiences help the KVKs in carrying out their activities in a focused manner. The members of SAC are also taken to field visit to get an insight of KVK functioning in the farm. Hence, conducting SAC meeting is of immense importance by all the KVKs of BAU. An appraisal of SAC meeting conducted by the KVKs indicates that almost all the KVKs of BAU fulfilled this requirement by conducting at least one SAC meeting during last year. Total 20 SAC meetings were organized and, a total of 977 individuals participated in the year 2016-17.

Scientific Advisory Committee Meet

Table 4.7 Scientific Advisory Committee meeting conducted by KVKs

Sl. No.	Name of KVK	Date of SAC meeting	No. of participants
1.	Saharsa	21.06.2016	37
2.	Madhepura	22.06.2016	55
3.	Supaul	23.06.2016	32
4.	Arwal	06.09.2016	34
5.	Patna	07.09.2016	42
6.	Jehanabad	08.09.2016	41
7.	Purnea	27.09.2016	102
8.	Araria	29.09.2016	33
9.	Aurangabad	15.10.2016	110
10.	Banka	18.10.2016	40
11.	Bhagalpur	19.10.2016	55
12.	Khagaria	20.10.2016	26
13	Munger	15.11.2016	53

Table 4.7 Scientific Advisory Committee meeting conducted by KVKs

14.	Lakhisarai	16.11.2016	50
15.	Sheikhpura	16.11.2016	21
16.	Nalanda	17.11.2016	54
17.	Gaya	14.12.2016	51
18.	Rohtas	16.12.2016	63
19.	Kishanganj	09.01.2017	45
20	Katihar	10.01.2017	33
		Total	**977**

4.6 National Initiative on Climate Resilient Agriculture (NICRA)

NICRA is a network project of ICAR launched in February, 2011 with specific objectives of enhancement of the resilience of Indian agriculture covering crops, livestock and fisheries to climatic variability and climate change through development and application of improved production and risk management technologies, to demonstrate site specific technology packages on farmers' field for adapting to current climate risks and to enhance the capacity of scientists and other stakeholders in climate resilient agricultural research and its application. To fulfill the above mentioned objectives, the output provided under the project is:

Selection of promising crop genotypes and livestock breeds with greater tolerance to climate stress

Existing best practices for climate resilience demonstrated in vulnerable districts.

Infrastructure at key research institutes for climate change research strengthened.

Adequately trained scientific manpower to take up climate change research in the country with empowerment of farmers to cope up with climatic variability.

Under the project, villages susceptible to climate variability were selected under the jurisdiction of KVK Aurangabad, Supaul, Jehanabad and Banka respectively for technology demonstration. The details of major interventions from each of the four KVKs are mentioned below:

4.6.1 KVK Aurangabad

a) Natural Resource Management: In the year 2016-17, an area of 8.0 ha was sown with paddy seeds through zero tillage technique at Harigoan and Baktiyarpur areas during the month of June. Due to use of zero tillage technique in paddy, the crop duration was reduced by 7 to 10 days and yield of the crop increased by 21 to 35 per cent. In this situation, the crop matures earlier so farmers have the scope to sow the wheat and other *rabi* crops in a timely manner. In this method benefits like higher yield, better B:C ratio and low cost of cultivation were realised.

Demonstration of Zero Tillage in Wheat

Table 4.8 Economics of Different Interventions in Rice, Wheat and Lentil

Interventions	Technology demonstrate along with crop	Area (ha)	Measurable indicator crop yield (q/ha)		Economics of demonstration (Rs./ha)			
			Demo	Local	Gross cost	Gross return	Net return	B: C R
Conservation tillage	ZTD in Rice	8	52.18	42.46	28450	83488	55038	2.93
	ZTD in Wheat	38	32.85	27.63	26800	45990	19190	1.71
Water saving irrigation methods	Sprinkler irrigation in lentil	10	16.05	9.12	19500	96300	76800	4.94

b) Crop Production: Harigoan village is mainly dependent on rainfall. Due to late monsoon, some areas are left barren. Short duration varieties like Sahbhagi was sown in late-sown conditions to avoid water stress resulting in good income from barren land.

Table 4.9 Economics of Different Interventions in Paddy

Interventions	Technology demonstrate	Measurable indicators of Yield		Economics of demonstration (Rs./ha)				Economics of Local (Rs./ha)			
		Demo	Local	Gross cost	Gross return	Net Return	BCR	Gross cost	Gross return	Net Return	BCR
Introduction of Short duration Varieties	Variety Sahbhagi	41.37	30.84	27250	55850	28600	2.05	32900	46089	13189	1.40
Line sowing in chick pea	Line sowing	15.93	8.57	85.88	25100	86022	60922	3.43	17500	46278	28778

c) Livestock: Krishi Vigyan Kendra Aurangabad is regularly organizing animal health camp in Harigoan village under NICRA Project. FMD vaccination was provided to 125 animals along with health check-up and provision of mineral mixture to 83 animals. The intervention has resulted in an increase of milk production up to 9 per cent.

4.6.2 KVK Jehanabad

a) Pond renovation for water harvesting and storage under NRM component: Village Sakrorha has some defunct water bodies which are very shallow. Seven such water bodies were renovated as ponds for water harvesting and storage during kharif season. Farmers of this village are using stored water mainly for supplemental irrigation in paddy crop and timely raising of community paddy nursery. Due to ground water recharge by such water harvesting structures, ground water table level of the village has also improved. This intervention benefited farmers of Sakrorha village particularly by saving nursery rice under delayed monsoon condition. This intervention provided protective irrigation for

200 acres of cropped area. Water harvested was used for supplemental /lifesaving irrigation in paddy crop, which prevented crop failure and created irrigation capacity of 414942.3 cubic ft. In *Rabi* season also pond water was used for moisture retention in all *Rabi* crops (wheat, oilseed, pulses, barley, oat etc.).

b) Construction of check-dam for diverting flowing water: Village sakrorha is surrounded by a network of pynes which flow only during monsoon season. Due to lack of sufficient number of barriers at different locations of pynes, water flowing in the pynes goes out of this village area (lower area) and finally falls in drainage channels and rivers. Seven check dams have been constructed at different location of pynes to build-up water head and to divert the flow of water into the farmer's paddy fields which helped in diverting 1028407.4 cubic ft. water and provided irrigation in additional 60 ha area benefitting around 120 farmers in a year.

c) Promotion of Kitchen gardening: The Kitchen gardening has been promoted as an alternate option in NICRA village for timely availability of fresh vegetables and fruits as well as for upgrading health status. Eight models of such kitchen gardens have been already developed by the villagers under the technical guidance of KVK.

d) Promotion of pulses as low water requirement crop: Wheat is a major *rabi* crop in this village but due to less water availability of surface water, farmers have given more emphasis on cultivation of pulses. The cultivation of

Check-dam

improved varieties of pulses crops were promoted in NICRA village as an alternate option in drought situation as these are low water requiring crops. At the same time these are highly remunerative crops with high market value. Due to late monsoon in that area some farmers were not able to grow paddy during *kharif* season, they were motivated to cultivate peagon pea var. NDA-1 in the month of June- July and var. P-9 in September whereas in rabi season Lentil (Var. Arun, HUL 57, KLS-218, PI-8, PI-6), Gram (P-256, GNG 1581, BGM 547) and field pea (Prakash). These varieties gave 18-42% more yield than local varieties.

e) Zero tillage technology for wheat cultivation: Demonstration on wheat sowing by zero tillage conducted in 20 ha land of 15 farmers. This technique saved labour, fuel, time (10-15 days) and irrigation requirement through efficient utilization of residual moisture. Sowing of wheat with zero tillage machine in the standing stubble of rice without any tillage is an innovative practice adopted by the farmers in the village. This year the production of wheat by zero tillage is 39.5 q/ha which is 14.49 % more than traditional cultivation (34.5 q/ha).

f) Promotion of green fodder: A fodder (Oat var. kent) seed bank is running in the village for the availability of fodder seed of oat (var. kent). Villagers are involved in general cultivation of fodder crops. It was observed that during kharif, shorghum (R. Chari) yielded 39.3 % and fodder maize (African Tall) gave 25.94 % more yield as compared to local variety. Similarly, improved variety of Oat-JHO-822 and kent gave 32.51 % and 34.43 % more yield than local. Increase in availability of quality fodder throughout the year resulted into an increase in milk production by 59% and on an average, each farmer's income by Rs.60/animal/day.

g) Drought tolerant/short duration varieties: Short duration drought tolerance paddy variety Sahbhagi were demonstrated on 57 farmers' field covering 38 ha area. The yield was increased with the tune of 15.34 per cent over farmers practice. Farmers observed that the variety mature about 15 days before their traditional variety which solved

the problem of shortage of fodder for animals. Besides this variety, short duration paddy variety Susksmarat, Abhishek, prabhat were also demonstrated among 18 farmers in 5 ha area.

h) Direct seeded rice: Demonstration of direct seeded rice was conducted in 8 ha land with paddy variety R. Sweta and BPT 5204. The yield increase was in the tune of 17.8 to 24.1 per cent over traditional method (36.5 q/ha). Maturity period was found 7 days less in DSR.

I Sprinkler irrigation: Keeping in view less availability of irrigation water in rabi season, demonstration on sprinkler system has been done in wheat (HD-2733, PBW 343) in 12 ha, Lentil (var. HUL 57) in 6 ha, Rai (R. Suflam) in 2 ha and Omum (R. Abha) in 0.5 ha. This system saved water and labour consumption.

4.6.3 KVK, Supaul

a) Installation of bamboo boring for supplemental irrigation: Water harvesting and recycling for supplemental and lifesaving irrigation in which 6 boring has been developed while 14 are in process.

b) Production of organic inputs: To enrich organic matter in sandy soil, 05 NADEP tank has been constructed in village.

c) IFS: Fish cum poultry based IFS system has been developed and Banana suckers were planted on pond embankment among 08 beneficiary farmers.

d) Water harvesting: 05 new ponds were constructed for rain water harvesting.

e) DSR: Short duration variety and flood tolerant varieties of Paddy has been demonstrated in NICRA village Sadanadpur in 38.0 ha with 136 farmers.

f) Seed bank: Seed bank for ensuring quality Paddy & wheat seeds have been developed.

4.6.4 KVK, Banka

a) In-Situ Moisture Conservation: To increase moisture retention and reducing weed intensity summer ploughing was done in 5 ha land of NICRA village.

b) Water Harvesting and recycling for supplemental irrigation: Sand bag check dam was constructed for life saving irrigation in Rabi crops

c) Vermicompost and worm Bank: Improving soil fertility and reducing fertilizer dose 5 units have been constructed in the village.

d) Short Duration Variety: Short duration paddy variety Sahbhagi has been demonstrated on 7 ha land.

e) Livestock & fisheries: 1000 goats of 125 farmers of the village have been vaccinated against PPR. For round the year fodder production, berseem variety Vardan was demonstrated in 5 farmers' field in 1 acre area. Cow pea cultivar EC/4216, cluster bean BG-1, Stylo and Clitoria were demonstrated in 6 farmers' field of Merha village. These fodder crops are suitable in less water condition and are boon for livestock farmers as these farmers are getting 1.2 to 1.5 litres more milk per day per animal. After feeding Stylo and clitoria there were reduce in concentrate amount i.e. 2-3 kg per day. The Pashu chocolate were illustrated as multi nutrient licking block for combating infertility problem in cattle.

f) Capacity building: Training on climate resilient agriculture related to resource conservation technology, contingent crop planning, value addition, feed management in dairy cattle, diversified agriculture etc. have been conducted. In addition to this, 5 field days were organized in this village.

Apart from these, regular activities like Field days, Animal health camp-cum-FMD vaccination awareness, campaign on parthenium eradication was carried out in the NICRA village.

4.7 Farmer First Programme: In order to enhance the income and diversify the livelihood sources of rural households, a farmer centric project entitled "Cross Sectional Livelihood Improvement and Income Enhancement through Agro-Enterprise Diversification" was implemented under the farmer FIRST programme of ICAR. The project was launched on 8th November 2016 in the Birnaudha and Barhari villages of Goradih block in Bhagalpur district.

Later on, considering the need, the project was extended to another tribal dominated village –Shitalpur. The project was aimed at making agriculture more viable from short-term and long-term perspectives by doubling the present income of the farmers. The specific objectives of the project were to

- Enhance farmer-scientist interface with focus on innovations, technology application and feedback for better understanding of farming situations.
- Identify, assess, refine and integrate economically viable and socially compatible technological options or modules for local adaptation, up-scaling and out-scaling.
- Integration of secondary agriculture including value addition and value chain management with local production system based Farmers Interest Groups (FIGs).
- Build multiple stakeholder participation, facilitate farm mechanisation and foster organisational linkages around the farm households for improving access to information, technology, input and market.
- Improve farming literacy and capacity through skill development of stakeholders especially rural youth and women and better communication.

4.7.1 Project interventions: As a part of this project, in order to diversify the income sources more than 150 landless households, small and marginal farmers have been trained for mushroom cultivation, 30 rural households have been trained for beekeeping activity. In order to reducec yield losses in wheat crop, zero tillage and resource conservation technologies are being demonstrated on around 35 acres of farmers' fields. Further the summer crop like moong and other pulses have been extensively promoted to increase cropping intensity.

It was observed that, though vegetable cultivation is practiced in significant farms, the quality as well as the quantity of produce is low due to poor management practices. In order to enhance the quality and quantity of vegetable production, the appropriate varieties were promoted in the project area covering the major vegetable crops like okra, bottle gourd, sponge gourd and bitter gourd. In order to enhance the quality of livestock, the veterinary services like artificial insemination, animal feed block preparation, vaccination etc. are being provided to the project area.

Various activities under Farmers FIRST

4.7.2 Future line of activities: In the coming days project will be aiming at introduction of new rice varieties/medium duration hybrids for upland and medium land ecologies and varieties of around 140 days for low land ecologies and timely sown wheat varieties for shortening the turnaround time between rice and wheat. Further to increase the profitability of horticultural farms project will make attempts to link farmers to market and promotion of value addition under glut situation. To increase the productivity of livestock activities like promotion of artificial insemination, creation of para-vet facilities, ensuring year-round availability of green fodder, improved feed and mineral mixture etc. will be carried out.

4.8 Tribal Sub-plan Project:

In order to address the challenges of low income and livelihood insecurity among the rural tribal households in Banka, Kishanganj and Katihar districts, a project entitled "Enhancement of Livelihood Security of Scheduled Tribe Communities through Agro-technological Intervention" is being implemented by Bihar Agricultural university Sabour in order bring about inclusive and sustainable development of the tribal communities in these districts by imparting of technical know-how of improved agricultural practices, development of vocational skills among rural resource poor schedule tribes and ensuring availability of quality technological input material to the farmers. The specific objectives of the project were

Increasing agricultural production and productivity through dissemination of appropriate resource and location specific agricultural technologies.

Enhancement of livelihood and nutritional security of tribal communities through agro-enterprise diversification.

Enhancement of farm profitability among tribal communities through promotion of value addition, agripreneurship and market linkage

Professional and entrepreneurial empowerment of tribal communities through mobilization and organization of tribal men,

Launch of TSP project at Banka district

This project is currently being implemented in 33 villages of the three districts. As a part of this project trainings have been imparted to the small and marginal farmers as well as to the landless labourers on the various production and marketing aspects of mushroom cultivation, bee keeping, backyard poultry, kitchen gardening etc. In order to enhance farm production and productivity through crop intensification and pulse crop cultivation, various farmer-scientist interaction meets have been organized. Handholding support is also provided in the form of basic inputs.

PPR Vaccination

Low cost treatment for FMD

In order to enhance the nutritional security among the landless rural families, the kitchen gardening kit have been prepared for the project beneficiaries. The kits have been already distributed to more than 300 tribal households. In addition to enhancement of crop production, the efforts have been also made in the direction of livestock and animal husbandry improvement. Interventions like vaccination camps, preparation of feed blocks etc. are being implemented. Some of the major skill imparting activities include training of farmers for mushroom cultivation, bee keeping, quail rearing, duck rearing, low cost treatment for FMD etc.

4.9 Protection of Plant Varieties and Farmer's Right Act-2001

India as a member of the World Trade Organization (WTO) since 1st January, 1995, is working as per

the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS Agreement). According to this Intellectual Property Rights (IPR) is available in every fields of technology including agriculture. Frontier agricultural research such as agro-biotechnology, Nano-technology, application of modern tools and techniques will require Intellectual Property (IP) protection through patents, plant variety protection and other forms of IPR. Use of IP technology will strengthen public private partnerships in the advancement of future agricultural research. Commercialization of such technologies will be benefited for the users and get higher benefits.

Bihar Agricultural University, Sabour is working in the light of Protection of Plant Variety and Farmer's Right Act-2001 from the July, 2013. We have a nodal centre of IPR at BAU, Sabour for monitoring IPR activities in the university. The centre is working with the following objectives-

1. To protect the technologies developed by the university and farmers' of Bihar under the jurisdiction of university.
2. To facilitate the inventor/technology generator for protection of their inventions and equitable benefit sharing arise out theme.

Protection of plant varieties is an integral part of research and development in agriculture. Bihar Agricultural University, Sabour is working in this field to promote IP related activities of university and the state. Till date two hundred and fifteen varieties were sent for registration to PPV&FR Authority, New Delhi. Among them one of the university bred cauliflower cv. *Sabour Agrim* got registered in last year and the variety will be protected for coming 15 years. The registration No. 269 of 2015 and date of grant is 18.12.2015.

Awareness Programme on IPR

Besides, seven training cum- awareness program was conducted in the year 2016-17 at various Krishi Vigyan Kendras to sensitized farmers about the PPV&FRA-2001. Details of the training program are given below-

Table 4.10 PPV&FRA programmes organised at different KVKs

Sl.No	Date	Venue	No. of Farmers Participated
1	03.03.2017	BAU, Sabour	500
2	29.03.2017	KVK, Aurangabad	200
3	29.03.2017	KVK, Banka	505
4	29.03.2017	KVK, Katihar	185
5	25.03.2017	KVK, Kishanganj	124
6	30.03.2017	KVK, Munger	146
7	29.03.2017	KVK, Purnea	125
		Total	1785

4.10 *Kisan Chaupal*

The university started *"Kisan Choupal"* on April 28, 2012 in collaboration with 20 *Krishi Vigyan Kendras* (KVKs) and nine colleges of the varsity. The Choupal is since then organized every Saturday with the theme *"Bihar Krishi Vishwavidyalay Kisano Ke Dwar-Kisan Choupal*". (Bihar Agricultural University at the doorstep of farmers: *Kisan Choupal*)

4.10.1 Mandates of *Kisan Choupal*: *Kisan Choupal* is organized by the KVKs and the Colleges under following mandates:

- To strengthen linkage between scientists and farming community and provide science based information at famers' doorsteps.
- To revive the tradition of *Kisan Choupal* existing in the ancient times to help farmers solve their problems on their own at their place.
- To collect feedback and/or researchable issues from farmers' fields and communicate to the researchers for further formulating research priorities.
- To provide area specific/demand driven information to farmers at their doorsteps.

- To make convergence with different agencies working for at grassroots level.
- To motivate the people with the use of scientific and technical videos on cropping practices and allied activities.

4.10.2 Impact of *Kisan Choupal:* Over the last three years, it left indelible print in the history of extension and/or transfer of technology. Deputy Director General, Agriculture Extension, ICAR was so impressed with this innovative process adopted by the university through *Kisan Choupal* forum that all the KVKs of the country were advised to implement it in their respective areas. The *Choupal* enables the farmers to directly interact with the expert scientists and get solution to their agricultural problems. In addition to it, more than one lakh farmer friendly publications of the university such *as Krishak Sandesh, Kisan Samachar*, booklets on mushroom cultivation, orchard management etc. were distributed during the past years through this forum.

In the year 2016-17, a total of 71853 participants were benefitted (Table 4.11). The extension functionaries of the line departments also played a major role in converting interest of the farmers into action.

Table 4.11 *Kisan Choupal* conducted by different colleges/KVKs

Sl. No.	KVK/College	Farmers			Extension Functionaries	Grand Total
		Male	Female	Total		
1.	MBAC, Saharsa	1907	305	2212	173	2385
2.	CoH, Noorsarai	2010	263	2273	151	2424
3.	BPSAC, Purnea	1860	396	2256	118	2374
4.	CoA, Dumraon	2205	268	2473	103	2576
5.	Araria	1792	271	2063	93	2156
6.	Arwal	1913	260	2173	113	2286
7.	Aurangabad	2106	192	2298	117	2415
8.	Banka	2682	747	3429	142	3571
9.	Bhagalpur	1836	535	2371	86	2457
10.	Gaya	2694	406	3100	97	3197
11.	Jehanabad	2398	514	2912	106	3018
12.	Katihar	2007	525	2532	135	2667
13.	Khagaria	2923	586	3509	156	3665
14.	Kisanganj	2002	520	2522	139	2661
15.	Lakhisarai	2044	483	2527	93	2620
16.	Madhepura	2586	352	2938	146	3084
17.	Munger	2430	510	2940	133	3073
18.	Nalanda	2259	412	2671	142	2813

Table 4.11 *Kisan Choupal* conducted by different colleges/KVKs (Contd.)

19.	Patna	1939	343	2282	129	2411
20.	Purnea	2095	483	2578	142	2720
21.	Rohtas	4560	556	5116	1788	6904
22.	Saharsa	2559	762	3321	284	3605
23.	Sheikhpura	1923	379	2302	97	2399
24.	Supaul	3678	656	4334	38	4372
Total		**56408**	**10724**	**67132**	**4721**	**71853**

4.11 Soil Health Card: The soil health card is a complete evaluation of the quality of soil right from its functional characteristics, to water and nutrients content and other biological properties. It provides information nutrient status of farmer's owed plot, fertilizer and nutrients recommendations and other required activities. It will also contain corrective measures that a farmer should adopt to obtain a better yield. Bihar Agricultural University with the help of its extension wing *i.e.* KVK benefits farmers' in following ways:

The farmers got a well-monitored report of the soil which is chosen for cultivation of crops.

The monitoring was done on a regular basis.

The farmers guided by experts to come up with solutions to improve the quality of the soil.

Soil Health Card Distribution

The soil card helped the farmers to get an idea on the crop-wise recommendations of nutrients and fertilizers required in each type of soil. This can help in increasing the crop yield.

A total of 18481 samples were analysed from 15773 farmers from 1073 villages of the state pertaining to 16 districts of the state (Table 4.12).

Table 4.12 Status of Soil Health Card scheme

Sl. No.	Name of KVK	No. of Samples	No. of Farmers	No. of Villages
1.	Araria	6123	5420	341
2.	Aurangabad	209	209	51
3.	Banka	1350	505	18
4.	Bhagalpur	412	388	24
5.	Jehanabad	387	387	51
6.	Katihar	1469	905	95
7.	Kishanganj	535	535	10
8.	Madhepura	1392	1392	26
9.	Munger	166	166	40
10.	Nalanda	809	242	138
11.	Patna	941	941	61
12.	Purnea	2211	2211	115
13.	Rohtas	918	913	44
14.	Saharsa	1041	1041	20
15.	Sheikhpura	124	124	14
16.	Supaul	394	394	25
Total		**18481**	**15773**	**1073**

4.12 Celebration of World Soil Day

Celebration of World Soil Day

The World Soil Day has celebrated on 05th December, 2016 in University H/Q as well as in all colleges, KVKs and other institutions of the university. The KVKs has organized KisanGoshthi on said topic. The programme has graced by public representatives, district level officers of administration and agricultural department. The participation of farmers in World Soil Day was very good. World Soil Day was celebrated at all the 20 KVKs on 5th December in which 7215 farmers participated. The KVK wise participation of farmers/extension personnel is given hereunder:

Table 4.13 Celebration of World Soil Day through different KVKs

Sl. No.	Name of KVK	No. of farmers participated
1.	Araria	800
2.	Arwal	532
3.	Aurangabad	244
4.	Banka	159
5.	Bhagalpur	330
6.	Gaya	230
7.	Jehanabad	142
8.	Katihar	113
9.	Khagaria	363
10.	Kishanganj	200
11.	Lakhisarai	235
12.	Madhepura	203
13.	Munger	285
14.	Nalanda	364
15.	Patna	423
16.	Purnea	470
17.	Rohtas	1139
18.	Saharsa	519
19.	Sheikhpura	264
20	Supaul	200
Total		**7215**

Table 4.13 Celebration of World Soil Day through different KVKs (Contd.)

4.13 *Jai Jawan Jai Kisan*

Hon'ble Prime Minister of India Shri Lal Bahadur Shastri coined the term *"Jai Jawan Jai Kisan"* in the year of 1965 to accredit the immense responsibility of food security by Indian Farmer. Hon'ble Prime Minister of India Shri Narendra Modi was decided to celebrate the ***Jai Jawan Jai Kisan week*** from 23rd to 29th December every year on the birth anniversary of the Shri Atal Bihari Vajpayee and late Shri Chaudhary Singh, two former Prime Ministers of India, Solemnize their immense contribution for promoting the use of science for the welfare of farmers.

During the year 2016-17, has been organized at different KVKs under the aegis of Bihar Agricultural University as per the directive of Secretary, Department of Agriculture, Cooperation & Farmers Welfare and Secretary, DARE & DG, ICAR along with some additional activities for the benefit of farmers. A brief outlook of the celebration of "*Jai Kisan Jai Kisan week*" was presented in table below.

The allied activities were conducted by different KVKs during the celebration of the event were as follows:

Demonstration of science oriented agricultural technology to farmers. Progressive farmers are

Jai Kisan Jai Kisan Week Celebration

also provided the improved seeds of rapeseeds & wheat under FLD programme of KVK.

Scientist-Farmer interaction meets where farmers raise their farm problem and carries discussion with scientists for solution to their problems.

Organization of *Kisan gosthi* regarding management based on weather, soil and water for increasing crop productivity.

Conduction of various skill oriented training programmes *viz.* Mushroom Production, Goat farming, Dairy, Poultry farming, vermicomposting etc. for entrepreneurship development.

Experts' advices to farmers for technology based management practices and need of weather based crop management to increase crop yield.

Table 4.14 *Jai Jawan Jai Kisan Week* organized at different KVKs

Sl. No	Name of KVK	Venue of Programme	No. of Farmers Participated
1.	Araria	Araria	173
2.	Arwal	Sohsa (Kaler) & Lari (Kurtha)	126
3.	Aurangabad	Aurangabad	186
4.	Banka	Madachak, Sijhua, Chutiya, Jhirwa, Banka	164
5.	Bhagalpur	West Bhittha, Ismailpur block, Bhagalpur	168
6.	Gaya	Barahmoria, Dobhi, Bodhgaya, Sherghati, Gurua, KVK	503
7.	Jehanabad	Jehanabad	157
8.	Katihar	Sakraily, Sirsa	144
9.	Khagaria	Khagaria	116
10.	Kishanganj	Ekra,Dighal Bank	183
11.	Lakhisarai	KVK	127
12.	Madhepura	Sripur&BalamGadhiya	142
13.	Munger	Munger	190
14.	Nalanda	Nalanda	186
15.	Patna	Patna	155
16.	Purnea	Purnea	139
17.	Rohtas	Rohtas	177
18.	Saharsa	Saharsa	210
19.	Sheikhpura	Sheikhpura	105
20.	Supaul	Andauli, Kisanpur	113
		Total	**3464**

Awareness programs regarding orchard & nursery development, fruit and vegetable

Chief Guest visiting Stalls Kisan Mela

the KVKs. He urged the farmers to come forward and connect with KVKs for scientific knowledge and skill development. Dr. R.K Sohane, Director Extension Education, BAU, Sabour, in his inaugural address mentioned various initiatives of the university in the extension front like *Kisan Chaupal* which is conducted every Saturday by the KVKs and colleges along with technical CDs on various agricultural technologies released by the university. He also focused on videos uploaded on YouTube which has generated more than 17 lakhs views till date. Best extension scientist award was also awarded to Smt. Anita Kumari, KVK Bhagalpur. She has done outstanding work on women empowerment and mushroom production. Innovative farmer award was awarded to Sri Dhananjay Singh, Munger; Sri Dayanand Prasad, Sheikhpura; Sri Shankar Rai, Saharsa; Sri Brajkishore Sharma, Jehanabad; Sri Amit Kumar, Bhagalpur; Sri Ramanand Sah, Supaul; Sri Satyendra Kr. Singh, Banka; Smt. Manjula Devi, Nalanda and Sri Chitranjan Kumar from Gaya. The farmers from various districts in Bihar under the jurisdiction of the University were also awarded in the mela. A souvenir was released on this occasion along with 2 technical CDs. The mela had more than 126 stalls with exhibits on various technologies of agriculture along with sale of improved seeds, contests for farmers and so on. The mela was attended by thousands of farmers from Bihar, West Bengal, Jharkhand, Eastern Uttar Pradesh and parts of Nepal. In the second day (04th March, 2017); Cattle show was also inaugurated by Sri Ravi Avtar Mishra, Chief General Manager, NABARD, Patna. The guest of honour of the function was Sri Vijay Kumar, Assistant General Manager, UCO Bank, Bhagalpur; Sri P.K Kannaujia, Regional Manager, Punjab National Bank, Bhagalpur; Sri Nilesh, Assistant General Manager, NABARD, Patna; Dr.Mindi Spencer, Assistant Director, Illinois University, USA and Dr.Asley, Illinois University, USA. The programme was chaired by Dr. A.K Singh, Vice Chancellor, BAU, Sabour.The main attraction of the cattle show was improved breeds of cattle along with goat, hen, and quail and so on. A total of 118 breeds of animals were displayed in

the show.

Farmers-Scientist Interface - In the technical session (04th March, 2017) of seminar; Dr. R. K. Sohane, Director Extension Education, Bihar Agricultural University said that NABARD and Bank has made efforts to ensure banking facilities in all villages of the state. The NABARD has extended his assistance to extend financial support for Agriculture and Cottage Industry through Kisan Club. Dr.Sohane has told that BAU with the support of NABARD has constituted number of Kisan Clubs in the villages under BAU jurisdiction through KVKs. He also emphasised the importance of Joint Liability Groups (JLGs) for the landless farmers in context of financial assistance.

Dr. Ajoy Kumar Singh, Vice-Chancellor, BAU suggested that Kisan Clubs which was constituted by NABARD should be linked with University. It will help to achieve the goal of upliftment of rural people through the Kisan club, he said. Dr. Singh assured that technical assistance will be always provided by the University to the farmers for the betterment of agri-produce and production. In the technical sessions, different resource persons presented their experiences on Protected Cultivation, Tissue Culture Banana, High Density Orchard, Vegetable Seed Production, Integrated Farming System, Quail Farming and Poultry apart from scientific cultivation of Maize, Chick Pea as well as Fodder crops. The last day of the Kisan Mela (05th March, 2017) was visited by Sri Shailesh Kumar, Member of Parliament, Bhagalpur. On the eve of closing ceremony, several publications of the university was released such as souvenir on the theme of the mela, Technical CDs, KrishakSandesh Magazine, a book entitled "Champion Farmers of KrishiVigyan Kendra", etc. The innovative farmers of the 21 districts under the jurisdiction of the university were also honoured in the mela. In the KisanMela, Horticulture-cum- flower show was also organized and sponsored by National Horticulture Board. In horticulture show more than 250 entries of different seasonal vegetables and fruits were received from the farmers. The entries have been evaluated by the panel of judges for giving prize under each item. The main attraction of the horticulture show was red coloured Australian guava, Rambutan, Mangosteen and Dragon fruit. Farmers from various districts of the state like Purnea, Banka, East Champaran, Munger, Lakhisarai etc. participated in the show with great enthusiasm. Similarly, Animal Show was also organized in which more than 175 entries of crossbred cattle, canines, poultry birds of different kinds were received from the farmers of surrounding blocks. Round the hour buses were made accessible to the farmers for field visit to the protected vegetable and flower cultivation unit, horticultural crop gardens, nursery unit, strawberry production unit, mushroom & vermi-compost unit, tissue culture lab, botanical garden, vegetable research, production and seed production farm, integrated farming system unit, fruit park, technology park, KVK Sabour etc. with the objective of learning by seeing. *Kisan Gyan Pratiyogita* and *Kisan Goshthi* were organized on each day along organization of cultural programmes in the evening. The fair was attended by more than 24,000 farmers from all 38 districts of Bihar and 6 districts of Jharkhand including farmers associated with ATMA/KVK/Kisan Club. Progressive farmers from different districts of the state were also honored on this occasion. Over 125 stalls have been presented in the fair (Table 4.15).

The stall of department of Plant Breeding was conferred the first prize, Agronomy with the second and Soil Science with the third prize. As far the colleges under the jurisdiction of BAU, Sabour is concerned; BPSAC Purnea was conferred the first prize; College of Horticulture, Noorsarai with

Participation of Guest in Kisan Mela

Table 4.15 Participation of Stakeholders in *Kisan Mela* 2017

Sl. No.	Name of the Stakeholder	Participants
1.	ATMA (38 District) Extension functionaries & farmers	7000
2.	KVK (21)	5000
3.	Interstate (Jharkhand)	700
4.	NGOs	1100
5.	SHGs/CIG/FIGs/Kisan Club/FPOs	2200
6.	Farmers from Bhagalpur and nearby district	8000

the second prize and MBAC, Saharsa with the third prize. In Kisan Mela-2017 a souvenir namely

Video Conferencing with Farmers

Table 4.16 Month/KVKs wise details of Video Conferencing

Month	No. of KVK connected	Video Conferencing	No. of Farmers Benefitted
April-16	18	35	1575
May-16	18	36	1650
June-16	18	39	1750
July-16	20	40	2000
August- 16	20	42	2100
September- 16	20	42	2100
October-16	20	35	1750
November-16	20	36	1800
December-16	20	41	2050
January -17	20	30	2400
February -17	20	31	2500
March -17	20	28	2240
	Total	**435**	**23915**

Table 4.17 Details of calls and Whatsapp, Messages on different aspect

S.N.	Department	No. of Calls	Whatsapp
1	Crop Protection	84	--
2	Fruit Science	264	25
3	Vegetable	288	40
4	Agronomy/ Weather	384	91
5	Animal Husbandry	607	--
6	P.B.G.	160	09
7	Bee Keeping	80	--
8	Soil Science	50	--
9	Social Science	222	--
10	P.P./Mushroom	136	19
11	Soil Science &Agril. Chemistry	--	15
12	Entomology	--	21
13	Seeds, Technology & PST	--	07
14	Agro, Eco. &Agril. Engg.	--	03
15	Extension & Others	--	26
	Total	**2275**	**256**

Table 4.18 KVKs wise details of Messages and Voice Calls made through Farmers portal

Name of KVK	No. of Advisory	No. of Farmers Benefitted
Araria	40	125166
Arwal	45	199550
Aurangabad	102	4550
Banka	121	544500
Bhagalpur	419	2372378
Gaya	31	101531
Jehanabad	57	211779
Katihar	264	807234
Khagaria	807	6464
Kishanganj	12	2854
Lakhisarai	627	646743
Madhepura	188	467082
Munger	36	72556
Nalanda	256	5021
Patna	15	5752
Purnea	10	322474
Rohtas	96	595200
Saharsa	42	100583
Sheikhpura	81	1680
Supaul	112	168354
Total	**3361**	**6761451**

4.15.4 Kisan Help Line

Bihar Agricultural University Sabour has regularly provided advisory services through Kisan Help Line over Toll Free Number and WhatsApp Number. In the year 2016-17, a total of 2275 advisories has provided over phone and 256 on WhatsApp (Table 4.17).

4.15.5 *Kisan Gyan Rath*

It is an important mobile system for imparting knowledge to the farmers at their doorsteps. It is equipped with video display unit for demonstrating agricultural practices. This *Rath* moves from village-to-village as per the schedule across the 25 districts of Bihar. It is paying a pivotal role in motivating the farmers to adopt the *latest technologies*. KisanGyanRath was launched by Bihar Agricultural University is *Kisan Gyan Rath*was launched by the Hon'ble Chief Minister of Bihar on October 11, 2014. It is an important

Launch of Kisan Gyan Rath by Hon'ble Chief Minister

medium to provide expert guidance to the farmers on their doorsteps. The *Kisan Gyan Rath (Bus)* is a fully equipped having facilities for soil analysis, interpretation and issuing of soil health cards to the farmers. The benefit from the scheme is that farmers need not to visit the soil testing laboratories instead the soil testing laboratories reach farmers on their doorsteps. The second Kisan Gyan Rath was launched by the Hon'ble Chief Minister of Bihar in 2017.

Objectives

- To disseminate scientific know-how information through technical videos at farmers doorsteps.
- To facilitate awareness development about the soil health among the farming community.
- To distribute soil health cards among the farming community
- To emphasize judicious utilization of chemical fertilizers and promote integrated nutrient management.
- To promote soil test based fertilizer recommendation for sustained soil health.
- To promote capacity building in farming community.

4.15.6 Community Radio Station

The community radio is an important tool to empower rural community through quality information. The community radio station established on May 17, 2011 at KVK, Barh, Patna on 91.2 F.M. radio band with the specific objectives to broadcasts content that is relevant to a local, specific audience but is often overlooked by commercial or mass- media broadcasters. The community radio station is very much operated, owned, and influenced by the communities they serve. Community radio is a model of radio broadcasting in addition to commercial and public broadcasting offered by the extension departments and the directorate. Community Radio Station has great potentials for education & social development. It is most economical tool to reach the masses and have a quick communication. It is also planned in future to work in conjunction with phone/ mobile and internet system.

Coverage of CRS, Barh: It covers 20 KM radius of 8 blocks of Patna District of Bihar. CRS covers total 503 villages of Patna District.

4.16 ARS/RAWE Orientation Programme

The orientation programme for 21 newly recruited Agricultural Research Scientists (ARS) was conducted at KVK Bhagalpur. Together with it, orientation programme as a part of Rural Agricultural Work Experience (RAWE) programme for students studying in different colleges of Bihar Agricultural University, Sabour was conducted in different KVKs under the jurisdiction of the university in which 1182 students participated.

Table 4.19 Details of orientation programmes at different KVKs

Sl. No.	Name of KVK	No of student/ ARS trained	No of days stayed
ARS			
	Bhagalpur	05	21
RAWE			
	Araria	08	90
	Aurangabad	22	150
	Banka	22	90
	Katihar	15	135
	Madhepura	10	128
	Munger	20	30
	Nalanda	11	107
	Rohtas	10	180
	Saharsa	09	112
	Supaul	12	160
Total		**144**	**1203**

4.17 Parthenium awareness week celebrated in different KVKs

Celebration of Parthenium Week

Parthenium hysterophorus is a noxious invasive species and it is considered to be one of the worst weeds currently known. This is a weed of global significance responsible for severe human and animal health issues, such as dermatitis, asthma and bronchitis, and agricultural losses besides a great problem for biodiversity. It is an aggressive colonizer of wasteland, road sides, railway sides, water courses, cultivated fields, and overgrazed pastures. Mechanical, chemical and biological measures are adopted for its control, however, awareness on its detrimental effects is the beginning of its control. The university is awakening the farmers on aforesaid harmful consequences of its through 'Parthenium week' celebration. In the last financial year in total 2493 peoples has aware during Parthenium week'.

Table 4.20 Participation of farmers in Parthenium week celebrated at different KVKs

S.No.	KVK	No. of Farmers Participated
1.	Araria	146
2.	Arwal	120
3.	Aurangabad	86
4.	Banka	103
5.	Bhagalpur	135
6.	Gaya	179
7.	Jehanabad	185
8.	Katihar	169
9.	Khagaria	117
10.	Kishanganj	90
11.	Lakhisarai	80
12.	Madhepura	50
13.	Munger	200
14.	Nalanda	89
15.	Patna	123
16.	Purnea	127
17	Rohtas	45
18.	Saharsa	144
19.	Sheikhpura	128
20.	Supaul	177
	Total	**2493**

4.18 Pradhan Mantri Fasal Bima Yojana

The *Pradhan Mantri Fasal Bima Yojana* (Prime Minister's Crop Insurance Scheme) was launched by Prime Minister of India, NarendraModi on 18 February 2016. It envisages a uniform premium of only 2 per cent to be paid by farmers for Kharif crops, and 1.5 per cent for Rabi crops. The premium for annual commercial and horticultural crops will be 5 per cent. This scheme is dedicated to bring in more than 50% of the farmers under its wing within the next 2–3 years. Around 25% of the claims will be sent to the farmer's direct account.

The major objective of this Yojana are providing insurance coverage and financial support to the farmers in the event of failure of any of the notified crop as a result of natural calamities, pests & diseases; and also to stabilize the income of farmers to ensure their continuance in farming. Each and every KVKs under the university had organized programme with participation of large number of farmers along with peoples elected representative *viz.* Minister, MLA, MP, Panchayat Members etc. Altogether 17,010 farmers have participated in this program (Table 4.21).

Table 4.21Programme on PMFBY conducted by KVKs

S.No.	KVK	Date of Programme	No. of Farmer Participated	Name of public representative
1.	Katihar	02.04.2016	712	Sri Manohar Prasad, MLA, Manihari, Katihar
2.	Bhagalpu	03.04.2016	770	Sri Deepak Bhuwania, Mayor, Bhagalpur
3.	Saharsa	03.04.2016	487	Sri Shankar Choudhary, Joint Director (Agronomy) Koshi Division, Saharsa
4.	Arwal	04.04.2016	1520	Sri Ram Kripal Yadav, Hon'ble Union State Minister (Water & Sanitation) GOI
5.	Aurangabad	04.04.2016	1524	Sri Upendra Kushwaha (Hon'ble Minister State HRD), Sri Susil Kumar Singh (MP, Aurangabad) and Dr A.K. Singh (Vice-Chancellor, BAU, Sabour)
6.	Banka	04.04.2016	1207	Sri Pradip Kumar, DDC, Banka & Sri Sudama Mahto, DAO, Banka
7.	Purnea	04.04.2016	414	Sri Santosh Kumar Kushwaha, Hon'ble M.P. Purnea
8.	Rohtas	04.04.2016	1090	Sri Upendra Kushwaha, Hon'ble HRD Minister of State, GoI
9.	Araria	05.04.2016	765	Mr. Amod Kumar Sharan (ADM, Araria)
10	Gaya	05.04.2016	430	--
11.	Khagaria	05.04.2016	780	Smt. Poonam Devi Yadav, Hon'ble MLA, Khagaria, Sri PannaLal Patel, Hon'ble MLA, Beldour
12.	Kisanganj	05.04.2016	524	Dr. Dilip Jaiswal, MLC, Kishanganj
13.	Madhepura	05.04.2016	854	Md. Sohail, DM, Madhepura

Table 4.21Programme on PMFBY conducted by KVKs

	Munger	05.04.2016	512	Dr. Kundan Kumar, S.D.O, Munger; Sri Shitanshu Shekhar, DDM, NABARD, Munger, Sri Anuraganand, Retired District Judge, Sri. Sarvesh Vijyan, LDM, Munger
	Nalanda	05.04.2016	1047	Sri Kaushlendra Kumar, Hon'ble M.P, Nalanda, Sri Kundan Kumar, DDC., Nalanda
	Patna	05.04.2016	534	Sri Ram KripalYadav, Minister of State, Water & Sanitation, (Govt. of India), Sri Gyanendra Singh Gyanu, Hon'ble MLA, Barh
	Supaul	05.04.2016	1100	D.M , Supaul
	Jehanabad	06.04.2016	1220	Dr. Arun Kumar, Hon'ble M.P., Jehanabad
	Lakhisarai	06.04.2016	540	Smt. Veena Devi, Hon'ble M.P., Munger
	Sheikhpura	06.04.2016	980	D.M. Sheikhpura & DDC, Sheikhpura
Total			**17010**	

5. TRAINING

All the State Agricultural Universities (SAUs) have three mandates (Teaching, Research and Extension), however, our university has four mandates, *i.e*. apart from aforesaid three mandates, we have training as fourth mandate. Training is an essential need for the development as per change in external environment of an organization. Hence, training helps to adopt such changes though the development of existing human resources in terms of skill and knowledge. Our varsity is also providing different vocational training to the grassroots. The capacity building of farmers/extension functionaries/rural youth is one of the important activities performed by KVKs. In changing scenario, agriculture sector is getting knowledge intensive. For adopting improved agricultural practices, famers need updated knowledge and specific skills. In this context KVKs are playing significant role.

5.1 Training Programmes Organised by KVKs

The university provide training for capacity building of farmers, extension functionaries, rural youth etc. through KVKs and various constituent colleges.

Under skill development training Sponsored by Agriculture Skill Council of India (ASCI) and National Fisheries Development Board (NFDB) programmes trainings are also imparted to the deserving candidates.

Training programme is conducted for farmers & farm women, rural youth and extension functionaries. In total 3957 training programmes were conducted and out of which 2901 for farmers and farm women, 729 for rural youth and 327 for extension functionaries (Table 5.1). Through these training 118304 personnel were trained and out of which 76.46 per cent and 23.54 per cent trainees were male and female, respectively.

5.1.1 Farmer & Farm Women

Training programmes were organized for progressive farmers in 11 thematic areas, in which 81921 farmers were trained and out of which 78.07 and 21.93 per cent trainees were male and female respectively. More number of training courses were organized for the thematic areas of crop production (545), horticulture (465), livestock production and management (448); and plant protection (394) (Table 5.2).

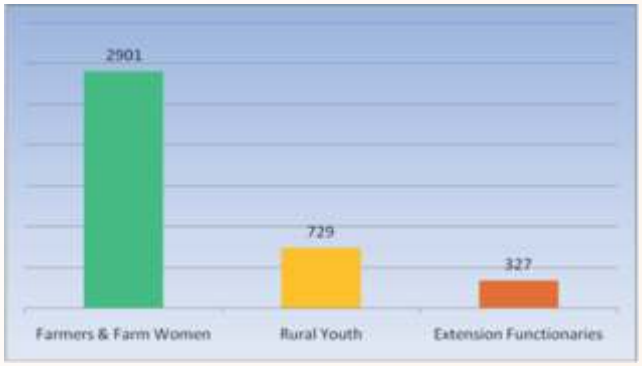
5.1.2 Rural Youth

Rural youth are best human resource in rural context but challenges lies with how far their huge talent, potentiality are channelizing for their self-employment. Rural youth were trained in various thematic areas with the objective to retain them and for overall skill generation among them for farming enterprises. Altogether rural youth were trained in 35 thematic areas and in total 17249 rural youths were trained and out of which 78.06 per cent were male trainees and 21.94 per cent were female trainees. In total 729 courses were covered with major thematic areas like enterprise development (84), mushroom production (77), Dairying (75), Seed production (53) etc (Table 5.3).

5.1.3 Extension Functionaries

Extension functionaries are the lifeline of extension linkages. With the changing technologies in the frontier areas of agriculture, farmer's needs and market context the role of extension functionaries especially the field extension functionaries become more challenging. It's becoming now imperative to keep update to these extension functionaries. Under this backdrop training programmes were organized in 20 thematic areas encompasing 372 courses. Through these training courses a total of 19134 extension functionaries were trained out of which 13029 (68.09%) were male and 6105 (31.91%) were female. Training on more number of courses were conducted on management of farm animals (59), productivity enhancement in field crops (47), integrated pest management (40), care and maintenance of farm machinery and implements (36) (Table 5.4).

Trainings were also imparted to Bee Keeper, Broiler Poultry Farm Worker, Quality seed grower and Mushroom Grower under the Skill Development Training Programme (ASCI) 2016-17. Altogether 80 trainees were trained and total training hours were 800 (Table 5.5).



Training programme conducted for Human Resource Development

Table 5.1 Training programme conducted for Human Resource Development

S.N.	Type of Participant	Number of courses	Number of trainees		
			Male	Female	Total
1	Farmers & farm women	2901	63956	17965	81921
2	Rural youth	729	13465	3784	17249
3	Extension functionaries	327	13029	6105	19134
	Total	**3957**	**90450**	**27854**	**118304**

Table 5.2 Training programme for progressive farmers/farm women

Thematic Area	No. of Courses	No. of participants									Grand total		
		Other			SC			ST					
		M	F	T	M	F	T	M	F	T	M	F	T
I. Crop production	545	11428	1463	12704	2716	692	3407	693	261	954	14924	2444	17368
II. Horticulture	465	8157	1198	9355	1745	537	2283	254	61	319	10149	1800	11949
III. Soil health and fertility management	223	4107	792	4899	712	227	939	372	96	468	5206	1115	6321
IV. Livestock production and management	448	7888	1826	9707	1735	930	2657	435	453	888	10146	3315	13461
V. Home science/women empowerment	380	2969	4314	7261	635	1449	2105	56	181	236	3662	5964	9626
VI. Agril. engineering	235	4194	236	4432	1188	348	1536	211	65	271	5593	658	6251
VII. Plant protection	394	7421	963	8384	1470	449	1919	54	1	55	8959	1432	10391
VIII. Fisheries	50	1064	126	1190	210	39	279	69	30	99	1343	195	1538
IX. Production of inputs at site	18	287	58	345	139	33	172	28	93	121	454	186	640
X. Capacity building and group dynamics	136	2804	381	3145	455	327	782	115	108	223	3374	826	4200
XI Agro-forestry	7	99	13	112	47	16	63	-	1	1	146	30	176
Total	**2901**	**50418**	**11370**	**61534**	**11052**	**5047**	**16142**	**2287**	**1350**	**3635**	**63956**	**17965**	**81921**

Table 5.3 Training programme for rural youth

Thematic Area	No. of courses	No. of participants									Grand total		
		Other			SC			ST					
		M	F	T	M	F	T	M	F	T	M	F	T
Mushroom production	77	846	575	1421	192	241	433	64	50	114	1105	697	1802
Bee-keeping	14	243	68	311	23	12	35	0	0	0	263	65	328
Integrated farming	26	408	39	447	75	15	90	24	0	24	507	27	534
Seed production	53	940	145	1072	146	43	187	24	0	24	1110	84	1194
Production of organic inputs	31	469	102	571	98	56	154	24	5	29	591	96	687
Integrated farming	19	348	33	381	109	12	121	19	0	19	476	18	494
Planting material production	31	441	50	491	178	14	192	0	0	0	619	28	647
Vermi-culture	10	148	29	177	58	42	100	23	41	64	229	112	341
Sericulture	9	191	30	221	29	22	51	0	0	0	220	22	242
Protected cultivation of vegetable crops	14	125	55	180	96	22	118	24	0	24	245	63	308
Commercial fruit production	28	535	26	561	93	12	105	29	0	29	651	37	688
Repair and maintenance of farm machinery and implements	39	701	53	754	154	17	171	35	16	51	890	56	946
Nursery management of horticulture crops	23	364	28	392	64	17	91	12	0	12	440	36	476
Training and pruning of orchards	18	117	218	335	29	64	93	7	6	13	233	185	418
Value addition	18	190	217	407	23	79	102	12	35	47	225	267	492
Production of quality animal products	14	249	51	290	81	46	127	7	38	45	337	109	446
Dairying	75	988	341	1329	291	246	537	131	244	375	1410	619	2029

Table 5.3 Training programme for rural youth (Continued)

Thematic Area	No. of courses	No. of participants									Grand total		
		Other			SC			ST					
		M	F	T	M	F	T	M	F	T	M	F	T
Sheep and goat rearing	21	234	165	399	105	48	153	57	90	147	396	300	696
Quail farming	12	174	76	250	34	2	36	10	-	10	208	78	286
Piggery	9	58	38	96	66	41	97	45	21	66	169	60	229
Rabbit farming	5	94	8	102	27	5	32	-	-	-	121	3	124
Poultry production	26	334	122	456	76	79	155	35	95	132	447	226	673
Ornamental fisheries	4	39	24	63	15	10	25	2	13	15	56	47	103
Para vets	4	51	26	77	12	6	18	4	-	4	67	17	84
Para extension workers	7	156	-	156	10	-	10	-	-	-	166	-	166
Composite fish culture	3	92	-	92	9	-	9	-	-	-	101	-	101
Freshwater prawn culture	3	62	-	62	13	-	13	-	-	-	75		75
Cold water fisheries	2	37	7	44	6	3	9	-	-	-	43	-	43
Fish harvest and processing technology	1	25	-	25	-	-		-	-	-	25	-	25
Fry and fingerling rearing	1	6	3	9	18	5	23		-	-	24	8	32
Small scale processing	32	287	228	515	112	132	244	47	12	59	446	132	578
Post Harvest Technology	12	153	54	207	80	34	114	33	12	45	266	182	448
Tailoring and Stitching	18	110	197	307	20	48	68	4	11	15	134	53	187
Rural Crafts	15	56	288	344	4	56	60	-	4	4	60	196	256
Enterprise development	84	1393	599	1992	268	198	466	69	13	82	1730	398	2128
TOTAL	**729**	**10165**	**3538**	**13693**	**2564**	**1547**	**4101**	**741**	**706**	**1449**	**13465**	**3784**	**17249**

Table 5.4 Training for extension functionaries

Thematic area	No. of courses	No. of participants									Grand total		
		Other			SC			ST					
		M	F	T	M	F	T	M	F	T	M	F	T
Productivity enhancement in field crops	47	1250	63	1492	282	9	291	15	4	29	1773	619	2392
Integrated pest management	40	1200	67	1267	113	4	117	1	-	1	1317	119	1436
Integrated nutrient management	30	869	97	946	143	14	157	13	-	13	1052	419	1471
Rejuvenation of old orchards	15	347	28	375	53	5	58	9	-	9	440	237	677
Value addition	13	339	59	398	25	6	31	-	1	1	383	90	473
Protected cultivation technology	11	232	44	276	74	4	100	6	-	6	315	102	417
Formation and management of SHGs	9	137	27	142	29	-	29	-	-	-	198	113	311
Group dynamics and farmers organization	2	28	1	29	3	-	3	-	-	-	31	1	32
Information networking among farmers	4	114	2	116	20	5	25	3	2	5	137	9	146
Capacity building for ICT application	7	200	13	213	31	2	33	-	-	-	235	124	359
Care and maintenance of farm machinery and implements	36	840	70	910	200	17	217	-	-	-	1051	277	1328
WTO and IPR issues	2	50	8	58	6	-	6	2	1	3	63	26	89
Management in farm animals	59	980	174	1154	423	172	597	190	569	759	2488	2508	4996

Table 5.4 Training for extension functionaries (Continued)

Thematic area	No. of courses	No. of participants									Grand total		
		Other			SC			ST					
		M	F	T	M	F	T	M	F	T	M	F	T
Livestock feed and fodder production	21	409	49	462	117	28	145	29	55	84	664	353	1017
Household food security	10	176	72	248	34	37	71	8	25	33	337	183	520
Women and child care	4	94	75	169	25	43	68	-	5	5	224	236	460
Low cost and nutrient efficient diet designing	4	65	31	96	13	12	25	5	8	13	131	97	228
Production and use of organic inputs	6	202	16	218	58	10	68	-	-	-	260	63	323
Gender mainstreaming through SHGs	8	95	64	159	21	26	47	-	-	-	166	143	309
Crop intensification	2	16	37	53	2	-	2	-	-	-	53	37	90
Others if any	42	1534	142	1676	111	16	127	29	2	31	1711	349	2060
TOTAL	**372**	**9177**	**1139**	**10479**	**1783**	**410**	**2217**	**310**	**672**	**992**	**13029**	**6105**	**19134**

Table 5.5 Skill development training programme through ASCI

Sl. No	Name of KVK	Course name	Hrs	No. of participants									
				Male			Female			Total			
				Others	SC	ST	Others	SC	ST	Others	SC	ST	Total
1.	Jehanabad	Bee Keeper	200	17	3	-	-	-	-	17	3	-	20
2.	Jehanabad	Broiler Poultry Farm Worker	200	17	3	-	-	-	-	17	3	-	20
3.	Lakhisarai	Quality seed grower	200	20	-	-	-	-	-	20	-	-	20
4.	Lakhisarai	Mushroom Grower	200	11	2	-	5	2	-	16	4	-	20
Total			**800**	**65**	**08**	**-**	**05**	**02**	**-**	**70**	**10**	**-**	**80**

5.1.4 NFDB funded capacity building programme

Fishery is one of the important emerging areas in Bihar for increasing income of the farmers and improving nutritional status of the people. Number of training programme was conducted for fish farmers and altogether 150 farmers were trained in three KVKSs Viz. Araria, Khagaria and Supaul (Table 5.6). The total duration of training programme was 29 days.

Table 5.6 NFDB funded trainings imparted by different KVKs

KVK	Name of capacity building training programme	Duration (days)	Date of programme	No. of Farmers trained
Araria	Training programme on Fisheries	05	29/11/2016 to 02/12/2016	30
Araria	Training programme on Fisheries	05	14/12/2016 to 18/12/2016	30
Khagaria	Training programme on "Improved culture practices of crops"	05	20/12/2016 to 24/12/2016	20
Khagaria	Training programme on "Management of Beels and Wetlands"	04	11/02/2017 to 14/02/2017	20
Supaul	Fish farmers training on IFS	05	06/12/2016 to 10/12/2016	25
Supaul	Fish farmers training on IFS	05	26/12/2016 to 30/12/2016	25
	Total	**29**		**150**

5.2 Training Programme Organised by the Directorate

The directorate of extension education has organised 24 trainings sponsored by BAMETI, ATMA, NIAM, MANAGE, NABARD, CIMMYT and others. The details of those trainings are provided in Tables 5.7, 5.8, 5.9, 5.10 and 5.11. Through these trainings, a total of 1039 participants were benefitted.

Table 5.7 Training Programme sponsored by BAMETI/ATMA

Sl. No.	Topic of the Training	Duration	No. of Participants	Sponsored by
1.	Hybrid maize seed production	22-24 September, 2016	47	BAMETI, Patna
2.	Mushroom spawn production	03-04 October, 2016	40	BAMETI, Patna
3.	High density orchard & orchard management	05-07 October, 2016	21	BAMETI, Patna
4.	Mushroom spawn production	17-21 January, 2017	24	ATMA, Madhubani
5.	Pineapple Production	13-15 February, 2017	23	ATMA, Kishanganj
6.	Vegetable Production	15-17 February, 2017	30	ATMA, Begusarai
7.	Vegetable Production	20-24 February, 2017	18	ATMA, Madhubani
8.	Vegetable Production & Preservation	20-24 March, 2017	43	ATMA, Giridih
		TOTAL	**246**	

Table 5.8 Training sponsored by NIAM, Jaipur/ MANAGE, Hyderabad

Sl. No.	Topic of the training	Duration	No. of participants
1.	Agricultural marketing (NIAM)	05-06 June, 2016	22
2.	Linking farmers to market (MANAGE)	22-25 August, 2016	30
3.	Capacity building programme for strengthening farmer producer(NIAM)	19-21 December, 2016	32
		TOTAL	**84**

Table 5.9 Training sponsored by NABARD

Sl. No.	Topic of the training	Duration	No. of participants
1.	Leadership training programme for Volunteers of Kisan Club on "Advances in Agricultural Production"	19-23 July, 2016	30
2.	Leadership training programme for Volunteers of Kisan Club on "Advances in Agricultural Production"	16-20 August, 2016	17
3.	Leadership training programme for Volunteers of Kisan Club on "Advances in Agricultural Production"	27-31 August, 2016	42
4.	Leadership training programme for Volunteers of Kisan Club on "Advances in Agricultural Production"	18-22 October, 2016	20
5.	Leadership training programme for Volunteers of Kisan Club on "Advances in Agricultural Production"	15-19 November, 2016	28
6.	Leadership training programme for Volunteers of Kisan Club on "Advances in Agricultural Production"	05-09 December, 2016	26
		TOTAL	**163**

Table 5.10 Training sponsored by CIMMYT

Sl. No.	Training programme for	Duration	Topic	No. of participants
1.	KVK Personals	19-24 April, 2016	Capacity Building Programme	17
2.	Different Institutions/KVKs/ CSISA personals	27-29 March, 2017	TOT programme on monitoring, evaluation & learning (ME & L)	23
			TOTAL	**40**

Table 5.11 Other training programmes

Sl. No.	Training Programme for	Duration	Topic	No. of Participants
1.	Armed forces	18 - 24 October, 2016	Integrated farming system	04
2.	Farmers	05.03.2017	PPV & FRA Awareness Programme	250
3.	Mango growers	05.05.2016	Formation of Jardalu Mango Growers Federation	104
4.	Katarni growers	28.05.2016	Formation of Katarni Rice Growers Federation	55
5.	Jardalu & Katarni Growers	16.11.2016	For GIS of Jardalu & Katarni	93
			TOTAL	**506**

5.3 Training Programme Related to Palmyrah Palm Products

An awareness programme on products of Palmyrah palm was organised by the university for the candidates belonging to 13 districts through which a sum of 2319 participants were benefited (Table 5.12).

Table 5.11 Other training programmes

Sl. No.	District	Date	No. of Participants
1.	Nalanda	24.10.2016	284
2.	Gaya	25.10.2016	141
3.	Aurangabad	26.10.2016	177
4.	Patna	27.10.2016	142
5.	Bhagalpur	10.11.2016	335
6.	Banka	11.11.2016	129
7.	Nawada	07.12.2016	210
8.	Jehanabad	08.12.2016	140
9.	Samastipur	27.12.2016	98
10.	Muzaffarpur	28.12.2016	175
11.	Saran	29.12.2016	220
12.	Vaishali	30.12.2016	150
13.	Begusarai	07.01.2017	118
	Total		**2319**

In addition to awareness programme, the university has also organised six trainings on hands on training of master trainers on Palmyrah palm products. In this training programme, a sum of 172 participants from 12 districts participated (Table 5.13).

Table 5.13 Hands on training of master trainers on Palmyrah palm products

Sl. No.	District	Date	No. of Participants
1.	Nalanda	16-17 December, 2016	30
2.	Nawada	18-19 December, 2016	33
3.	Gaya		
4.	Muzaffarpur	21-22 December, 2016	24
5.	Samastipur		
6.	Patna	26-27 December, 2016	39
7.	Vaishali		
8.	Saran		
9.	Aurangabad	28-29 December, 2016	16
10.	Jehanabad		
11.	Bhagalpur	30-31 December, 2016	30
12.	Banka		
	Total		**172**

6. QUALITY SEEDS AND PLANTING MATERIAL

6.1 Introduction

Seed is the carrier of new technology and at the same time it is the basic input of agricultural production on which the performance and efficacy of other input depends. Quality seeds appropriate to different agro-climatic conditions and in sufficient quantity at appropriate time and at affordable price are required to enhance production and productivity. It is, therefore, imperative to place emphasis on developing an efficient and effective technology of seed production involving farmers, which should be relatively low cost and affordable to the low-income farmers.

Directorate of seed

Bihar is an agriculture based economy. For sustainable increase in agriculture production and productivity in the state, it is necessary to develop new, improved varieties, efficient system of production and supply of quality seeds to farmers. The state is having great potential of enhancing the production and productivity by increasing the availability of quality seeds. Since, seed production and making available quality seeds is a multi-tasking effort, Bihar Agricultural University has taken tremendous efforts, since its inception in August, 2010, to produce large quantity of nucleus, breeder, foundation and certified seed of various agricultural and horticultural crops under the supervision of Directorate of Seed and Farms.

6.2 Quality Seed and Planting Material

Production of quality seeds of promising varieties/ hybrids of field crops/ vegetables crops/ forage crops/ seedlings/ saplings of flowers and fruits, mushroom spawns and fish-fingerlings is being carried out. During the year 2016, the university has made great stride in seed production and multiplication of planting material. The total 9485.5 quintal of quality seed of cereals, pulses, oilseeds and vegetable crops were produced. The crop-wise seed productions are presented hereunder.

Seed processing unit

Table 6.1 Seed Production Status: Rabi, 2015-16

Sl. No.	Name of Variety	Breeder seed (q)	Foundation seed (q)	Certified seed (q)	TFL seed (q)	Total Unprocessed seed	Total Processed seed (q)
A	**Wheat**						
1.	HD 2985	-	369.36	51.00	11.35	431.71	345.37
2.	HD 2967	41.00	674.00	90.00	-	805.00	644.00
3.	HD 2733	-	25.50	-	-	25.50	20.40
4.	HD 3086	44.00	48.00	-	-	92.00	73.60
5.	HI 1563	10.00	259.33	-	-	269.33	215.46
6.	DBW 107	16.00	34.80	-	-	50.80	40.64
7.	DBW14	52.00	263.95	59.00	-	374.95	299.96
8.	Sabour Samridhi	-	10.80	-	-	10.80	8.64
9.	Sabour Nirjal	-	22.80	-	-	22.80	18.24
	Total	**163.00**	**1709.00**	**200.00**	**11.35**	**2083.00**	**1666.00**
B	**Lentil**						
1.	HUL 57	12.00	87.77	-	-	99.77	79.27
2.	KLS 218	-	4.66	-	-	4.66	3.73
3.	Arun	12.00	14.10	25.87	2.79	54.76	43.81
4.	IPL 406	-	13.50	-	-	13.50	10.80
5.	Shivalik	-	6.15	-	-	6.15	4.92
	Total	**24.00**	**126.18**	**25.87**	**2.79**	**178.84**	**142.53**
C	**Moong**						
1.	HUM-16	-	16.94	2.20	-	19.14	15.31
2.	PDM 139	-	-	-	4.79	4.79	3.83
3.	TMB-37	-	-	-	0.13	0.13	0.10
4.	K-851	-	-	-	0.08	0.08	0.06
5.	Pusa Vishal	-	0.50	-	-	0.50	0.40
	Total	**-**	**17.44**	**2.20**	**5.00**	**24.64**	**19.70**

D	**Gram**						
1.	PG186	10.00	83.31	-	-	93.31	76.65
2.	P256	-	-	1.53	-	1.53	1.22
	GCP	12.00	-	-	-	-	12.00
	Total	**22.00**	**83.31**	**1.53**	**0.00**	**94.84**	**89.87**
E	**Pea**						
1.	Kashi Uday	-	-	0.92	-	0.92	0.74
2.	Prakash	-	-	0.50	0.85	1.35	1.08
3.	Azad Pea-3	-	0.90	-	-	0.90	0.72
	Total	**-**	**0.90**	**1.42**	**0.85**	**3.17**	**2.54**
F	**Mustard**						
1.	RNG 48	-	-	-	2.50	2.50	2.00
2.	R. Suflam	-	5.95	-	13.74	19.69	15.75
G	**Rai**						
1.	Uttara	-	-	-	1.75	1.75	1.40
	Total	**-**	**5.95**	**0.00**	**17.99**	**23.94**	**19.15**
H	**Cowpea**						
1.	Kashi Kanchan	-	-	-	0.20	0.20	0.16
I	**Linseed**						
1.	Subhra	-	0.30	-	-	0.30	0.24
J	**Potato**						
1.	Kashi Lalit	-	13.00	-	-	13.00	10.40
2.	Kashi Kanchan	-	67.00	-	-	67.00	53.60
3.	K. Pukhraj	-	151.50	-	-	151.50	121.20
	Total	-	231.50	-	-	231.50	185.20
	Grand total (q)	**209.00**	**2174.28**	**231.02**	**37.98**	**2640.32**	**2126.00**

Table 6.2 Seed production status *kharif*, 2016

S. No	Crop variety	Breeder seed (q)	ACs & RRS	Foundation Seed (q) KVKs	Total	Grand total (q) (Expected yield)
A	**Paddy**					
1.	MTU-7029	72.00	150.00	150.00	300.00	372.00
2.	MTU-1010	12.00	60.00	-	60.00	72.00
3.	MTU-1001	6.00	-	-	-	6.00
4.	Prabhat	72.00	180.00	30.00	210.00	282.00
5.	R.Kastruri	8.00	50.00	50.00	100.00	108.00
6.	R.Suwasini	10.00	-	-	-	10.00
7.	R.Mahusari-1	100.00	500.00	750.00	1250.00	1350.00
8.	Swarna Sub 1	12.00	-	600.00	600.00	612.00
9.	R.Sweta	210.00	1300.00	1200.00	2500.00	2710.00
10.	Shahbhagi	12.00	100.00	360.00	460.00	472.00
11.	Sita	20.00	-	30.00	30.00	50.00
12.	S. Shree	30.00	-	12.00	12.00	42.00
13.	S.Surbhi	14.00	30.00	95.00	125.00	139.00
14.	S. Ardhjal	172.00	30.00	90.00	120.00	292.00
15.	S. Deep*	12.00				12.00
	Total	**762.00**	**2400.00**	**3367.00**	**5767.00**	**6529.00**
B	**Pigeon pea**					
1.	NDA-1	-	60.00	-	60.00	60.00
2.	Malviya -13	-	-	60.00	60.00	60.00
3.	Bahar	-	40.00	-	40.00	40.00
	Total	-	**100.00**	**60.00**	**160.00**	**160.00**
C	**Til**					
1.	Shekhar	-	-	56.00	56.00	56.00
2.	Krishna	-	8.00	77.00	85.00	85.00
	Total	-	**8.00**	**133.00**	**141.00**	**141.00**
D	**Jute**					
1.	JRO-204	1.40	1.40	7.00	8.40	9.80
2.	JRO-128	1.40	1.40	-	1.40	2.80
	Total	**2.80**	**2.80**	**7.00**	**9.80**	**12.60**
E	**Dhaincha**					
1.	Local variety	-	-	2.00	2.00	2.00
	Grand Total (q)	**764.80**	**2511.00**	**3569.00**	**6080.00**	**6845.00**

Table 6.3 Fruit and vegetable seed/sapling production *Rabi*, 2015-16 & Summer, 2016

S. No.	Crop	Variety	Class of seed	Area (m^2)	Production (kg)	Productivity (kg/ha)	Seed (kg)
1.	Bottle gourd	Rajendra Chamatkar	B/S	240	6.00	250	6.00
		NDBGH-4	Hybrid	900	43.00	447	27.00
2.	Sponge Gourd	Rajendra Nenua 1	B/S	600	15.00	250	15.00
3.	Tomato	Kashi Vishesh	T/L	250	2.50	100	2.50
4.	Spinach Beet	Arka Aupma	T/L	100	3.00	300	3.00
5.	Radish	Kashi Vishesh	T/L	100	6.00	600	6.00
6.	Cowpea	Kashi Kanchan	T/L	250	20.00	800	20.00
7.	Okra	Kashi Kranti	T/L	800	25.00	312	25.00
8.	Vegetable Pea	Azad Pea -3	T/L	1600	100.00	625	100.00
9.	Amranth	Pusa Lal Sag	T/L	280	15.00	535	15.00
10.	Black Cumin	Rajendra Shyma	T/L	200	15.00	600	15.00
11.	Coriander	Pant Haritma	T/L	3000	280.00	933	280.00
12.	Fruit Saplings (In number)	25	-	-	90,000 (In number)	-	-

6.3. Fingerlings and Fresh Spawns

Bihar has abundance of diversified aquaculture and fisheries resources consisting of ponds, tanks, mauns, chaurs and rivers. The aquaculturists of the state are dependent on the fingerlings bought from West Bengal which affects the fish production in number of ways. The seeds are smaller in size with high mortality and disease susceptibility; which may due to inbreeding and long distance transportation, poor growth rate etc. Different KVKs under the jurisdiction of BAU have initiated farmer friendly approach for seed production called "induced breeding" of Indian major carps and common carps. Besides breeding of common carp, rohu, catla, silver carp and grass carp are also successfully being carried out . The total quantity of fish produced by the IFS, BAC Farm was 82.6 kg during the year 2016.

Table 6.4 Fishery and Fish seed production by IFS, KVK, Bhagalpur

Sl. No.	Name of demo Unit	Area (m^2)	Details of production		
			Breed	Produce	Quantity (In Ltr.)
1.	Fishery	4046.87	Rohu	Fingerlings	155.00
2.	Fish hatchery		Katla	Fish spawn	50.00
			Common carp		
			Silver carp		
			Grass carp		

Besides the fish production, the university is also involved in production of egg and Quail. The total number of egg and quail produced by the BAC farm during the year 2016 was 86678 and 2600, respectively. Mushroom production in the state has become a symbol of women empowerment. Spawn of mushroom is an important input in mushroom cultivation. Arrangement of spawn should be done in advance so that growers do not suffer from scarcity of spawns. Before starting mushroom cultivation, entrepreneurs and farmers should ensure that spawn is available at nearby places. Most of KVKs, BAU, Sabour are engaged in training of women farmers/ Self Help Group members for commercial mushroom production. Besides training they also provide quality mushroom spawns to farmers, particularly woman farmers for commercial mushroom production.

6.4 Modern Tools and Techniques Used for Seed/Propagule Production

Bihar Agricultural University is using modern tools and techniques for seed /propagules production. The newly established seed processing plant is well equipped with modern machines. The scientists involved in seed/propagule production are having all the necessary infrastructures including moisture proof seed storage facility for maintaining nucleus/breeder seed stocks. Considering the demand of fruit crop planting material in the state and to meet the requirement of State/ National Horticulture Mission, the university has developed infrastructure like shade net house, lath house and greenhouse to control the adverse the environmental conditions for better plant growth and production of healthy saplings. Banana is a major crop of Bihar and there is high demand of quality planting material of it. To cater this huge demand, it requires a large quantity production of banana plantlets.

To cater this need, the university has established a tissue culture laboratory in a public-private partnership mode to provide quality planting material of banana. This unit has the capacity to produce one million tissue cultured plantlets every year. The nursery of fruit crops is well equipped with new technologies like green house and shade net for raising saplings during off seasons in order to meet the increasing demands. The farm of nursery is now well equipped with sprinkler system.

6.5 Quality Control and Assurance

Bihar Agricultural University, Sabour is committed to provide high quality seeds/ planting material to the farmers and other stakeholders with the highest level of quality assurance.

In-vitro Seed quality Testing

Bihar Agricultural University offers processed, upgraded and treated seeds of uniform size and quality control procedures which are produced under the supervision of expert scientists.

Scientists visit to BAU, Sabour's seed production plots

6.6 New Initiatives

Based on present scenario of availability of quality seed or planting materials and demand of it in Bihar, some new initiatives are being undertaken by the university, which are mentioned below:

- Area under seed production will be increased by utilizing un-developed land at different centres of university
- Seed/sapling production of seasonal flower, ornamental and medicinal plants
- Spawn production of Mushroom on commercial scale will be undertaken

- Makhana seed production on commercial basis will be initiated
- Establishment of infrastructure to strengthen the seed production programme of university

Inauguration of seed processing & storage facilities at BAU, Sabour

- Increasing the popularity and marketing of BAU produced seed and planting material among farmers and other stakeholders.
- Training will be imparted to farmers and other stakeholders on seed production of various crops as well as on seed processing and storage aspects.

6.7 Breeder Seed Production of Pulses

For implementation of the project entitled "Enhancing breeder seed production for increasing indigenous production of pulses in India", the Indian Institute of Pulses Research (IIPR), Kanpur is acting as a nodal agency. The ICAR has proposed to produce additional breeder seed of pulses of chickpea, mungbean, urdbean, pigeonpea, lentil and field pea. The additional targets of breeder seed production of pulses to produced in following three years from *Rabi*, 2016-17 onwards is given in Table 6.5

Establishment of new processing plant and seed storage godown at BAU, Sabour under Breeder Seed production of Pulses project of ICAR-IIPR. Site for godown construction has been identified.

Establishment of new processing plant and seed storage godown at PRC, Mokama; KVK, Munger and KVK, Lakhisarai under Seed Hub of Pulses project of ICAR-IIPR.

Table 6.5 Target of additional pulse breeder seed production

SN	Crops	Production Target (q) 2016-17	Production Target (q) 2017-18	Production Target (q) 2018-19
1.	Chickpea	100	20	20
2.	Lentil	15	15	10
3.	Fieldpea	10	15	10
4.	Mungbean	20	15	20
5.	Urdbean	20	10	10
6.	Pigeonpea	100	20	15
	Total	**265**	**95**	**85**

Table 6.6 Breeder Seed Production Programme *Rabi*, 2016-17

SN	Crop	Centre of seed production	Variety	Area allotted (ha)	Expected yield (q)
1.	**Chickpea**	BAC, Sabour	PG 186	10	100
			Shubhra	3	30
			DCP 92-3	2	20
		PRC, Mokama	Shubhra	1	10
			PG 186	2	20
			GCP 105	2	20
		RRS,Tilaundha	PG 186	4	40
		RRS, Agwanpur	PG 186	3	30
		KVK, Lakhisarai	PG 186	3	30
Total				**30**	**300**
2.	**Lentil**	PRC, Mokama	HUL 57	1	9
		RRS, Agwanpur	HUL 57	2.5	23
		KVK, Lakhisarai	IPL 406	1	9
Total				**4.5**	**41**
3.	**Field Pea**	BPS, Purnea	Prakash	1	10
			Aman	1	10
Total				**2**	**20**
Grand Total				**36.5**	**361**

6.8 Seed Hub of Pulses

Three seed hubs are proposed under the jurisdiction of BAU, Sabour namely, AICRP (Pulses), BAU, Sabour; KVK, Munger and KVK, Lakhisarai with following targets of pulse crops seed production for the next three years.

Table 6.7 Targets of pulse seed production at different centers

S. No.	Seed Hub Centres	Crops	Production Target (q) 2016-17	Production Target (q) 2017-18	Production Target (q) 2018-19
1.	AICRP (Pulses), BAU, Sabour	Chickpea	300	500	650
		Lentil	250	300	350
2.	KVK, Lakhisarai, BAU, Sabour	Chickpea	300	500	650
		Lentil	250	300	350
3.	KVK, Munger, BAU, Sabour	Chickpea	200	250	250
		Lentil	200	300	300
		Field Pea	150	150	150
Grand Total			**1650**	**2300**	**2700**

The total area under seed production of pluses during kharif 2016 and Rabi was 163.20 ha at different centres (Table 6.8)

Table 6.8 Pulses seed production programme during *Kharif*, 2016 and *Rabi*, 2016-17

S. No.	Name of Center	Crop	Variety	Area (ha)	Expected yield (q)
1.	AICRP (Pulses), BAU, Sabour	Chickpea	PG 186	21.0	200
		Lentil	HUL 57	28.0	300
			Arun		
2.	KVK, Munger, BAU, Sabour	Arhar	Narendra Arhar-	6.2	200
			Bahar	4.0	
			Malviya-13	5.0	
		Chickpea	PG-186	20.0	200
		Lentil	HUL-57	22.0	200
		Fieldpea	Malviya Matar-15	4.0	100
			Azad P-3	3.0	
	KVK, Lakhisarai, BAU, Sabour	Chickpea	PG 186	20.0	200
		Lentil	HUL 57	30.0	200
Total				**163.20**	**1600**

7. UNIVERSITY LIBRARY

The University Library was established in 1908 with the establishment of Agricultural Experiment Station and Agricultural School at Sabour. It continued with its basic activities of information resource development by collection, processing, organisation, storage and retrieval of information; maintaining liaison with other related university libraries for resource sharing and exchange of information; providing need based current awareness, reference and bibliographic services; facilitating online access to wide range of information resources in print and electronic versions. Open access system is followed in the Library and the books are arranged as per Dewey Decimal Classification scheme and catalogued as per A.A.C.R.-II.

Some of the holdings (Books and Journals) are of the 17th, 18th and 19th centuries. Those are the rare documents of this university library. Library is acquiring data bases like AGRIS, AGRICOLA, CABSAC, HORT CD, CROP CD since 1973.

7.1 Acquisition

During the period 2016 – 2017, the following resources were added:

Study section of the university library

Table 7.1 University Library Resource Development

Sr. No.	Particulars	Added during the year (No.)	Total collections
1.	**Books**		
	Books (General section + Book bank + SC/ST Book bank)	2,094	38,016
	Theses	56	736
	Reports	165	857
	Gifted books	54	300
	Total	**2,369**	**39,909**
2.	**Journals**		
	Foreign	14	
	Indian	56	
	Online journals through CeRA	3625	
	Open Access Journals	490	
3.	**E-Resources**		
	CAB abstracts	900 full text Journals	
	CABI e-Books	1,150	
	Elsevier e-books/series	1,330	
	KrishiKosh (Digital Repository)	Full access	
	E-Theses through KrishiPrabha	8,096	
	India Agristat	Full access	
	CD-Rom databases	Since 1973	

7.2 Circulation of Reading Materials

1.	Books issued	4,139	
2.	Books returned	3,614	

7.3 Library Visitors 13,785

7.4 Membership

All students, faculty members and employees of the university are member of the Library.

7.5 Services

7.5.1 E-Access Service: Online access of journals through CeRA, subscribed journals, e-Resources of CAB abstract, CABI e-Books, Elsevier e-books/series, India Agristat, e-Theses from KrishiPrabha, KrishiKosh and open access journals are accessible in the university library.

7.5.2 CD-ROM Search Service: University library provides CD-ROM database search facility. The following databases are available in the library:

(i) AGRIS: 1975 – 2004
(ii) AGRICOLA: 1970 – 2004
(iii) CABSAC: 1973 – 1997
(iv) HORT CD: 1973 – 2010
(v) CROP CD: 1973 – 2005

7.5.3 Digital Service: Digital service is available through scanning the documents in the Library.

7.5.4 Reprography Service: Photocopying service is available to users.

7.5.5 Circulation Service: The members are entitled for borrowing publications from the library as per the library rules and regulations.

7.5.6 Reference Service: Reference service is also provided in the Library.

7.5.7 Book Bank Service: In this scheme UG/PG students are given textbooks for the semester on rental basis at a nominal cost and free of charge to SC/ST students.

7.5.8 Resource Sharing Service: Resource sharing service is also available to other libraries.

7.5.9 Clipping Service: Newspaper clippings service is available in the Library.

7.6 Timing

The Library hours are 07:00 AM to 07:00 PM in all working days, 09:30 AM to 01:30 PM on Sundays and remain closed on holidays.

7.7 Teaching Programme

Under P.G. programme an introductory course of library and information services has been introduced as a compulsory course in all disciplines and optional for Ph.D. scholars.

7.8 Modernization

The library has twenty five computer systems with internet facilities in which five computers have been added recently. We have acquired IP addresses and four Wi-Fi systems have been set up to provide online access of the e-resources. Also two printers have been acquired in the library.

7.9 e-Resources

Electronic Resource section of the University library has acquired online access of CAB abstract with 900 full text journals, full access of 1,150 CABI e-Books and full access of 1,330 Elsevier e-Books / Series. It has also online access of 3,625 full text journals through CeRA, online access of IndiaAgristat, 490 open access journals on Agricultural Science, access of KrishiKosh and 8,096 e-Theses from KrishiPrabha. All College Libraries of the University have also been given online access of all the e-resources.

Electronic Resource Section of the University Library

7.10 Automation and Digitization

Automation and digitization of library documents has been initiated and till date most of new arrivals have been entered in database. Web-OPAC of university library and digital repository of BAU publications are available at BAU web site for end users. Our university has been included in KrishiKosh for digital repository of BAU publications. For this University had also been included in the NAIP Sub-project entitled: "Strengthening of Digital Library and Information Management under NARS (e-Granth)".

7.11 Consortia

The university library is a member of Consortium for e-Resources in Agriculture (CeRA), KrishiPrabha and KrishiKosh. E-Journals of American Society of Agronomy, Annual Reviews, CSIRO, Elsevier, IndianJournals.com, Oxford Journals, Springer Link, Taylor & Francis and Wiley are accessible through CeRA.

8. STUDENTS' WELFARE ACTIVITIES

Directorate of student's welfare is an important office of the university providing ample Support for facilitating students all-round development. Students are encouraged to participate in hostel management, food-services, games & sports, cultural & literary activities, professional societies in each college under the guidance of staff-counsellor. Directorate of Students' Welfare currently involved in discharging the following important responsibilities of the university:

a) Planning, promotion and organization of students' extra-curricular activities *viz*., sports & cultural activities, debates, National Cadet Corps (NCC) & allied activities and other recreational activities in the university.

b) Monitoring, supervising and co-ordinating the management of students' hostels, university/college cafeteria and arrangements of mess

c) Looking after all schemes relating to scholarship/fellowship and stipend, part-time employment, freeships and such other financial assistance to deserving and/or needy students and travel facilities for the study tours of students

d) Monitoring and promoting discipline among students of the university

e) Counseling and advisement to students

f) Providing assistance in the placement of the graduates of the university.

During the reported year following major activities were carried out by the University:

8.1 Annual Inter College Sports Tournament

An Annual Inter College Sports Tournament was organized from 4th to 6th January, 2016 on the Campus of Bihar Veterinary College, Patna. This was inaugurated by the Hon'ble Vice-Chancellor, B.A.U., Sabour. The Hon'ble Chancellor, Bihar Sri Ram Nath Kovind was the chief guest at the valedictory session.

8.2 Celebration of *International Yoga Divas*

The 2nd International Yoga Divas was organized at all the college campuses of the university. A total of 400 students and faculty attended the Yoga class. The yoga trainers from district Yoga schools and of other ashrams provided the instruction on yoga sessions.

8.3 All India Educational Tour

A total of 96 students from all the constituent colleges of the university were taken on all India educational tour from 2 - 18 July, 2016.

8.4 Celebrations of *Swachhta Pakhwada* from 16 - 31 October, 2016

In response to the call of ICAR and the Hon'ble Prime Minister of India, in consonance with the "Swachh Bharat Mission" launched on the concept of Mahatma Gandhi's vision, "Sanitation is more important than independence," Bihar Agricultural University, Sabour also observed a fortnight long *Swachhta Pakhwada* from 16 - 31 October, 2016 in all its institutions including Bihar Agricultural College Sabour. The cleanliness campaign was launched with a big fan and fare in the university auditorium at Sabour campus by Dr. A. K. Singh, Vice- Chancellor Bihar Agricultural University, Sabour on 16th of October, 2016.

Inauguration of Swachhta Pakhwada at BAU, Sabour

All the Deans and Directors, faculty members, students, staff and other workers of the University and that of Bihar Agricultural College, Sabour participated in this inaugural programme. The Hon'ble Vice-Chancellor deliberated upon the nationwide programme of Swachh Bharat Mission and its importance. He also stated the call of the ICAR to observe a fortnight long Swachhta Pakhwada from 16-31October, 2016 to be taken up by all the Colleges, all its units, research stations and the KVKs of the University. The audience took a 'Swachhta Shapath' (cleanliness oath) on the occasion. This 'SwachhtaShapath' (cleanliness oath) was the same as ordained by ICAR for the Agricultural World. The audience promised to dedicate 100 hours every year towards *'Swachh Bharat Abhiyan'*.

In order to improve cleanliness in the surrounding areas of the college/university campus and especially in the nearby villages, a *Swachhta Abhiyan* rally was organized in the morning of 17th of October, 2016. The rally was led by Hon'ble Vice-chancellor. Deans and Directors of the university; Assoc. Dean-cum-Principal, Bihar Agricultural College, Sabour; Chairmen and Heads of the departments along with the faculty members and students of the college participated in this rally. The rally went through the main road to Sabour baazar and back to Khankitta village and educated the people about the importance of the cleanliness.

8.5 Organization of Essay and Poster Competition during *Swachhta Pakhwada*

Debate, essay and poster competitions on *Swachhta Pakhwada* were organized for the students of the university on 24th of October, 2016 in the university auditorium. More than a dozen students of the college participated in these events. during the valedictory session of *Swachhta Pakhwara*, the awards and certificates to the students were distributed in a graceful celebration in the university auditorium. Dr. Ajoy Kumar Singh, Hon'ble Vice-Chancellor, BAU, Sabour graced the event and all Deans, Directors, faculty members, staff and students were present during the program.

Distribution of prizes of various competitions held during Swachhta Pakhwada at BAU, Sabour

8.6 Participation in the 17th All India Inter-Agricultural Universities "Agri-unifest"

As many as 25 students, 13 boys and 12 girls of different colleges of BAU participated in the 17th All India Inter-Agricultural Universities Agri-unifest held at Rajasthan University of Veterinary & Animal Science, Bikaner (Rajasthan) from 22-25 February, 2017. Two faculty members accompanied the entourage.

Glimpses of Agri Unifest held at RUVAS, Bikaner (Rajasthan)

Table 8.1 The list of students participated in various competitions during *Swachhta Pakhwada*

Sl. No.	Event	Name of the student winning prize	Semester
01.	Debate	Mr. Abhishek Kumar	III (U.G.)
		Mr. Alok Kumar	III (U.G.)
		SaksheeSuman	III (U.G.)
		AradhnaKumari	III (U.G.)
		Suman Kumar	III (U.G.)
02.	Essay	Mr. Abhishek Kumar	III (U.G.)
		Mr. Abhishek Kumar	M.Sc. (Hort.)
		Roshan Kumar	M.Sc. (Hort.)
03.	Poster	Alok Kumar	III (U.G.)
		AnupamJyoti	III (U.G.)

8.7 Organization of 7th Annual Inter-College Sports and Athletics Meet of Bihar Agricultural University, Sabour

The 7th annual inter-college sports and athletics meet of Bihar Agricultural University, Sabour was organized during February 18-20, 2017 at Sabour campus. The sports meet was inaugurated by Dr. A. K. Singh, Hon'ble Vice Chancellor, B.A.U., Sabour on February 18, 2017. Students, both boys and girls participated in this meet.

Inauguration of 7th Annual Inter-College Sports and Athletics Meet of BAU, Sabour

Glimpses of 7th Annual Inter-College Sports and Athletics Meet at BAU, Sabour

8.8 Participation in 17th All India Inter Agricultural University Games and Sports Meet at Chaudhary Charan Singh Haryana Agricultural University, Hisar (Haryana):

As many as 34 students from different colleges, 25 boys and 09 girls participated in 17th All India Inter Agricultural University Games and Sports Meet at ChaudharyCharan Singh Haryana Agricultural University, Hisar (Haryana) from 25-29 March, 2017.

Participation of students BAU at 17th All India Inter Agricultural University Games and Sports Meet at CCSHAU, Hisar

8.9 Observance of Agricultural Education Day

On the call of the ICAR, New Delhi, in unison with the agricultural institutions all over the country, Bihar Agricultural University, Sabour also commemorated the birth anniversary of first President of independent India and Bharat Ratna, Dr. Rajendra Prasad at the university headquarter and in it all constituent colleges, research centres and KVKs. As suggested by the ICAR. The main objectives to observe the day were, to expose the students of the university and nearby schools to importance of agriculture in their life and its relevance to the development of India, how Agriculture as a profession could bring richness to their life, inspire them and attract them towards agriculture and allied fields, choose professional career after schooling in one of the agricultural courses, engage themselves in agriculture and related activities or become agri-entrepreneurs in future. On this occasion a number of programmes and activities were organized throughout the day which included debate, essay art competition and exhibitions along with agriculture stake holders meet of agricultural scientists, bankers, extension workers and progressive farmers and deliberations with RAWE students staying in eight KVKs of the university through video conferencing.

The themes and topics decided for different celebrations were decided by a senior level meeting held in the university under the chairmanship of Director Planning and Dean (Ag.) Dr. Arun Kumar which were common for the programmes in the university (Table 8.2).

The observance of the day began with inauguration by Dr. Arun Kumar, Director Planning and Dean (Ag.) in the university auditorium. All Deans and Directors, all the faculty members and students attended this programme. In his inaugural address, Dr. Arun Kumar stating the importance of the day observed that Bharat Ratna Dr. Rajendra Prasad as the First President of independent India was a great educationist and his personality of high thinking and simple living exuded magnifying inspirations to the students. Dr. R. K. Sohane, Director Extension deliberated upon entrepreneurial opportunities for agricultural graduates and rural youth. Dr. B. C. Saha, Dean (PGS) called upon the students to engage themselves fully in their studies as Dr. Rajendra Prasad did. The India of the dreams of the great leader Dr. Rajendra Prasad was a very developed, prosperous, united and showing path to others and all this was a challenge for the new generation to achieve, he observed. Dr. J.B.Tomer, Director of Research observed that there was immense possibility in agriculture for the new generation. Dr. Ashok Kumar, Director Students

Observance of Agricultural Education Day at BAU, Sabour

Welfare and Registrar recalled the great studentship shown by Dr. Rajendra Prasad. He called upon the students to follow the wisdom of the great leader. Dr. Ram Datt, Asstt. Professor, Extension Education Coordinator, Centre of Excellence for Teaching and Learning, BAU, Sabour called upon the students to awake, arise and stop not till they could make their own life and the life of their countrymen happy, wealthy and satisfactory.

Agriculture pursued scientifically and wisely could help them fulfil their threes dreams, he observed.

8.10 A Brief Report of the Celebrations Observed by Different Wings of the University

Bihar Agricultural College, Sabour In order to commemorate the Agricultural Day at Bihar Agricultural College, Sabour about 400 students from four schools namely, D.A.V. Bhagalpur; Diksha International, Jhurkhuria, Bhagalpur; Anand Public School, Khankitta, Sabour and SarashwatiVidyamandir, Sabour and the students and faculty of the College gathered in the college auditorium. The students participated in various event organized by the college. The programme began with the welcome address by Dr. R. P. Sharma, Assoc. Dean-cum-Principal, B.A.C., Sabour.

Agricultural Education Day celebration at BAC, Sabour

The results of the debate, essay writing and painting are presented below:

Sl.	Name of the Students	Position
I	***Debate***	
1	Ms. Umme Hafsa, BAC, Sabour	1st
2	Mr. Ashutosh, BAC, Sabour	2nd
3	Mr. Navneet Kumar, BAC, Sabour	3rd
II	***Essay Writing***	
4	Ms. Nidhi Shree, BAC, Sabour	1st
5	Mr. Sreejeet K.J., BAC, Sabour	2nd
6	Mr. Devendra Kumar, BAC, Sabour	3rd
III	***Painting***	
7	Ms. Yogita, BAC, Sabour	1st
8	Ms. Ayushi Raj, BAC, Sabour	2nd
9	Ms. Tejaswani, BAC, Sabour	3rd

8.2 Various competitions and events held during Agricultural Education Day at BAU, Sabour

Sl. No.	Programme	Topic
01.	Debate	Agriculture Development was the only way foreradication of poverty in India.
02.	Essay	Agricultural Education in context of new generation
03.	Exhibition	Climate change and its impact of agriculture
04.	Stake Holders Meet	How to build SMART VILLAGES
05.	Discussion through Video Conferencing	Entrepreneurial Scope for rural youth

The college also organized an exhibition and attractions of the exhibition were climate changeand its impact of agriculture and future food security; nanotechnology; climate smart agriculture; precision farming & nutrient management, knowledge smart technologies, water smart Technologies, etc.

A number of motivational lectures on career in agriculture, future prospects of agriculture, demand and supply of human resources, prospect of entrepreneurship on agriculture were delivered by the eminent scholars of the University. The speakers focused on huge prospects existing in agriculture, in various sectors like management, agri-industry, banking etc. The lectures were delivered by Dr. Arun Kumar, Director Planning and Dean (Ag), Dr. B.C. Saha, DRI-cum-Dean PGS.The programme in the auditorium ended with prize distribution among the winners of these events the list of whom is posted earlier

BholaPaswanShashtri Agricultural College, Purnea: The BPSAC, Purnea celebrated Agricultural Education Day, which was marked with the participation of about 135 under graduate students of B.Sc. (Ag.) along with the faculty members and 120 students of Raja Prithvi Chand Sr. Secondary School, Purnea City, Purnea. The objective of this day was to expose students especially the students of schools to various facts of agriculture education and its relevance to country's development, inspire them and attract them towards agriculture science, so that they develop interest in agriculture and allied subjects. The students were also advised to choose professional career after schooling in courses of agriculture, to become agriculture entrepreneurs in future. Sri. D.P. Yadav, Area Manager, National Seed Corporation, Purnea appraised about the role of NSC and opportunities of employment in NSC for agriculture graduates. Sri. Girindra Nath Jha, a progressive farmer, narrated the importance of medicinal plants for society and generation of employment for agricultural students. Officer In charge of Academic cell, BPSAC, Purnea Sri Mani Bhushan highlighted the mode of entrance and pattern of admission in agricultural courses, preparation of ICAR exams, different scholarship and career opportunity in field of agriculture.

Agriculture Education Day Celebration at BPSAC, Purnea

Head Master, Raja Prithivi Chand Senior Secondary School, Purnea City expressed happiness about the active role of ICAR institutes, SAUs, Agricultural department of Central and State Government for providing knowledge of current agriculture education system in the country through Agricultural Education Day. On this occasion NSS/Literary and Debating Society, BPSAC, Purnea organized different competition like debate on topic “Agriculture Development: the only way for poverty alleviation in India”, drawing competition on the topic “Effect of climate change in Agriculture” and essay writing competition on “Agricultural Education: In context of new generation”. The programme was followed by prizes of Rs. 2200.00, 1500.00 and 1100.00 and certificate distribution to the successful students who participated in different activities like debate, poster making, and essay competition.

Debate competition during the celebration of agriculture education day programme at BPSAC, Purnea

Table 8.3 Results of Various Competitions on the occasion of Agriculture Education Day at BPSAC, Purnea

S.No.	Poster Competition	Debate Competition	Essay Competition	Position
1	Miss. RadhaKumari	Mr.Mayank Kumar Sinha	Mr.Mayank	First
2	Mr. Abhishek Kumar	Miss. Sivangi Gupta	Miss. RajniKumari	Second
3	Miss. Sivangi Gupta	Miss. PrernaKumari	Miss. Raj Nandini	Third

V.K.S. College of Agriculture, Dumraon (Buxar): The V.K.S. College of Agriculture, Dumraon (Buxar) celebrated Agricultural Education Day at Multipurpose Hall with the participation of our college students and more than 100 students of class VII to XII std from different schools of the vicinity of the Dumraon along with their teachers. Prof. U.S. Jaiswal, Associate Dean-cum-Principal in his inaugural speech laid emphasis on the relevance of various horizon of the agricultural science covering education, research, extension and training. He encouraged the students, advised them to keep agriculture, and allied subjects in mind while choosing a career in future. Sri Ashutosh Pandey, a progressive farmer, participated as chief guest in programme and emphasized that how to earn from agricultural and allied subjects. Dr. Md Reyaz Ahmad, Dr. D. K Singh Associate Professor-cum-Sr. Scientist, and Dr. Nitu Kumari, sensitized the students about the scope and advantages of agricultural education and motivated them to be part of progress in agricultural science. The daylong celebration was interactive engaging and participating with special events for the participating students *i.e.*, painting on 'Impact of climate change on agriculture', debate on 'Agriculture is the only way to eradicate poverty in India' and essay on 'Agricultural education in the views of new generation'.

Observance of Agriculture Education Day at VKSOCA, Dumraon

In painting competition, Prince Bhaskar, Amba Kumari (Sumitra Mahila College, Dumraon) and Nishu Bharati (DAV Public school, Dumraon) were awarded first, second and third prize respectively. In essay Raushan Kumar, Abhishek Kumar and Amrita Singh were awarded first, second and third prize respectively. In debate competition Seema Kumari, Harsh Vardan and Mira Kumari were awarded first, second and third prize respectively. The winners of the different events have received cash prize of Rs. 2200/(First) Rs. 1500/(second) and Rs1100/(Third).

Glimpses of essay competition celebration on Agriculture Education Day at VKSOCA, Dumroan

Mandan Bharti Agricultural College, Agwanpur (Saharsa): The programme was inaugurated by Dr. Umesh Singh, Assoc. Dean-cum-Principal, MBAC, Agwanpur, Saharsa. The students of the college participated in the debating, essay and poster presentation competitions in the college. The topics were same as circulated by the university for different events.

Observance of Agriculture Education Day at MBAC, Saharsa

Table 8.4 The results of the various events held during Agriculture Education Day at MBAC, Saharsa

S.No.	Debate Competition	Essay Competition	Poster Competition	Position
1	Simran Sindhu	Simran Sindhu	PriyankaKumari	First
2	Suhani Singh	Suhani Singh	-	Second
3	GuddyAnand	Mantu Kumar Ray	-	Third

Dr. Kalam Agricultural College, Kishanganj: The college celebrated Agricultural Education Day in which Programme Coordinator, KVK, Kishanganj; Principal, Kendriya Vidyalaya, Kishanganj; Headmaster of Higher Secondary School, Hawai Adda, Kishanganj were invited. During Inaugural session, glimpses of the programme were delivered along with the general introduction of Dr. Rajendra Prasad. Lectures were also given by different scientists to boost up young generation for their future orientation about agricultural education. Programme Coordinator, KVK, Kishanganj highlighted importance of agricultural education and the scope of this sector emphasizing the contribution of agriculture in the Indian economy. Various cultural activities were performed like art competition, debate and essay writing during this occasion.

Nalanda College of Horticulture, Noorsarai (Nalanda)

Nalanda College of Horticulture, Noorsarai, Nalanda organized a series of activities on the occasion of "Agriculture education day" on 3rd December, 2016. The programme was inaugurated by the Assoc. Dean-cum-Principal of the College by lightening the lamp. The details of various events held are summarized hereunder.

Observance of Agriculture Education Day at NCOH, Noorsarai

1. Essay Competition : the number of participating students was 51. The theme was same as stated earlier *i.e.*,*"Krishi Shiksha Nayee Pidhi Ki Najar Mein"*. After evaluation the essay of the following students were adjudged as:

1	Usha Kiran	1st
2	Sapan Kumar	2nd
3	Md. Umar Mahboob	3rd

2. Debate competition, the number of participant students was fifteen, the three best judged among them were:

1	Mr. Raunak Kumar	1st
2	Md. Umar Mahboob	2nd
3	Mr. Anjani Kumar	3rd

3. Models : The students were motivated to prepare and display models on various aspects of agriculture education and research. The students formed seven groups consisting of four students in each group and thus twenty eight students displayed seven models.

Model presentation on Agricultural Education Day Celebration at NCOH, Noorsarai

The three best models adjudged 1st, 2nd & 3rd involving a total of 12 students were awarded prizes of Rs. 2200/- for first, Rs. 1500/- for second and Rs. 1100 for third position. More than 100 students from Madhya Vidyalaya, Chandasi; Aadarsh Gandhi Uchch Vidyalaya, Chandasi; Madhya Vidyala, Sangat and St. Terela School, Noorsarai has been participated and got benefitted by learned lectures given by Dr. P. K. Singh, Dr. M.D. Ojha, Dr. A. P. Singh and Dr. Alok Kumar. Many students from these schools also participated in the programme by giving speech reciting songs and other activities.

Bihar Veterinary Science College, Patna & Sanjay Gandhi Institute of Dairy Technology, Patna: The two colleges of Veterinary Sciences and Dairy Technology, Patna organized the Agricultural Education Day together. The three events namely, debate, essay and exhibition competitions were held for the students on the pattern of other colleges of the university. On this occasion, lectures by the senior faculty members were organized for the benefit of the students and the faculty of the two colleges.

Glimpes of Various activities during Agricultural Education Day at BVC & SGIDT, Patna

Celebrations in KVK, Sabour The Agricultural Education Day was observed in KVK, Sabour with an inauguration byDr.R.P.Sharma, Assoc. Dean-cum-Principal, B.A.C., Sabour. The post graduate students also participated in the programme Tree plantation was done on the occasion. The students were taken to the visit of the entrepreneurial demonstration units of the Centre. They exhibited keen interest in vermin composting and mushroom cultivation and learned their technqye and advantages on the spot.

Glimpses from environmental day celebration at various units of BAU, Sabour

Director Planning and Dean (Ag.) Dr. Arun Kumar at the end of prize distribution function observed that this should not be taken as just a programme of One Day. He emphasized that, there is a need to promote the essence and observations of the day among all sections of the society, especially among the students community in the whole state of Bihar.

9. IMPORTANT MEETINGS AND WORKSHOPS

9.1 Eleventh Research Council Meeting

The 11th Research Council Meeting of the Bihar Agricultural University, Sabour for *Kharif* 2016 was organized during 12th to 13th May, 2016 under the chairmanship of Dr. A. K. Singh, Vice-Chancellor, BAU, Sabour and in the august presence of Dr. H. S. Gupta, Director General, BISA; Dr. S. K. Sharma, Former Project Director, Directorate of Cropping System Research, Modipuram, Meerut; Dr. Pradip Dey, Project Coordinator, STCR, Indian Institute of Soil Science, Bhopal and Dr. R. K. Malik, Senior Agronomist, CIMMYT, India. The progressive farmers present in the meet were Sri Deepak Kumar Singh and Smt. Sanju Devi. The welcome address was delivered by Dr. J. B. Tomar, Director Research who also presented the overview of research activities along with

Inaugural session of 11th Research Council Meet

Action Taken Report of the previous research council meet. Dr. A. K. Singh, Vice-Chancellor, BAU, Sabour urged the scientist of the University that research programme should be focused and practical oriented. Dr. H. S. Gupta advised the scientists to come up with collaborative projects or implement the same in this institute after exposure at outside institutions. Dr. R. K. Malik emphasized on proper implementation of the technologies at farmer's field. Dr. Pradip Dey and Dr. S. K. Sharma praised the efforts of young scientist and also reviewed all the research projects meticulously. Dr. J. B. Tomar, Director Research, BAU, Sabour said that suggestions given by experts and house would be incorporated during the execution of research programme. On the second day of the Research Council Meeting, few important technologies were also proposed in this meet as per the requirement of the farmers of the state. Out of these, one aromatic rice genotype, Bhagalpur Katarni (BRR0001) for medium irrigated ecosystem of agro-climatic Zone IIIB, and technologies namely (1) Nutrient management in organic vegetable production, (2) Production technology of Sahbhagi Dhan, (3) Use of pre-emergence herbicide (pendimethalin) for control of *Cuscuta* spp. in lentil, (4)

Conservation tillage practices in sowing of lentil, (5) Agrifound Dark Red variety of onion for the production in Kharif, (6) Agrifound Light Red variety of onion for the production in *Rabi*, (7) Rice and wheat straw based complete feed block for live stocks, (8) Bypass protein for growing dairy animals, and (9) Homemade mineral mixtures for cattle were presented for release. Dr. A. K. Singh, Vice Chancellor, BAU, Sabour and

Participants of 11th Research Council Meeting

Chairman of this eleventh research council meet appreciated the research carried out by the scientist and urged them to maintain same pace and tempo during his concluding remarks.

9.2 Twelfth Research Council Meeting

The 12th Research Council Meeting for *Rabi* 2016

Inaugural session of 12th Research Council Meet

Release of publication during of 12th Research Council Meet

was organized at BAU, Sabour on 28th and 29th of September, 2016. Padam Shri Dr. Brahma Singh, Emeritus Scientist, DRDO, New Delhi; Dr. R.K. Malik, Senior Agronomist, CIMMYT; Dr. N.K. Singh, National Professor and B.P. Pal Chair, NRC on Plant Biotechnology, New Delhi along with Shri Jagdev Ram, Joint Director, Agriculture (Planning), Govt. of Bihar were present during the meeting. The Research Council Meeting was chaired by Hon'ble Vice Chancellor, Dr. A. K. Singh. Dr. J.B. Tomar, Director Research presented the research achievements of university along with the released technologies and action taken report. University is currently executing 155 State Plan Projects, 17 AICRP, 20 national externally funded research projects and 12 international externally funded research projects. Multilevel research advisory groups comprising natural resource management, crop improvement, crop protection, social sciences and product development and marketing groups presented a strong research front. Since inception of the university, 15 crop varieties and 34 farm production and processing technologies have been developed and released for the farmers benefit. Padam Shri Dr. Bharam Singh discussed the problems related to non-availability of agricultural labour and inadequate mechanization of the farms. He added that participatory research should also be given priority along with the academician's sole research. He further stated that, adequate emphasis should also be laid on the production of pulses in eastern part of India. Dr. Singh congratulated the university members for their significant achievements and opined that this university may attain best university status in the days to come. Dr. R. K. Malik stressed on the need for diffusion oriented bottom-up research and extension approach rather than top-down approach. He also enlightened audience on the importance of team effort in conducting researches. Dr. N. K. Singh focused on prioritization of research along with proper monitoring and evaluation. He expressed his concern of shifting of legume cultivation to central and southern region of India. He opined that there is urgent need to increase nutrient efficiency. Recent technological interventions in increasing input use efficiencies need to be incorporated. Quality basic science

research is of urgent need for supporting adaptive and applied research. Shri Jagdev Ram provided a comprehensive account of different activities of state government for the Rabi season. He urged the scientists to provide adequate attention on Palmyrah based food products so as to take it as an enterprise. Dr. A. K. Singh urged the scientists in the social science domain to investigate the cause of stagnation in agricultural production in post green revolution phase. He also emphasized on proper feedback mechanism for prioritization of research. He expressed satisfaction on the achievements on researches conducted on Palmyrah palm from the University. He also advised to conduct a brainstorming session on wheat with the scientists of the university. Dr Singh expressed his satisfaction on the achievements of the scientists of the university in research domain.

9.3 Eleventh Extension Council Meeting

The 11th Extension Education Council Meeting for *Kharif* 2016 was held at BAU, Sabour on 11th May

11th Extension Council Meet

2016. Dr. A. K. Singh, Vice Chancellor of the University; Dr. S.K Roy, Director, ATARI, Kolkata; Dr. R.K Malik, Senior Agronomist, CIMMYT, Mexico and Dr. Madan Singh, DRI-cum-Dean PGS, RAU, Pusa, inaugurated the meet. Dr. R.K Sohane, Director, Extension Education highlighted the extension activities of the university. He informed the house on innovative approaches like *Kisan Chaupal*, formation of Farmers Producers Company, KVKs in rural school as well as active participation of the university in central government sponsored schemes like *Jai Jawan Jai Kisan*, *Sansad Adarsh Gram Yojana*, Soil health card scheme, *Pradhanmantri Fasal Bima Yojana* etc. He stated that University has reached the farmers effectively and efficiently with the help of video-conferencing facilities, mobile text and voice messaging services, Kisan Rath etc. In the near future, the university has planned to create Climate Smart Villages, which will cater to the agricultural needs in the context of changing climate. He also stated that the approaches like Farm mechanization, Animal health camp, Mera Gaon Mera Gaurav schemes are bringing greater benefits to the farming community. The Director Research of the university, Dr. J.B Tomar briefed the house on technologies ready for transfer. These technologies are of immediate need to the farming community and will result in enhancement of production and productivity. Dr. S.K Roy, Director, ATARI, Kolkata underlined the initiatives on cluster demonstration. He said that more and more villages will be covered under NICRA in the current year and the soil testing laboratory will be made functional in all the KVKs. He stressed on development of fisheries in the state. Dr. R.K. Malik, Senior Agronomist, CIMMYT (India) focused on building multi-stakeholder partnerships through KVK system. He urged the KVK to act as marketing wing of the university. He urged the KVKs to develop farmers as technicians. Dr. Madan Singh, DRI-cum-Dean PGS, RAU, Pusa urged the programme coordinators of different KVKs to necessarily attend the district coordination committee meeting where one can have better idea on agricultural scenario of the district. He instructed the scientists

Participants of 11th Extension Council Meet

to standardize training module for different groups of farming community. Hon'ble Vice Chancellor of the university, Dr. Ajoy Kumar Singh, urged the scientists to revisit and review the package of practices recommended to the farmers. Also, he informed the house that a technology inventory as

Inaugural session of Symposium on Lychee, Longan and other Sapindaceae fruits

well as manual on On-Farm Trials conducted by the KVKs will be released soon or the benefit of the farming community.

9.4 International Symposium on Lychee, Longan and other Sapindaceae fruits

The International Symposium on Lychee, Longan and other Sapindaceae fruits was held at Bihar Agricultural University, Sabour during 31st May to 3rd June 2016. Padam Shree Dr. K.L. Chadha, President, The Horticultural Society of India, New Delhi; Dr. A.K Singh, Vice Chancellor, BAU, Sabour; Dr. Regina B. Cronje, ARCR ITSC, Nelspruit, South Africa; Dr. W.S Dhillon, Professor (Horticulture), PAU, Ludhiana and former ADG, ICAR, New Delhi; Dr. Vishal Nath, Director, NRC, Litchi, Muzaffarpur; Dr. B.C. Saha, DRI-cum-Dean PGS, BAU, Sabour graced the inaugural function.

The impact on the farmers along with socio-economic and other relevant issues will also be discussed at length during the symposium, The chief guest of the symposium, Padam Shree Dr. K.L Chadha emphasized upon the important aspects like germplasm conservation, processing of litchi and other sapindaceous fruits, promotion of non-conventional sapindaceous fruits like Longan and Rambutan etc. as well as their export potential. He remarked that Bihar is fortunate to have both the king and queen of fruit, i.e. mango and litchi respectively. The Vice Chancellor of the university, Dr. A.K Singh in his presidential address, pointed out the impact of climate change on fruit production and quality as well as improvement of shelf life of litchi and allied crops.

Participants of Symposium on Lychee, Longan and other Sapindaceae fruits

He also emphasized on capacity building of the litchi growers. Dr. Regina B. Cronje presented the activities of International Society of Horticultural Sciences, Belgium throughout the world. Dr. W.S. Dhillon emphasised the importance of fruit crops in promoting nutritional security and its contribution in the national economy. Dr. Vishal Nath explained the role of National Research Centre on Litchi in holistic improvement of Litchi production and advancements in research like canopy management and precision input management interventions in physiological systems. The inaugural session ended with the vote of thanks from Dr. B. C. Saha.

9.5 Mango Diversity Show - 2016

Mango Diversity Show was organized during 14th and 15th June, 2016 at Bihar Agricultural University, Sabour. It was inaugurated by Dr. Ajoy Kumar Singh, Vice Chancellor, BAU, Sabour and Dr. G. Trivedi, former Vice Chancellor, RAU, Samastipur. Different mango varieties were displayed under early, mid and late season categories. A total of about 256 varieties were displayed among which more than 110 varieties were from the mango growers of Bihar. The objective of the show was to display the rich diversity of mango for the benefit of mango growers. During the diversity show, Zardalu was

Hon'ble Vice-Chancellor taking part in Mango Diversity Show

very much appreciated by the dignitaries and visitors. Coloured varieties viz. Husn-e-ara, Gulabkhash, Swarnarekha, Kesar were the centre of attraction for the visitors. In the show, farmer's were appreciated with the recognitory awards to encourage them engage in production of quality mango. Many other dignitaries also attended the show including Dr. Kriti Singh, Former VC, NDUAT, Faizabad and Former Chairman ASRB, Dr. T. Janaki Ram, ADG (Horticulture), ICAR New Delhi. During the prize distribution function a total of 38 prizes were distributed among the mango growers from different categories. The maximum nine awards were received by Mr. Ashok Chaudhury (famously known as mango man of Bihar) in different categories. A Kisan gosthi was also organized on the day of prize

Participants of Workshop on Innovation Platform Development

distribution to create awareness among the growers on various issues of mango cultivation. A folder "Aam ki Samasyai Tatha Unka Nidhan" was released for distribution among the farmers. The prize distribution function was attended by Dr. G. Trivedi, former Vice Chancellor, RAU, Dr. G.S Dubey Former Dean PGS, BAU Ranchi, Dr. S.M. Prasad Former Head, BAU Ranchi, Dr. Kalyan Singh former Dean (Ag.), BHU Varanasi.

9.6 Workshop on Innovation Platform Development

A four day long workshop on Innovation Platform was organized under ACIAR, Australia funded SRFSI project from 31st May to 3rd June 2016 in Purnea district. A total of 20 participants from NARC, Nepal, Jeevika, ICAR, Patna, Shakhi and BAU, Sabour participated in the workshop. Dr. Sanjay Kumar, Principal Investigator, SRFSI, Dr. Ram Datt, Co-PI SRFSI, Dr. Ranvir Kumar, Co-PI

Workshop on Attaining Excellence in Science and Soft Skill Development among Agricultural Professionals

SRFSI and associated staff of SRFSI participated in the workshop from the university. Peter Brown and Toni Darbas from CSIRO facilitated the workshop. The main objective of this workshop was to develop innovation platform for solving the problems of farmers and make enabling environment for promotion of scientific technologies at grassroots through developed system.

9.7 Workshop on Attaining Excellence in Science and Soft Skill Development among Agricultural Professionals

A day long workshop on attaining excellence in science and soft skill development among agricultural professionals was organized by BAC, Sabour and CETL, BAU, Sabour on 15th June, 2016 at BAU, Sabour. Dr. Arun Kumar, Dean Ag, Dr. R.K. Sohane, Director Extension Education, Dr. K.K. Singh, Director Seed and Farms, Dr. B.B. Mishra, Associate Dean-cum-Principal BAC,

Sabour, Chairmen of various department, faculty members and students were present during the workshop. Prof. P.K. Chhonkar, Adjunct Faculty graced the event as the guest speaker. Prof. Chhonkar discussed about how to attain excellence in science, balance between workplace and family, soft skill development and physical fitness of the professionals during the workshop.

9.8 National Conference on Bringing Self Sufficiency in Pulses for Eastern India

Bihar Agricultural University, Sabour celebrated the International Year of Pulses-2016 by organizing the National conference on "Bringing Self Sufficiency in Pulses for Eastern India" during 5th to 6th August, 2016 on the occasion of University foundation day (5th August) at Sabour in collaboration with ISPRD, Kanpur. Various eminent personalities namely Shri Ram Vichar Rai, Hon'ble Minister of Agriculture, Govt. of Bihar; Prof. Ramesh Chand, Member, Niti Aayog; Dr. N. P. Singh, Director, Indian Institute of Pulses Research (IIPR), Kanpur; Dr. P. M. Gaur, Principal Scientist, ICRISAT, Hyderabad and Sri Anuj Kumar, Principal Secretary to the Hon'ble Minister of Agriculture, Government of Bihar graced the inaugural function. The conference was presided over by Dr. A. K. Singh, Hon'ble Vice Chancellor of Bihar Agricultural University, Sabour; Dr. R. K. Sohane, Chairman-cum-Director Extension Education and Dr. P. K. Singh, Organizing Secretary of the conference. The conference also gained importance since Bihar Agricultural University is celebrating its seventh foundation day on 5th August 2016. The Chief Guest of the conference, Shri Ramvichar Rai streamlined the importance of pulses in the diet. The government of Bihar has taken active measures towards promotion of pulses in the state along with a precise road map in this regard. Prof. Ramesh Chand expressed the need to strengthen the existing institutions in the country and praised the efforts of the university in a short span of 7 years. He emphasized that the benefit-cost analysis of the technology should be established for better understating on the feasibility of the technology. Dr. N.P Singh informed the house on the initiatives

Participants of National Conference on Bringing Self Sufficiency in Pulses for Eastern India

of the centre towards developing quality seed hubs. He expressed strong need to strengthen the research system in the country which can alone help in the development of agriculture. Dr. A.K Singh remarked on the importance of pulses in the vegetarian diet. He further urged to conduct researches in Tal and diara land, which have immense potential for pulses production in the country. The welcome address was delivered by Dr. P.K Singh, the 233 Participants comprises Scientists, Students and Farmers from different states of the country like; Bihar, Jharkhand, Orrisa, West Bengal, Uttar Pradesh, Maharashtra, Andhra Pradesh, Rajasthan, New Delhi, Haryana participated in the conference. Several renowned scientists working on pulses participated and given their expertise talk during the conference. Dr. Rafat Sultana, the Joint Organizing Secretary of the conference, rendered organizing Secretary while the vote of thanks. The chief guest of valedictory session was Dr. R.R. Hanchinal, Chairman, PPV& FAR and Hon'ble Vice Chancellor, BAU, Sabour preside the valedictory session. The conference was a grand success and it

provided an exceptional opportunity to researchers, policy makers, extension workers, farmers, traders and entrepreneurs to draw strategies for food and nutritional security and environmental sustainability through pulse crops and draft a consensus road map for increasing profitability and productivity of pulses for near future.

9.9 Workshop on Excellence in Personality development of SC/ST students

A three day workshop on "Excellence in Personality development of SC/ST students" was organized at BAU, Sabour from 24th February, 2017 under the leadership of Dr. G. Chand, Assoc. Prof., Plant Pathology, BAU, Sabour. The program was inaugurated by Hon'ble Vice Chancellor Dr. A.K.Singh, BAU, Sabour in the prestigious presence of Dr. Ratan Mandal, Ex Chairman, OBC Commission, Bihar, Dr. B. Ravidas, Chairman, Ambedkar Thoughts, TMU, Bhagalpur, Dr. K. Datta, Assoc. Prof., English, Bidhan Nagar College, Kolkata, Dr. Arun Kumar, Dean, Agriculture and Dr. R.K. Sohane, DEE, BAU, Sabour. The program was especially focused on SC and ST students and about 105 students from different constituent colleges under BAU, Sabour participated in the workshop. Dr. Ratan Mandal, in his address encouraged the students to interact with the village children and arouse their interest in higher education. This would also help in the upliftment of the SC/ST students along with building up of an educated society. The workshop covered various aspects of personality development, leadership skill development and professional etiquettes.

Workshop on Excellence in Personality development of SC/ST students

10. AWARDS AND RECOGNITION

10.1 Awards and Recognition to the institutions

10.1.1 Best KVK Award

KVK, Harnaut received '*Best KVK Award-2016*' by Indian Council of Agricultural Research, New Delhi during the celebration of Foundation Day of ICAR on 16th July 2016 at Vigyan Bhawan, New Delhi. Dr. Sanjeev Kumar, Programme Coordinator, KVK, Harnaut, Nalanda received the award from the dignitaries.

10.1.2 Global Agriculture Leadership Award

Bihar Agricultural University, Sabour received a prestigious '*Global Agriculture Leadership Award*' by Indian Council of Food and Agriculture, New Delhi on September 8, 2016 at Taj Hotel, New Delhi for the university's outstanding work in the area of agriculture education, research and grooming the scientific and professional manpower to power India's agricultural growth. Hon'ble Vice-Chancellor Bihar Agricultural University, Dr. Ajoy Kumar Singh received the award from Prof. KS Solanki, Hon'ble Governor of Haryana and H.E. Sh. Ram Naik, Hon'ble Governor of Uttar Pradesh, Prof. P.J. Thomas, Hon'ble Dy. Chairman, Rajya Sabha. Prof. MS Swaminathan, Father of India's Green Revolution was the chairman of National Organizing Committee of Agriculture Leadership Awards 2016. Agriculture Leadership Awards was started in 2008 to recognize the leadership roles played by individuals and institutions, which is positively impacting the lives of farmers and rural masses. Dr. A. K. Singh, Vice Chancellor, Bihar Agricultural University, Sabour, has also acted as panelist in the session 'Managing inputs and technologies for productivity' during 9th Agriculture Leadership Summit 2016 organized by ICFA.

10.2 Awards / Recognition Received by the Faculty Members of the University

Table 10.1 Details of the Awards and Recognitions Received by the Faculty Members

SI. No.	Name of the scientist	Name of the Award	Year	Agency/Event
1.	Dr. Satyendra	Outstanding Scientist Award (Plant Breeding)	2016	Venus International Foundation, Chennai Research Awards - VIRA 2016 (Celebrating the Creative Minds of World) in Annual Research Meet (ARM) 2016, December 3, 2016 Le Royal Meridien, Chennai
2.	Dr. Satyendra	Yong Scientist Award	2016	Society for Development in Science and Agriculture, Meerut India. National conference oninnovative and current advances in agriculture and allied sciences (ICAAAS-2016) December 10–11, 2016 at Prof. Jayashankar Telangana State Agricultural University Rajendranager, Hyderabad (Telangana)
3.	Dr. Rafat Sultana	Best Paper oral Presentation Award	2016	BSSPEI, 05-06, 2016, BAU, Sabour
4.	Dr. V. B. Patel	Best paper Award	2016	Horticultural Society of India at 7th Indian Horticulture Congress, held at New Delhi
5.	Dr. Shirin Akhtar	Young Scientist Award	2016	Astha Foundation, Meerut. National Conference on Innovative and Current Advances in Agriculture and Allied Sciences, Hyderabad, Telengana in December, 2016
5.	Dr. Randhir Kumar	Best paper presentation Award	2016	International symposium at the Sciences and Technology at Faculty of Science, Kasetsart University, Bangkok – 10900, Thailand during 1-5 February, 2016
6.	Dr. S. K. Gupta	Out Standing Scientist Award	2016	IJTA 4th International Conference on "Recent Advances in Agriculture and Horticulture Science" at Fern Residency, Jodhpur, Rajasthan, India
7.	Dr. S. K. Gupta	Best Young Scientist Award- 2016	2016	Society for Scientific Development in Agriculture and Technology (SSDAT) at Prof. Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad (Telangana)
8.	Dr. S. K. Gupta	Best Poster Paper Presentation Award	2016	National Seminar on "Soil Health Management" Organized by Bihar Agricultural University, Sabour-813210, Poster title "Impact of crop residue burning and its management

Table 10.1 Details of the Awards and Recognitions Received by the Faculty Members (Continued)

SI. No.	Name of the scientist	Name of the Award	Year	Agency/Event
9.	Dr. Mainak Ghosh	Young Scientist Award	2016	International Journal of Tropical Agriculture in 3rd International Conference on Agriculture, Horticulture and Plant Science, Hans Hotel, New Delhi, India during June, 25-26, 2016.
10.	Dr. Mainak Ghosh	Outstanding Scientist Award	2016	International Journal of Tropical Agriculture in 4th International Conference on Recent Advances in Agriculture and Horticulture Sciences, The Fern Residency Jodhpur, Rajasthan, India during December, 30-31, 2016.
11.	Dr. Mainak Ghosh	Excellence in Teaching Award,	2016	National Conference on "Innovative and Current advances in Agricultural and Allied Sciences (ICAAAS-2016)" organized by Society for Scientific Development in Agriculture and Technology, Meerut (U.P.) India and Astha Foundation, Meerut (U.P.) India, at Prof. Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad, Telangana, India, during December, 10-11, 2016
12.	Dr. G. S. Panwar	Best poster presentation award	2016	National Symposium on 'Soil Health Management' held on January 28-29, 2016 at BAU Sabour Bhagalpur (Bihar)
13.	Dr. G. S. Panwar	Best poster presentation award	2016	National symposium on 'Bringing Self Sufficiency in Pulses For Eastern India' held on August 05-06, 2016 at BAU Sabour, Bhagalpur
14.	Mr. Vinay Kumar	Young Scientist Award	2016	Society for scientific Development in Agriculture and technology held on 10-11 December 2016 (Prof. Jayashankar Telengana State Agricultural University)
15.	Dr. Ruby Rani	Best poster paper presentation award	2016	V International symposium on Lychee, Longan & Other Sapindaceae Fruits. Bihar Agricultural University, Sabour, Bhagalpur, Bihar (India)
16.	Dr. R. Vishwakarma	Bharat Shiksha Ratan Award	2016	Global Society for Health and Educational Growth
17.	Dr. R. Vishwakarma	Outstanding Scientist in Agricultural Award	2016	Scientific & Educational Research Society, Meerut

Table 10.1 Details of the Awards and Recognitions Received by the Faculty Members (Continued)

SI. No.	Name of the scientist	Name of the Award	Year	Agency/Event
18.	Dr. R. Vishwakarma	Outstanding Scientist in Agricultural Award	2016	Scientific & Educational Research Society, Meerut
19.	Dr. R. Vishwakarma	Junior Scientist of the Year Award	2016	National Environmental Science Academy
20.	Dr. G. Chand	Venus International Faculty Award	2016	Venus International Foundation, Chennai
21.	Dr. G. Chand	Science Initiator Award	2016	Society for Scientific Development in Agriculture, Meerut
22.	Dr. G. Chand	Science Initiator Award	2016	Kasetsart University Bangkok, Thailand
23.	Dr. M. Ansar & A.P. Bhagat	Best Poster Presentation Award	2016	37th Annual Conference and National Symposium, ISMPP at RAU, Pusa
24.	Dr. Srinivasaraghvan A.	Best Poster Presentation Award	2016	Indian Phytopathological Society (MEZ), New Delhi & ICAR-IIPR, Kanpur
25.	Dr. Srinivasaraghvan A.	Best Poster Presentation Award	2016	Indian Phytopathological Society (SZ), UAS, Raichur
26.	Dr. T.N. Goswami	Young Scientist Award	2016	International Conference on Agriculture, Horticulture and Plant Science, New Delhi (June, 25-26, 2016)
27.	Dr. T.N. Goswami	Excellence in Teaching Award	2016	National conference on Innovative and Current Advances in Agriculture & Allied Sciences (December, 10-11, 2016)
28.	Shri R.N. Gupta	Excellence in Teaching Award	2016	Astha Foundation, Meerut
29.	Dr. Shashikant Divakar	Young Scientist Award	2016	Astha Foundation, Meerut. National conference on innovative and current advance in agriculture and allied science (ICAAS-2016) during 10-11 December, 2016 held at Prof JayashankarTelangana State Agricultural University Rajendranagar, Hyderabad.

Table 10.1 Details of the Awards and Recognitions Received by the Faculty Members (Continued)

SI. No.	Name of the scientist	Name of the Award	Year	Agency/Event
30.	Dr. Meera Kumari	Young Scientist Award	2016	Astha Foundation, Meerut. National conference on innovative and current advance in agriculture and allied science (ICAAS-2016) during 10-11 December, 2016 held at Prof Jayashankar Telangana State Agricultural University Rajendranagar, Hyderabad.
31.	Dr. Mohammed Wasim Siddiqui	Certificate of Appreciation	2016	World Food Preservation Center, LLC, USA
32.	Dr. Mohammed Wasim Siddiqui	Bharat Jyoti Award	2016	India International Friendship Society, New Delhi, India
33.	Dr. Md. Shamim	Young Scientist Award	2016	Bioved Research Institute of Agriculture, Technology and Sciences, Allahabad, 211002, India
34.	Dr. Erayya	Young Scientist Award	2016	Aufau Periodicals, Salem, Tamil Nadu, India.
35.	Dr. S.L. Bairwa	Young Scientist Award	2016	Aufau Periodicals, Salem, Tamil Nadu, India.
36.	Dr. S.L. Bairwa	Young Scientist Award	2016	Agricultural Technology, Development Society, Ghaziabad, Uttar Pradesh.
37.	Dr. S.S. Solankey	Young Faculty Award	2016	Venus International Foundation, Chennai, India
38.	Dr. Md. Shamim	Young Faculty Award	2016	Venus International Foundation, Chennai, India
39.	Dr. S.S. Solankey	Best Teacher Award	2016	Bihar Agricultural University on the eve of Teachers Day (5th September, 2016).
40.	Dr. Anil	Best Teacher Award	2016	Bihar Agricultural University on the eve of Teachers Day (5th September, 2016).
41.	Dr. S.S. Solankey	Best Researcher Award	2016	Bihar Agricultural University on the eve of Republic Day (26th January, 2016)
42.	Dr. Sanjeev Kumar	Excellence in Teaching Award	2016	Society for scientific Development in Agriculture and Technology, Meerut (U.P) India.

11 FACULTY DEVELOPMENT PROGRAMME

The challenges associated with the diversification in nature of work and the work place environment are as real for the campus as elsewhere. Rapid change requires a skilled, knowledgeable workforce with employees, who are adaptive, flexible, and focused on the future. Nine scientists were sent for higher education leading to Ph.D. degrees during the year 2016-17.

Table 11.1 List of Faculty members selected higher education under Faculty Development Programme during 2016-17

Sl. No.	Name	Designation	Address	Subject
Faculty of Agriculture				
1.	Mr. Diwakar Paswan	Assistant Professor	MBAC, Agwanpur	Agronomy
2.	Mr. Ravindra Kumar	Assistant Professor	MBAC, Agwanpur	Horticulture
3.	Mr. Ramesh Nath Gupta	Assistant Professor	BAC, Sabour	Plant Pathology
4.	Mr. Sanjay Kumar	Assistant Professor	BAC, Sabour	PBG
Faculty of Dairy Technology				
5.	Mr. Binod Kumar Bharti	Assistant Professor	SGIDT, Patna	Dairy Chemistry

Table 11.2 List of Faculty members attended Winter/Summer School during 2016-17

Sl. No.	Faculty	Topic	Date	Organisation/ Place
1.	Dr. Syed Sheraz Mahdi, Asstt. Prof.-cum-Jr. Scientist, Deptt. of Agronomy, BAC, Sabour	Multiple Crop Modelling to Improve resource use efficiency in Agriculture under changing climatic conditions.	December 03 - 23, 2016	PJTSAU, Hyderabad
2.	Dr. Sushant, Asstt. Prof.-cum-Jr. Scientist, Deptt. of Agronomy, BAC, Sabour	Winter School on "Agro Ecological Strategies for Designing Sustainable faring system"	December 01 - 21, 2016	UAS, Raichur

Table 11.2 List of Faculty members attended Winter/Summer School during 2016-17 (Continued)

Sl. No.	Faculty	Topic	Date	Organisation/ Place
3.	Dr. Rupa Rani, Asstt. Prof.-cum-Jr. Scientist Fruit & F.T. BAC, Sabour	ICAR - NRC, Lichi Course Training Programme	July 07 - 31, 2016	ICAR - NRC, Lichi, Muzaffarpur
4.	Dr. WasimSiddqui, Asstt. Prof.-cum-Jr. Scientist Food Science, BAC, Sabour	"Information communication technology mediated Agricultural Extension"	August 02 - 22, 2016	ICAR - IARI, New Delhi
5.	Dr. Ghanshyam, Asstt. Prof.-cum-Jr. Scientist Soil Science &Agril. Chemistry, BAC, Sabour	"Recent innovations in management of organic production system"	August 05 - 25, 2016	ICAR - IARI, New Delhi
6.	Dr. Sudhir Kumar, Asstt. Prof.-cum-Jr. Scientist PBG, BAC, Sabour	"Innovative breeding techniques for development of climate smart crops"	August 08 - September 12, 2016	PAU, Ludhiana
7.	Dr. Durga Prasad, Asstt. Prof.-cum-Jr. Scientist Plant Pathology BAC, Sabour	"Perspectives of Plant-microbe Integrations in Promoting Plant health and disease management"	September 07 - 27, 2016	GBPUAT, Pantnagar
8.	Dr. Suborna Ray Choudhary, Asstt. Prof.-cum-Jr. Scientist, Agronomy, BAC, Sabour	"Climate change adaptation and mitigation strategies for sustainable Agriculture"	September 05 - 14, 2016	SKAN, Jobner
9.	Dr. SubhashishSarkhel, Asstt. Prof.-cum-Jr. Scientist Plant Pathology, BAC, Sabour	"Fungal diversity and modern trends in Taxonomy though DNA barcoding and chemo-profiling"	September 16 - October 06, 2016	ICAR - IARI, New Delhi
10.	Dr. Sankar Chandra Paul, Asstt. Prof.-cum-Jr. Scientist, Deptt. of Soil Science &Agril. Chemistry BAC, Sabour	"Soil Air and Water Pollution and Mitigation Strategies"	November 02 - 22, 2016	PAU, Ludhiana
11.	Dr. RamanujVishwakarma, Asstt. Prof.-cum-Jr. Scientist, Deptt. of Entomology, BAC, Sabour	"Stored Grain-Pest Detection & Identification and Phytosanitary Treatments"	January 02 - 22, 2017	NIPHM, Hyderabad

Table 11.2 List of Faculty members attended Winter/Summer School during 2016-17 (Continued)

Sl. No.	Faculty	Topic	Date	Organisation/ Place
12.	Dr. Rafat Sultana, Asstt. Prof.-cum-Jr. Scientist PBG, BAC, Sabour	"Development and Utilization of Genetic and Genomic Resources through Biotechnology for Biotic and Abiotic stress Management and quality Improvement in Field Crops"	November 28 - December 25, 2016	UAS, Dharwad
13.	Dr. Md. ArshadAnwer, Asstt, Prof.-cum-Jr. Scientist, Deptt. of Plant Pathology, BAC, Sabour	"Adoption of suitable Conventional and Biotechnological Approaches for Biotic and Abiotic stress Management in Crops"	February 13 - 05 March, 2017	GBPUAT, Pantnagar
14.	Dr. Birendra Singh, Asstt. Prof.-cum-Jr. Scientist, Deptt. of PBG, BAC, Sabour	"Molecular breeding with emphasis on developing climate resilience rice varieties"	November 02 - 22, 2016	CRRI, Cuttack
15.	Er. Satish Kumar, Asstt. Prof.-cum-Jr. Scientist, Deptt. ofAgril. Engineering, BAC, Sabour	"Renewable energy for productive uses in rural agro-processing sector"	November 09 - 29, 2016	CIAE, Bhopal
16.	Dr. Chandan Roy, Asstt. Prof.-cum-Jr. Scientist, Deptt. of PBG, BAC, Sabour	"Winter school Development and Utilization of genetic and genomic resources thourgh biotechnology for biotic stress management and quality improvement in fiddle crops"	December 01 - 21, 2016	UAS, Dharwad
17.	Dr. Basudev Kole, Asstt. Prof.-cum-Jr. Scientist, Deptt. of SMCA, BAC, Sabour	"New Age Extension Strategy for Communication Proficiency and managerial Skill for Extension Professionals Concept, Approach , Methodology and application"	September 07 - 27, 2016	BCKB, Nadia
18.	Dr. Kumari Reshmi, Asstt. Prof.-cum-Jr. Scientist, Deptt. of (PBG), BAC, Sabour	"Innovative breeding techniques for development of Climate Smart Crops"	August 23 - September 12, 2016	PAU, Ludhiana
19.	Dr. Tamoghan Saha, Asstt. Prof.-cum-Jr. Scientist, Deptt. of Entomology, BAC, Sabour	"Analysis (AESA) based Plant conjunction with Ecological Engineering for pest management in Rice"	September 15 - October 05, 2016	NIPHM, Hyderabad
20.	Dr. Ram Dutt, Asstt. Prof.-cum-Jr. Scientist Ext. Education, BAC., Sabour	"ICT use in Agriculture"	July 05 - 25, 2016	PAU, Ludhiana

Table 11.2 List of Faculty members attended Winter/Summer School during 2016-17 (Continued)

Sl. No.	Faculty	Topic	Date	Organisation/ Place
21.	Dr. Rakesh Kumar, Asstt. Prof.-cum-Jr. Scientist Soil Science &Agril. Chemistry, BAC, Sabour	"Assessing natural resources management, Climate risk and environment sustainability using simulation models	November 08 - 28, 2016	IISS, Bhopal
22.	Dr. Hidayatullah Mir, Asstt. Prof.-cum-Jr. Scientist, Deptt. of Hort. BAC, Sabour	"Indigenous Technical knowledge concept, scope and relevance in intergrated Agriculture Production system"	August 19 - September 08, 2016	SKUAST, Srinagar
23.	Sri Anupam Das, Asstt. Prof.-cum-Jr. Scientist, Deptt of Soil Science and Agricultural Chemistry, BAC, Sabour	"Advance in Experimental Data Analysis".	October 06 - 26, 2016	ICAR- IASRI, New Delhi
24.	Dr. Muneshwar Prasad Mandal, Asst. Prof.-cum-Jr. Scientist, Deptt. of Plant Breeding & Genetics, BAC, Sabour	"Allele Mining in crops: Methods and utility" Aug.., 2016.	July 18 - August 07, 2016	DAUS, Khushinagar
25.	Dr. Sareeta Nahakpam, Asst. Prof.-cum-Jr. Scientist, Deptt. of Plant Breeding & Genetics, BAC, Sabour	"Abiotic and heavy metal stress management in crop through physiological, phytoremediation and proximate sensing approaches"	September 02 - 22, 2016	SKAN, Jobner
26.	Dr. Suborna Ray Choudhary, Asstt. Prof.-cum-Jr.Scientist, Deptt. of Agronomy, BAC, Sabour	"Climate change adaptation and mitigation strategies for sustainable agriculture	September 05 - 14, 2016	SKAN, Jobner
27.	Dr. Sweta Shambavi, Asstt. Prof.-cum-Jr. Scientist, Deptt. of SSAC, BAC, Sabour	Management, Climate risk and environmental sustainability using simulation models"	November, 2016	ISSS, Bhopal
28.	Dr. Ragini Kumari, Asstt. Prof.-cum-Jr. Scientist, Deptt. of SSAC, BAC, Sabour	"Recent Advancement in Bio-fertilizer & Vermicomposting Technology for Sustaining Agricultural Development"	December 12, 2016- January 01, 2017	CAU, Pusa
29.	Mr.Jajati Manda, Asstt. Prof.-cum-Jr. Scientist, Deptt. of Soil Science and Agriculture Chemistry, BAC, Sabour	"Recent Advancement in Bio-fertilizer & Vermicomposting Technology for Sustaining Agricultural Development"	December 12, 2016- January 01, 2017	CAU, Pusa

Table 11.2 List of Faculty members attended Winter/Summer School during 2016-17 (Continued)

Sl. No.	Faculty	Topic	Date	Organisation/ Place
30.	Dr. Mahendra Singh, Asstt. Prof.-cum-Jr. Scientist, Deptt. of Soil Science and Agriculture Chemistry, BAC, Sabour	"Recent Advancement in Bio-fertilizer & Vermicomposting Technology for Sustaining Agricultural Development"	December 12, 2016-January 01, 2017	CAU, Pusa
31.	Dr. Amrendra Kishore, Asstt. Prof.-cum-Jr. Scientist, LMP, BVC, Patna	CAFT Training Programme	November 09 - 29, 2016	College of veternary Sciences, Namakal, Tamilnadu
32.	Dr. R.K. Nirala, Asstt. Prof.-cum-Jr. Scientist, BVC, Patna	CAFT Training Programme	November 05 - 25, 2016	Dindayal University, Mathura

Table 11.3 List of Faculty Members Attended Short training / Seminar / Symposia (National / International)

Sl. No.	Scientist Name	Seminar/ Symposium attended
1.	All the scientists of the Department of Horticulture (Fruit and Fruit Technology)	V International Symposium on Lychee, Longan & other Sapindaceae Fruits at Bihar Agricultural University, Sabour, Bhagalpur from May 31 to June 03, 2016.
2.	Mr. Ravindra Kumar, Dr. Ruby Rani and Dr. K. Karuna	National seminar on 'Soil Health Management' at BAU, Sabour from 28-29 January, 2016.
3.	Dr. V.B. Patel and Dr. H. Mir	7th Indian Horticulture Congress 2016 at IARI, New Delhi, from 15-18 November 2016.
4.	Dr. Shashank Tyagi	National seminar on 'Soil Health Management' at BAU, Sabour from 28-29 January, 2016.
5.	Dr. Shashank Tyagi	National conference on 'Bringing self sufficiency in pulses for eastern India' at BAU, Sabour from 05-06 August, 2016.
6.	Dr. S K Gupta	3rd International Conference on"Agriculture, Horticulture and Plant Sciences" Organized by IJTA and Serials Publications Pvt. Ltd. New Delhi, at Hans Hotel, Barakhamba Road, New Delhi during June, 25-26, 2016.
7.	Dr. S K Gupta	National Seminar on "Soil Health Management" Organized by Bihar Agricultural University Sabour, at Bihar Agricultural University, Sabour, Bhagalpur-813210 (Bihar) during January,28-29, 2016
8.	Dr. Mainak Ghosh	4th International Agronomy Congress 2016 on "Agronomy for Sustainable Management of Natural Resources, Environment, Energy and Livelihood Security to Achieve Zero Hunger Challenge" organized by Indian Society of Agronomy, ICAR, New Delhi, India, during November, 22-26, 2016.
9.	Dr. Mainak Ghosh	National Seminar on "Soil Health Management" organized by Bihar Agricultural University, Sabour during January 28-29th, 2016

Table 11.3 List of Faculty Members Attended Short training / Seminar / Symposia (National / International) (Continued)

Sl. No.	Scientist Name	Seminar/ Symposium attended
10.	Dr. Seema	National Seminar on "Soil Health Management" organized by Bihar Agricultural University, Sabour during January 28-29th, 2016
11.	Mr. Pravesh Kumar	National conference on 'Bringing self sufficiency in pulses for eastern India' at BAU, Sabour from 05-06 August, 2016.
12.	Mr. Sunil Kumar	National Seminar on "Soil Health Management" organized by Bihar Agricultural University, Sabour during January 28-29th, 2016
13.	Mr. Sunil Kumar	"Regional Review Meeting for Eastern Region" under Gramin Krishi Mausam Sewa (GKMS) and Forecasting Agricultural Output using Space Agro technology and Land based Observations (FASAL) projects at RAU Pusa, Samastipur organized by IMD, Ministry of Earth Sciences, New Delhi during 29-30 March 2016.
14.	Mr. Sunil Kumar	National conference on 'Bringing self sufficiency in pulses for eastern India' at BAU, Sabour from 05-06 August, 2016.
15.	Mr. Arnab Roy Chowdhury	National Seminar on "Soil Health Management" organized by Bihar Agricultural University, Sabour during January 28-29th, 2016
16.	Mr. Arnab Roy Chowdhury	4th International Agronomy Congress 2016 on "Agronomy for Sustainable Management of Natural Resources, Environment, Energy and Livelihood Security to Achieve Zero Hunger Challenge" organized by Indian Society of Agronomy, ICAR, New Delhi, India, during November, 22-26, 2016.
17.	Dr. Birendra Kumar	National Seminar on "Soil Health Management" organized by Bihar Agricultural University, Sabour during January 28-29th, 2016
18.	Dr. Birendra Kumar	International conference on Innovative Research and Solutions(ICIRS-2016) on 16th April,2016, Tirupati.A.P.

Table 11.3 List of Faculty Members Attended Short training / Seminar / Symposia (National / International) (Continued)

Sl. No.	Scientist Name	Seminar/ Symposium attended
19.	Dr. Birendra Kumar	National Conference on Bringing Self-Sufficiency in Pulses for Eastern India,05-06 August, 2016, BAU, Sabour, Bhagalpur, Bihar.
20.	Dr. Shambhu Prasad	National seminar on Medicinal and Aromatic Plants,Jawaharlal Nehru KrishiViShwaVidyalaya Jabalpur, Madhya Pradesh.
21.	Dr. Shambhu Prasad	National seminar on Jaivik kheti, Jawaharlal Nehru KrishiVishwaVidyalaya Jabalpur, Madhya Pradesh
22.	Dr. S. Sheraz Mahdi	4th International Agronomy Congress 2016 on "Agronomy for Sustainable Management of Natural Resources, Environment, Energy and Livelihood Security to Achieve Zero Hunger Challenge" organized by Indian Society of Agronomy, ICAR, New Delhi, India, during November, 22-26, 2016.
23.	Dr. S. Sheraz Mahdi	National seminar on 'Soil Health Management' at BAU, Sabour from 28-29 January, 2016.
24.	Dr. M. Haque	4th International Agronomy Congress 2016 on "Agronomy for Sustainable Management of Natural Resources, Environment, Energy and Livelihood Security to Achieve Zero Hunger Challenge" organized by Indian Society of Agronomy, ICAR, New Delhi, India, during November, 22-26, 2016.
25.	Dr. G.S. Panwar	National seminar on 'Soil Health Management' at BAU, Sabour from 28-29 January, 2016.
26.	Dr. G.S. Panwar	National Conference on Bringing Self-Sufficiency in Pulses for Eastern India,05-06 August, 2016, BAU, Sabour, Bhagalpur, Bihar
27.	Dr. Suborna Roy Choudhury	National seminar on 'Soil Health Management' at BAU, Sabour from 28-29 January, 2016.
28.	Dr. G.S. Panwar	National symposium on Transforming Indian agriculture towards Food and Nutritional Security held at ICAR-IGFRI, Jhansi on February, 20-21

Table 11.3 List of Faculty Members Attended Short training / Seminar / Symposia (National / International) (Continued)

Sl. No.	Scientist Name	Seminar/ Symposium attended
29.	Dr. G.S. Panwar	4th International Agronomy Congress 2016 on "Agronomy for Sustainable Management of Natural Resources, Environment, Energy and Livelihood Security to Achieve Zero Hunger Challenge" organized by Indian Society of Agronomy, ICAR, New Delhi, India, during November, 22-26, 2016.
30.	Dr. Arun Kumar	National Conference on IPR in Agriculture-"Needs and Future Prospect" organized by BAU, Sabour 22-23 Dec2015
31.	Dr. Kumari Rajani	National conferences on Bringing Self sufficiency in pulses in Eastern India organized by BAU, Sabour 5-6 Aug 2016
32.	Dr. Mukesh Kumar	National Seed Seminar on Food Security through augumented seed supply under climate uncertinities organized by ISST 28 - 30Jan 2017
33.	Dr. A. Ghatak & Dr. M. Ansar	37th Annual Conference & National Symposium on Food Security through Plant Health Protection. April 04-06, 2016. Rajendra Agricultural University, Pusa, Samastipur.
34.	Dr. A. Ghatak, R.N. Gupta, Dr. G. Chand, Dr. Srinivasaraghavan A., Dr. M.A. Anwer, and Dr. T. Saha	37th Annual Conference & National Symposium on Food Security through Plant Health Protection. April 04-06, 2016. Rajendra Agricultural University, Pusa, Samastipur.
35.	Dr. Chanda Kushwaha	National seminar on Enhancing Productivity of Fruit crops-Mitigating major challenges. January 08, 2017 at IIHR, Bangalore
36.	R.N. Gupta, Dr. G. Chand, Dr. Srinivasaraghavan A., and Dr. M.A. Anwer	National Conference on Soil Health management, from January 28-29, 2016. Bihar Agricultural University, Sabour.
37.	Dr. S.B. Sah, and Dr. T.N. Gowswami	Innovative and current advances in agriculture and allied sciences" (ICAAAS-2016) during 10-11 December, 2016 held at Prof. Jayashankar Telengana State Agricultural University, Rajendra Nagar,Hyderabad (Telengana) India

Table 11.3 List of Faculty Members Attended Short training / Seminar / Symposia (National / International) (Continued)

Sl. No.	Scientist Name	Seminar/ Symposium attended
38.	Dr. Tamoghna Saha	"Indigenous Technologies for Sustainable Agriculture and Better Tomorrow", January 09-10, 2016, held at CSIR-NBRI, Lucknow.
39.	Dr. Tamoghna Saha	"Prospects of Skill Development in Agriculture and Rural Development - A Step Towards Make in India", during 20-21 Feb. 2016, held at Bioved Krishi Prodyogiki Gram, Moharab, Sringverpur, Allahabad.
40.	Dr. G. Chand	International Conference on Innovative Approaches in applied Sciences and Technologies (ICISAT-2016), from 1-5 February, 2016 held at Kasetsart University, , Bangkok, Thailand.
41.	Dr.Srinivasaraghavan A., and Dr. Durga Prasad	National Symposium on "Eco-Friendly Approaches for Plant Disease Management: Recent Trends and Opportunities" during 29-30 December 2016 at ICAR-IIPR, Kanpur
42	Dr. Arvind Kumar	National seminar on the topic "Environment & Health" organized at the Mahavir Cancer Sansthan, Patna

Table 11.4 Participation in workshop

Sl. No.	Name of Scientist	Workshop
1.	Mr. S S Acharya	Annual Group Meeting of Safflower and Linseed, 2015-16 held at VNMKV, Parbhani, Maharastra, from 2 - 4, September, 2016.
2.	Dr. M K Singh	Biennial work shop of AICRP for Dryland Agriculture at PDKV Akola (17-21st Jan, 2017)
3.	Dr. M K Singh	Orientation cum technical workshop of AICRPDA at CRIDA, Hyderabad (8-9th June, 2016)\
4.	Dr. Mainak Ghosh	Four days training course (from 19-22 April 2016) on 'Build capacity of staff in participatory research and extension methods' under Cereal System Initiative for South Asia at BAU, Sabour, Bhagalpur, Bihar, India.
5.	Dr. Sanjay Kumar	Annual Workshop of SRFSI project at Darjeeling from 17-21 September, 2016.

12 PUBLICATIONS

12.1 Research Articles

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13. UNIVERSITY BUDGET

Financial Year 2016 -17		Rs. in Lakh		
Plan Scheme				
Particulars		**BE 2016-17**		**RE 2016-17**
A	Pay & Allowances	9432.35		5780.53
B	Contingency	29465.44		5600.00
C	Construction of Infrastructure	423110.40		32403.80
	Total (A to C)	462008.19		43784.30

Non-Plan Scheme				
Particulars		**BE 2016-17**		**RE 2016-17**
A	Pay & Allowances	12376.85		10854.49000
i	Promotion of Teacher/Scientists under CAS	76.88		81.74
ii	Non-teaching staffs under MACP	83.75		793.90
iii	Upgraded Pay Scale of Unit's Clerk	571.42		0.00
iv	PhD increment of Teacher/Scientists	180.26		0.00
v	Re-retirement of Teacher/Scientists	209.09		0.00
vi	Promotion of Non-teaching F.O. to J.R.A.	8.06		2.59
vii	Promotion of Non-teaching Lab Asstt to F.O.	9.47		4.15
viii	Pay Arrr of Teacher/Scientists (6 pay revision)	1087.51		0.00
ix	Pay Arrr of Non-teaching (6 pay revision)	2213.94		0.00
x	Pension Arrr of Teacher/Scientists (6 pay revision)	1749.49		0.00
xi	Pension Arrr of Non-teaching (6 pay revision)	758.43		0.00
xii	Proposed AppointmentTeacher/Scientists	1994.29		1050.65
xiii	Proposed Appointment Non-teaching staffs	2629.81		408.47
B	Contingency	11137.01		6370.14
C	Construction of Infrastructure	7494.18		2669.45
	Total (A to C)	**42580.44**		**22235.58**

Annexure -I

SENATE

(as on 31.03.2017)

S. No.	Name/Designation	Role
1.	**The Chancellor** Bihar Agricultural University, Sabour	Chairman
2.	**Vice- Chancellor** Bihar Agricultural University, Sabour	Member (In absence of Chancellor, preside the Senate)
3.	**Agriculture Production Commissioner** Agriculture Department, Govt. of Bihar	Member
4.	**Principal Secretary** Department of Food and Consumer Protection, Govt. of Bihar, Patna	Member
5.	**Joint Secretary** Agriculture Department, Govt. of Bihar	Member
6.	**Joint Secretary** Department of Animal & Fisheries, Govt. of Bihar, Patna	Member
7.	**Chief Conservator of Forests** Department of Forest & Environment, Bihar	Member
8.	**Director of Agriculture**, Bihar, Patna	Member
9.	**Director of Animal Husbandry** Department of Animal & Fisheries, Resources, Patna	Member
10.	**Director of Fisheries**, Bihar	Member
11.	**Joint Director of Agriculture Education**, Bihar	Member
12.	**Dr. R.N. Verma** Ex Professor, CSUAT, Kanpur, Uttar Pradesh	Member
13.	**Dr. K.K. Kokate** Director Extension Education, MPKV, Rahuri, Maharashtra	Member
14.	**Dean Agriculture** BAU, Sabour	Member
15	**Dean, PGS** BAU, Sabour	Member
16	**Dean, Dairy Technology** SGIDT, Patna	Member
17	**Dean, Veterinary Sciences** BVC, Patna	Member

S. No.	Name/Designation	Role
18.	**Director Research** BAU, Sabour	Member
19.	**Director, Extension Education** BAU, Sabour	Member
20.	**Associate Dean-cum-Principal** BAC, Sabour	Member
21.	**Associate Dean-cum-Principal** MBAC, Agwanpur, Saharsa	Member
22.	**Associate Dean-cum-Principal** BPSAC, Purnea	Member
23.	**Associate Dean-cum-Principal** VKSAC, Dumraon, Buxer	Member
24.	**Associate Dean-cum-Principal** COH, Noorsarai, Nalanda	Member
25.	**Associate Dean-cum-Principal** DKAC, Aarabadi, Kisanganj	Member
26.	**Regional Director** Agricultural Research Institute , Agwanpur, Saharsa	Member
27.	**Dr. Paras Nath** Associate Professor (Entomology)BPSAC, Saharsa	Member
28.	**Dr. Reyaj Ahmed** Associate Professor (Plant Pathology) VKSAC, Dumraon, Buxer	Member
29.	**Dr. S.R.P. Sinha** University Professor (Parasitology) BVC, Patna	Member
30.	**Dr. Jahangir Badshah** University Professor, SGIDT, Patna	Member
31.	**Dr. M.D. Ojha** Associate Professor (Horticulture-Olericulture) NCOH, Noorsarai, Nalanda	Member
33	**Dr. V.B. Patel** University Professor (Horticulture- Pomology) BAC, Sabour	Member
32.	**Dr Vinod Kumar** Associate Professor (Agronomy)MBAC, Agwanpur, Saharsa	Member
34	**Sri Vinod Rajhans** Clerk, Comptroller Office BAU, Sabour	Member

Annexure -II

BOARD OF MANAGEMENT
(as on 31.03.2017)

S. No.	Name/Designation	Role
1.	**Dr. Ajoy Kumar Singh,** Vice-Chancellor, B.A.U. Sabour	Chairman
2.	**Agricultural Production Commissioner,** Govt. of Bihar, Patna*	Member
3.	**Secretary, Department of Finance,** Govt. of Bihar, Patna*	Member
4.	**Secretary, Animal Husbandry,** Govt. of Bihar, Patna*	Member
5.	**Director, Agricultural,** Govt. of Bihar, Patna*	Member
6.	**Director, Horticulture,** Govt. of Bihar, Patna*	Member
7.	**Dr. P.S. Pandey,** ADG, ICAR, New Delhi	Member
8.	**Dean PGS,** BAU, Sabour*	Member
9.	**Director Research,** BAU, Sabour*	Member
10.	**Chairman,** Department of SSAC, BAC, Sabour*	Member
11.	**Dr. Ashok Kumar,** Registrar, BAU, Sabour	Member Secretary

* Ex -officio members

Annexure -III

ACADEMIC COUNCIL

(as on 31.03.2017)

S. No.	Name/Designation	Role
1.	**Dr. Ajay Kumar Singh,** Vice Chancellor, BAU, Sabour	Chairman
2.	**Dr. Ashok Kumar,** Registrar, BAU, Sabour	Member Secretary
3.	**Director,** Extension Education*	Member
4.	**Director,** Research*	Member
5.	**Director,** Resident Instruction-cum-Dean, PGS*	Member
6.	**Dean,** Agriculture*	Member
7.	**Dean,** Dairy Technology *	Member
8.	**Dean,** Veterinary Science*	Member
9.	**Principal,** BAC, Sabour*	Member
10.	**Principal,** MBAC, Saharsha*	Member
11.	**Principal,** BPSAC, Purnea*	Member
12.	**Principal,** COA, Dumraon*	Member
13.	**Principal,** COH, Noorsarai*	Member
14.	**Principal,** BVC, Patna *	Member
15.	**Chairman,** Horticulture [Olericulture]*	Member
16.	**Chairman,** Horticulture [Pomology]*	Member

S. No.	Name/Designation	Role
16.	**Chairman,** Horticulture [Pomology]*	Member
17.	**Chairman,** Agronomy*	Member
18.	**Chairman,** Extension Education*	Member
19.	**Chairman,** Agril. Science & Agril. Chemistry*	Member
20.	**Chairman,** Plant Breeding & Genetics*	Member
21.	**Chairman,** Animal Breeding & Genetics*	Member
22.	**Chairman,** Animal Nutrition*	Member
23.	**Chairman,** ARGO*	Member
24.	**Chairman,** Livestock Production & Management*	Member
25.	**Chairman,** Vet. Parasitology*	Member
26.	**Dr. S. N. Singh,** Chairman, SMCA, BAC, Sabour	Member
27.	**Dr. S. N. Ray,** Chairman, Entomology, BAC Sabour	Member
28.	**Dr. M.N. Singh,** HOD, Dairy Technology, SGIDT, Patna	Member
29.	**Dr. A.K. Thakur,** HOD, Dairy Extension, SGIDT, Patna	Member
30.	**Dr. K.G. Mandal,** HOD, Vet. Physiology, BVC, Patna	Member
15.	**Dr. S.R.P. Sinha,** HOD, Vet. Microbiology, BVC, Patna	Member
16.	**Dr. Md. Feza Ahmad,** Univ. Prof., Horticulture, BAC, Sabour	Member

S. No.	Name/Designation	Role
17.	**Dr. Jahangir Badsah,** Univ. Prof., DE, SGIDT, Patna	Member
18.	**Dr. R.P. Pandey,** Univ. Prof., BVC, Patna	Member
19.	**Dr. R.P. Pandey,** Univ. Prof. (PBG), BAU, Kanke, Ranchi	Member
20.	**Comptroller**, BAU, Sabour**	Member
21.	**Assoc. Librarian,** BAU, Sabour **	Member

* Ex-officio members; ** Invitee Member

Annexure -IV

Board of Studies, Faculty of Agriculture

(as on 31.03.2017)

Sl. No.	Name/Designation	Role
A	**Dr. Arun Kumar,** Dean (Agriculture)	Chairman
B	**Assoc. Dean-cum-Principal** (all colleges of faculty)	Member
	i. **Dr. R.P. Sharma,** Assoc. Dean-cum-Principal, BAC, Sabour	
	ii. **Dr. U. S. Jaiswal,** Assoc. Dean-cum-Principal, VKSCOA, Dumraon	
	iii. **Dr. Rajesh Kumar**, Assoc. Dean-cum-Principal, BPSAC, Purnea	
	iv. **Dr. Umesh Singh**, Assoc. Dean-cum-Principal, MBAC, Agwanpur	
	v. **Dr. P.K. Singh**, Assoc. Dean-cum-Principal, COH, Noorsarai	
	vi. **Dr. D.P.S. Divakar**, Assoc. Dean-cum-Principal, DKAC, Kishanganj	
C	**All Chairman/HODs**	Member
	i. **Dr. P.K. Singh,** Chairman, PBG	
	ii. **Dr. R.P. Sharma,** Chairman, (Agronomy)	
	iii. **Dr. Md. Feza Ahmad,** Chairman Hort.(Fruit)	
	iv. **Dr. S.R. Singh,** Chairman, Extension Education	
	v. **Dr. Randhir Kumar,** Chairman, Hort.(Veg.)	
	vi. **Dr. S.N. Singh,** Chairman, SMCA	
	vii. **Dr. M.K. Wadhwani,** Chairman, Agricultural Economics	
	viii. **Dr. J. P. Singh,** HOD, FST	
	ix. **Dr. A.P. Bhagat,** Chairman, Plant Pathology	
	x. **Dr. S.N. Ray,** Chairman, Entomology	
	xi. **Dr. Sanoj Kumar,** HOD, Agricultural Engineering	

D	**One member from each of the Department nominated**	Chairman
	i. **Dr. R. R. Singh,** Univ. Prof. Hort. (Fruit)	Member
	ii. **Dr. Nitish De,** Assoc. Prof. (PBG)	
	iii. **Dr. Rajiv Rakshit,** Asstt. Prof., SSAC	
	iv. **Dr. B. Kole.** Asstt. Prof. (SMCA)	
	v. **Dr. R.K. Sharma,** Asstt. Prof., Hort. (Veg. & Flow.)	
	vi. **Dr. Durga Prasad,** Asstt. Prof. (Plant Pathology)	
	vii. **Dr. M. Haque,** Assoc. Prof.(Agronomy)	
	viii. **Dr. Kiran Kumari,** Asstt. Prof. (Entomology)	
	ix. **Dr. Meera Kumari,** Asstt. Prof. (Agril. Economics)	
	x. **Dr. Ram Datt,** Asstt. Prof. (Ext. Edu.)	
	xi. **Dr. Md. Wasim Siddiqui,** Asstt. Prof. (FST)	
	xii. **Er. Satish Kumar,** Asstt. Prof. (Agril. Engineering)	
E	Dr. P.K. Singh, Chairman (PBG)	Member Secretary

Annexure -V

PG BOARD OF STUDIES

(As on 31.03.2017)

S . NO.	Name	Designation	Role
A	**Deans of the faculty**		
	1.Dr. B.C. Saha	DRI-cum-Dean PGS	Chairman
	2. Dr. Arun Kumar	Dean (Ag.), BAU, Sabour	Member
	3. Dr. S.B. Verma	Dean (Dairy Technology)	Member
B.	**Associate Dean cum Principals**		
	4. Dr. R.P. Sharma	Assoc. Dean-cum-Principal, BAC, Sabour	Member
	5. Dr. S. Samantaray	Assoc. Dean-cum-Principal, BVC, Patna	Member
	6. Dr. Umesh Singh	Associate Dean Cum-Principal MBAC Agwanpur	Member
	7.Dr. U.S. Jaiswal	Associate Dean-Cum Principal V.K.S Agri. Dumron (Buxar)	Member
	8. Dr. Pancham Kumar	Associate Dean cum-Principal, NCOH, Noorsaria, Nalanda	Member
	9. Dr. Rajesh Kumar	Assoc. Dean-cum Principal BPSAC, Purnea	Member
C.	**Chairmen of different Departments (Faculty of Agriculture)**		
	10. Dr. S.K. Pathak	Chairman, Agronomy	Member
	11. Dr. M.K. Wadhawani	Chairman, Agril Economics	Member
	12. Dr. S. R. Singh	Chairman, Ext. Education, BAU	Member
	13. Dr. S.N. Ray	Chairman, Entomology	Member
	14. Dr. Randhir Kumar	Chairman, Hort. (Veg. & Floriculture)	Member
	15. Dr. Md. Feza Ahmad	Chairman Horticulture (Fruit)	Member
	16. Dr. P. K. Singh	Chairman, PBG; MBGE; Botany & Crop Physiology	Member
	17. Dr. A.P. Bhagat	Chairman Plant Pathology	Member
	18. Dr. N. Chattopadhyay	Chairman, Soil Science	Member
	19. Dr. S. N. Singh	Chairman, SMCA	Member
	20. Dr. R.R. Singh	Chairman, SST	Member

S . NO.	Name	Designation	Role
D.	**Chairmen of different Departments (Faculty of Veterinary Sciences)**		
	21. Dr. S.B. Verma	Chairman, Animal Breeding Genetics	Member
	22. Dr. Chandramoni	Chairman, Animal Nutrition,	Member
	23. Dr. Sudhir Kumar Choudhary	Chairman, Veterinary Gynaecology and Obstetrics	Member
	24. Dr. SatyaDeo Kumar	Chairman, Livestock Product & Management	Member
	25. Dr. S. Samantaray	Chairman, Veterinary Parasitology	Member
E	**Heads of the Department (Faculty of Veterinary Sciences)**		
	26. Dr. S.B. Verma	Head (I/c)Livestock Product Technology	Member
	27. Dr. SatyaDeo Kumar	**Head (I/c)** Veterinary & Animal Husbandry Extension Education	Member
	28. Dr. Chandramoni	**Head (I/c)** Veterinary Anatomy & Histology	Member

Annexure -VI

RESEARCH ADVISORY COMMITTEE

(as on 31.03.17)

A	**Crop Science**	
1.	**Crop Improvement**	
	(i) Dr. B.C. Saha, Dean, PGS	Chairman
	(ii) Dr. P.K. Singh, University Prof., PBG	Co-Chairman
	(iii) Dr. V. B. Patel, University Prof. (Hort.)	Member
	(iv) Dr. R.R. Singh, University Prof. Horti. (Fruit)	Member
	(v) Dr. G.S. Panwar, Assoc. Prof. (Agro.)	Member
	(vi) Dr. Nitish De, Assoc. Prof. PBG	Member
	(vii) Dr. Randhir Kumar, Assoc. Prof., Veg.	Member
	(viii) Dr. Awadhesh Kr. Pal, Asstt. Prof., PBG	Member
	(ix) Dr. Ruby Rani, Asstt. Prof., Horti. (Fruit)	Member
	(x) Dr. T.N. Goshwami, Asstt. Prof., Ento.	Member
	(xi) Dr Satyendra, Asstt. Prof., PBG	Member
	(xii) Dr. R.B.P. Nirala, Asstt. Prof., PBG	Member
	(xiii) Dr. S.P. Singh, Asstt. Prof., PBG	Member
	(xiv) Dr. Amrendara Kumar, Asstt. Prof., PP	Member
	(xv) Dr. Abhijeet Ghatak, Asstt. Prof., PP	Member
	(xvi) Dr. Ravi Kesari, Asstt. Prof., PBG	Member
	(xvii) Dr. T. Chattopadhyaya, Jr. Scientist, PBG	Member (Convener)
2.	**Natural Resource Management:**	
	(i) Dr. R.P. Sharma, University Prof. & Principal, BAC	Chairman
	(ii) Dr. S.K. Pathak, Chief Scientist, Agronomy	Member
	(iii) Dr. Feza Ahmad, Univ. Prof., Hort.	Member

	(iv) Dr. M. Haque Assoc. Prof., Agronomy	Member
	(v) Dr. R. B. Varma, Assoc. Prof., Veg. Sc.	Member
	(vi) Dr. Anshuman Kohli, Assoc. Prof., Soil Sc.	Member
	(vii) Dr. S. Sheraz Mahdi, Asstt. Prof., Agronomy	Member
	(viii) Dr. Swaraj Kr. Datta, Asstt. Prof., Agronomy	Member
	(ix) Dr. Anil, Asstt. Prof., Entomolgy	Member
	(x) Dr. Sareeta NahkPam, Asstt. Prof., PBG	Member
	(xi) Dr. Sunil Kumar, Asstt. Prof., SSAC	Member
	(xii) Dr Nintu Mandal, Asstt. Prof., SSAC	Member
	(xiii) Dr. Rajeev Rakshit, Asstt. Prof., SSAC	Member (Convener)
3.	**Crop Protection:**	
	(i) Dr. A.P. Bhagat, University Prof. and Chairman (P.P.)	Chairman
	(ii) Dr. S.N. Ray, University Prof. and Chairman (Ento.)	Member
	(iii) Dr. Gireesh Chand, Assoc. Prof., PP	Member
	(iv) Dr. (Mrs.) Kiran Kumari, Asstt. Prof. (Ento.)	Member
	(v) Dr. Amrendra Kumar , Asstt. Prof. (PP)	Member
	(vi) Dr. Tamoghna Saha, Asstt. Prof. (Ento.)	Member
	(vii) Dr. Sunil Kumar, Asstt. Prof., Agronomy	Member
	(viii) Dr. Md. Ansar, Asstt. Prof. (PP)	Member
	(x) Dr. Anil, Asstt. Prof. (Ento.)	Member
	(xi) Dr. Arshad Anwar, Asstt. Prof. (PP)	Member (Convener)
4.	**Product Development and Marketing:**	
	(i) Dr. R.R. Singh, Director Seeds and Farm	Chairman
	(ii) Dr. J.P. Singh, University Prof., (FS&T)	Member
	(iii) Dr. N. Chattopadhyay, University Prof. (SSAC)	Member

	(iv) Dr. Sanoj Kumar, Asstt. Prof. (Agril. Engg.)	Member
	(v) Dr. A.K. Jha, Asstt. Prof. (Soil Science)	Member
	(vi) Dr. Lokesh Meena, Asstt. Prof. (Agril. Eco.)	
	(vii) Dr. Deepti Singh, Asstt. Prof., Horti.(Veg. & Flori)	Member
	(viii) Dr. Paramveer Singh, Asstt. Prof., Horti.(Veg. & Flori)	Member
	(ix) Dr. Shamsher Ahmad, Asstt. Prof. (FS & T.)	Member (Convener)
5.	**Social Science/Extension**	
	(i) Dr. S.R. Singh, Chairman Extension Education	Chairman
	(ii) Dr. M.K. Wadhwani, Chairman, Agril. Economics	Member
	(iii) Dr. S.N. Singh, Chairman, SMCA	Member
	(iv) Dr. R.N. Singh, R.D., ARI, Patna	Member
	(v) Dr. Meera Kumari, Asstt. Prof. (Agril. Eco.)	Member
	(vi) Dr. Ram Dutt, Asstt. Prof. (Exten. Educa.)	Member
	(vii) Mr. Aditya, Asstt. Prof. (Exten. Educa.)	Member (Convener)
B.	**Animal Science**	
1.	**Livestock & Poultry Improvement (Animal Improvement)**	
	(i) Dr. S.B. Verma, Univ. Prof. & Chairman, ABG	Chairman
	(ii) Dr. K.G. Mandal, Assoc. Prof. / ABG	Member (Convener)
2.	**Animal Production**	
	(i) Dr. S. Samantaray, Univ. Prof. & Chairman, Parasitology	Chairman
	(ii) Dr. Chandramoni, Univ. Prof. & Chair. Animal Nutrition	Member
	(iii) Dr. Kaushlendra Kumar, Asstt. Prof. Animal Nutrition	Member (Convener)
3.	**Livestock Product Development & Marketing**	
	(i) Dr. A. K. Thakur, Assoc. Prof. Dairy Ext. SGIDT, Patna	Chairman
	(iii) Dr. Abdhesh Jha Asstt. Prof. Dairy Eco. SGIDT, Patna	Member (Convener)
4.	**Animal Health**	
	(i) Dr. S. Samantray, Univ. Professor & Chairman Parasitology	Chairman
	(ii) Dr. P. Kaushik, Asstt. Prof. Vety. Pub. Health	Member (Convener)

Annexure -VII

ON-GOING PROJECTS
(as on 31.03.17)

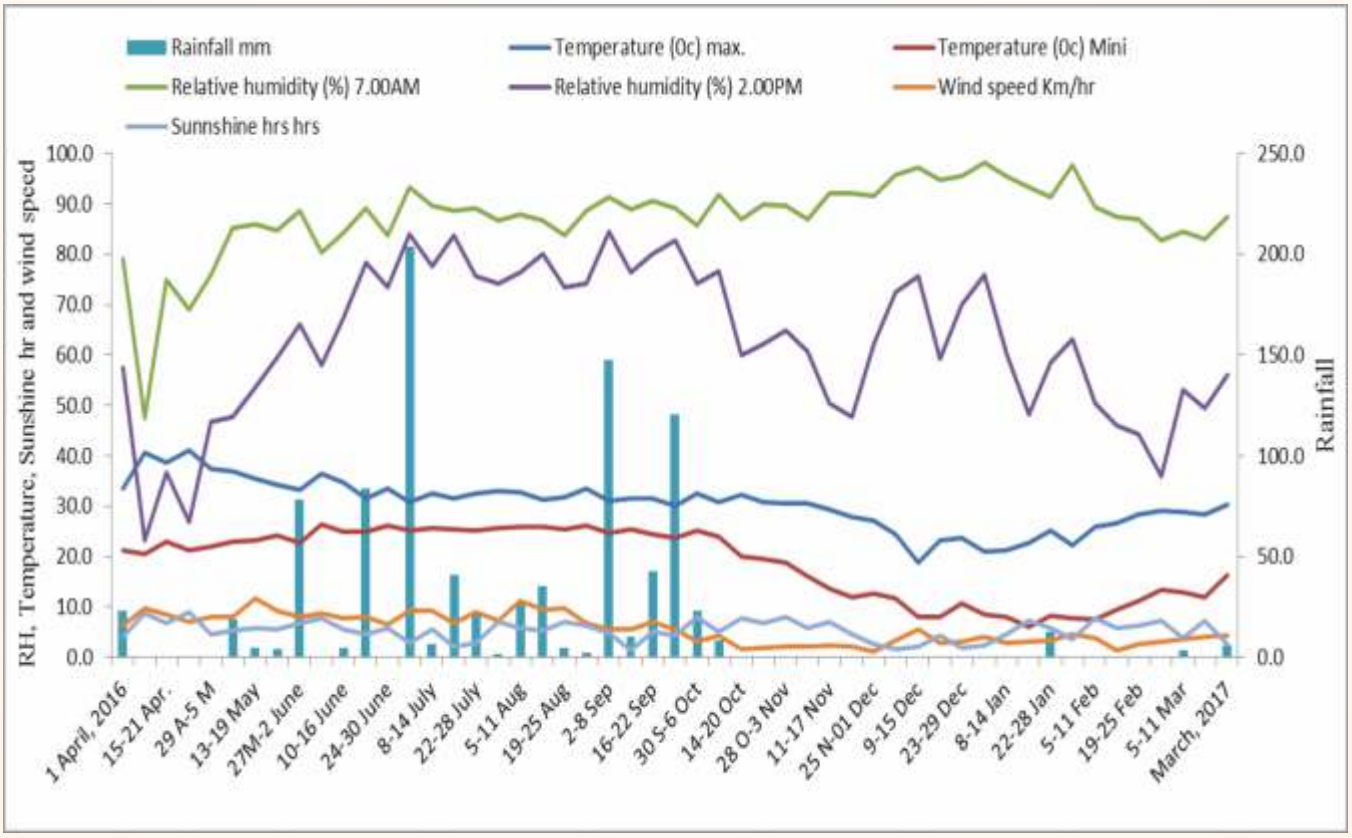
S. No	Particulars	No. of projects
1.	**In-house Projects**	
	a) Crop Improvement	31
	b) Natural Resource Management	61
	c) Crop Protection	30
	d) Product Development and Marketing	20
	e) Social Science	10
	f) Animal Husbandry	20
	Total	**172**
2.	**National Projects**	
	a) DST	18
	b) BARC	3
	c) DBT	1
	d) AICRP	15
	e) NAIP	1
	Total	**38**
3.	**International Projects**	**12**
4.	**Total No. of projects**	**222**

Annexure -VIII

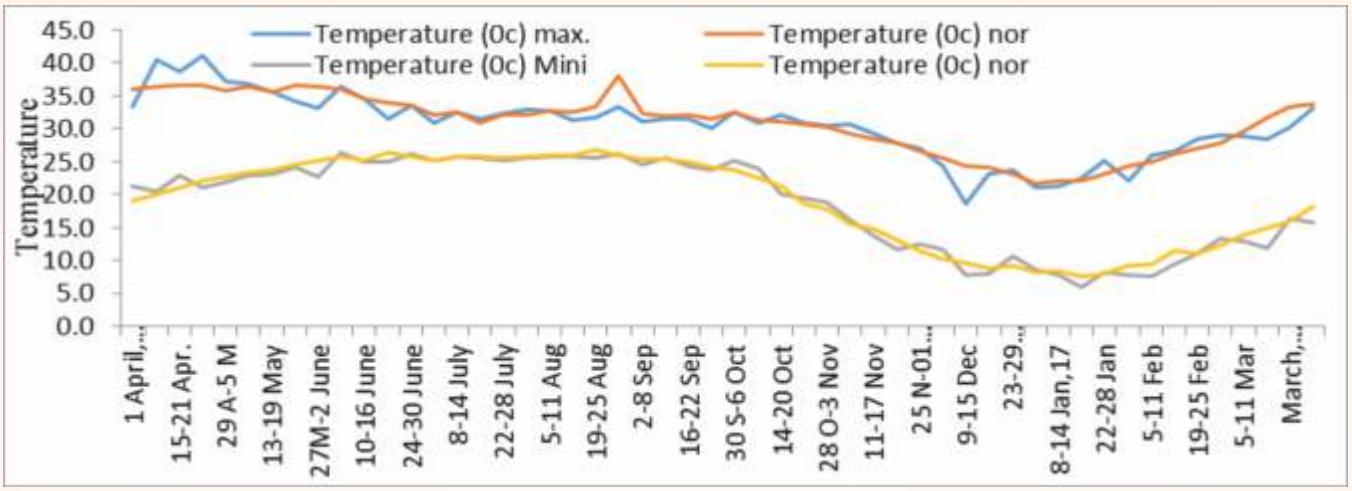
WEATHER REPORT

1. Daily Weather Trends

The weather during the year 2016-17 of Sabour remained almost normal. From the daily weather parameters viz. Maximum temperature, Minimum temperature, Rainfall, Relative humidity (morning & evening), Wind speed and Bright sunshine hours measured at Meteorological Observatory, Bihar Agricultural College, Sabour, some fluctuations can be seen during the winter season in daily maximum and minimum temperature during 10-20 December 2016 and 03-29 January 2017 (Figure 1).The high minimum temperature was observed during 26 Feb-21 march 2016 which is very crucial period for flowering and grain setting in rabi crops. Due to high minimum temperature less number of seed set in rabi crops may have occurred which may affect the economic and yield of the rabi crops. The lowest minimum temperature (5.2^0 C) was observed on 25 January 2017. Maximum temperature during the period 8 April - 1 May 2016 was above or near 40 ^{0}C. During the period from 03 July 2016 to 18 July 2016, Relative humidity both measured in morning and evening was having sudden increase and after that rainfall also started occurring. Daily maximum and minimum temperature with deviation from normal temperature during Dec 2016- January 2017 is also shown in figure 2.



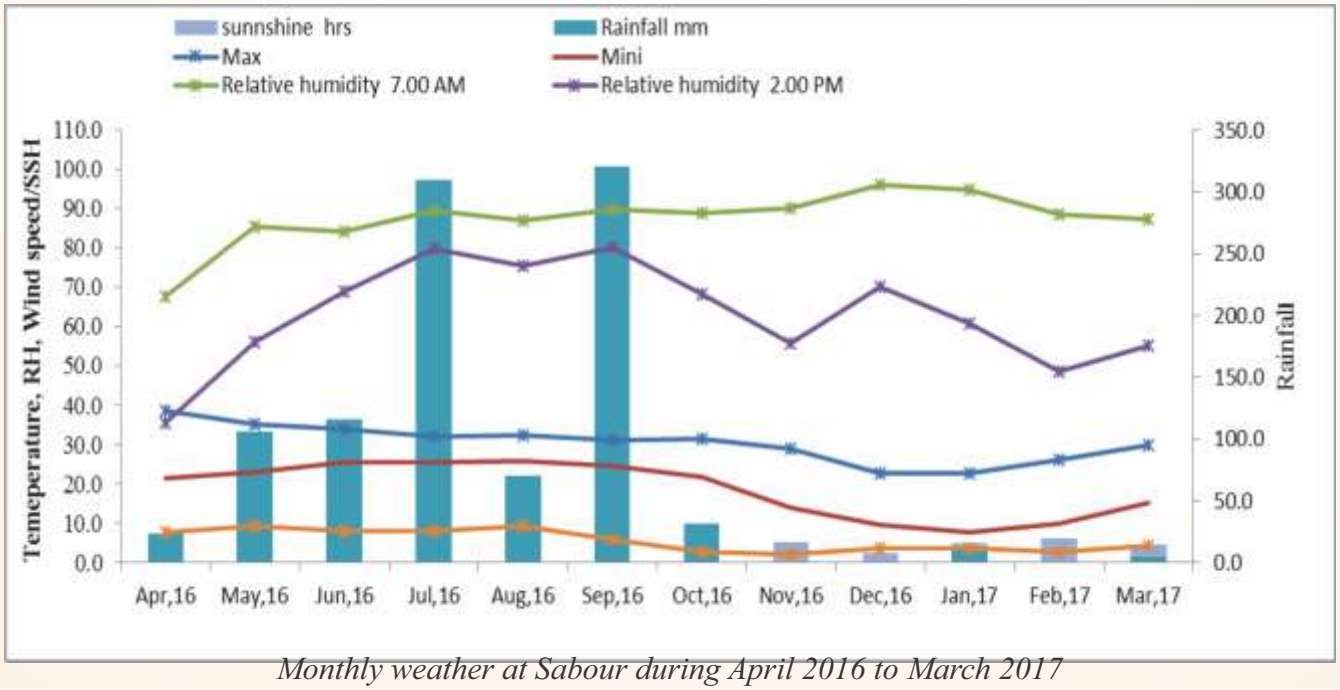
Weather at Sabour during April 2016 to March 2017



Daily maximum and minimum temperature with normal temperature during April 2016-March 2017

2. Monthly Weather Trends

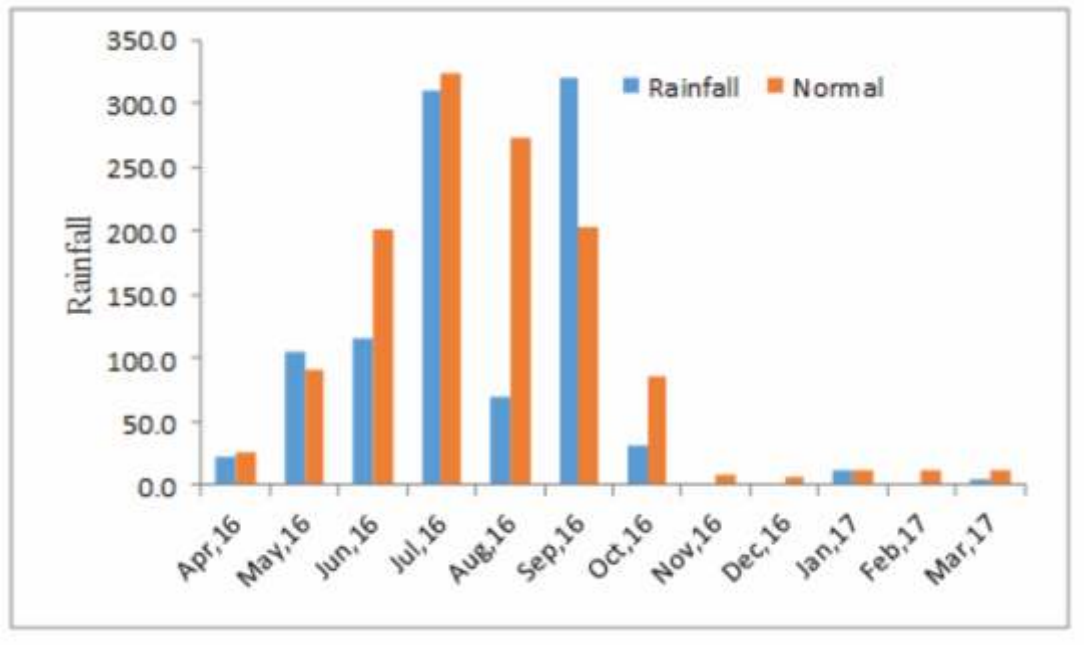
Monthly average of minimum temperature during February 2017 is slightly high. It indicates that there may have effect on flowering and seed set in *rabi* crops and may have reduced the yield of the crops. Monthly average of the daily data shows that relative humidity at evening during the month of April and May 2016 was very low. Highest rainfall more than 321mm was received in September month. But during November, December 16 and February17, no rains occurred which made low moisture reservations in the soil at the time of sowing and booting stages of wheat.



Monthly weather at Sabour during April 2016 to March 2017

3. Monthly Rainfall Trends

Monthly rainfall during the period was above normal in the months of May and September 2016. There was no rainfall at all in November, December 2016 and February 2017.



Monthly rainfall (mm) 2016-17 compared with normal monthly rainfall

4. Agromet Advisory Services Project (Gramin Krishi Mausam Sewa)

Weather forecast and Agro advisory is given on every Tuesday and Friday for 17 districts of zone III A and zone III B of Bihar.

Weather forecast by SMS on mobile of 5,32,686 farmers in 17 districts of Bihar is given regularly.

E -agromet has been started to prepare agro advisories for 17 districts of Bihar.

Every day, daily weather data and weather forecast is given to the newspapers like Dainikjagran, Prabhatkhabar, Hindustan, Nayibaat, Rashtiya Sahara and DainkBhsakar.

Weekly weather forecast is given in HAPPENING of BAU in every week for all zones of Bihar.

Fortnightly weather forecast is given in BAU EK Najar in every fortnight for all zones of Bihar.

Agro advisory bulletin is sent to all KVK's, NGO's, ATMA, all Regional Research Stations, all Colleges under zone III A, III B, Annadata programme for farmers through ETV, office of District agricultural officer, all newspapers published in the area, All India radio, though e mail on every Tuesday and Friday.

It is also sent to the Kisan helpline, technical cell, VC cell and Director Extension in BAU, Sabour.

It is sent to upload in the web site www.bausabour.ac.in of BAU, Sabour and is uploaded on the website of Indian meteorological department www.imdagrimet.gov.in.

बिहार कृषि विश्वविद्यालय द्वारा किसानों के लिए 24x7 व्हाट्सएप सेवा

BAU AGRO DOCTOR

कृषि, पशुपालन व मत्सय पालन से संबंधित लक्षणों का फोटो या विडियो व्हाट्सएप करें और अनुभवी वैज्ञानिकों से तुरंत समाधान पाएं

7004528893

खेती की समस्या बताएं। व्हाट्सएप से समाधान पाएं ।।

बिहार कृषि विश्वविद्यालय, सबौर की पहल
बीएयू एग्रो डॉक्टर सेवा

कृषि से संबंधित फोटो/वीडियो भेजकर अपनी समस्याओं का त्वरित समाधान व्हाट्सएप नंबर **7004528893** पर विश्वविद्यालय के वैज्ञानिकों/विशेषज्ञों से पायें।

बिहार कृषि विश्वविद्यलय द्वारा निर्मित तकनीकी फिल्मों को निःशुल्क देखने के लिए हमारा यूट्युब चैनल www.youtube.com/bausabour को सब्सकाइब करें