सत्यमेव जयते

Department of Biotechnology

Ministry of Science & Technology

Government of India

Biotech KISAN

A SUSTAINABLE SUCCESS





FAARD FOUNDATION फार्ड फाउण्डेशन

कृषि प्रगति एवं ग्रामीण विकास संस्था

FOUNDATION FOR ADVANCEMENT OF AGRICULTURE AND RURAL DEVELOPMENT

ICAR-IIVR VARANASI

भा.कृ.अनु.प.-भारतीय सब्जी अनुसंधान संस्थान, वाराणसी

ICAR-Indian Institute of Vegetable Research

Establishment of Biotech KISAN (Krishi Innovation and Science Application Network) Hub at FAARD Foundation, Varanasi

Department of Biotechnology
Ministry of Science & Technology
Government of India

Biotech KISAN - A SUSTAINABLE SUCCESS

Project Team:

Prof. Panjab Singh, Hub Facilitator
Prof. R.M. Singh, Principal Investigator
Dr. Jagdish Singh, Principal Investigator
Dr. Neeraj Singh, Principal Investigator
Dr. Santosh Singh, Co-Principal Investigator

Project Core Group:

Dr. Tusar Kanti Behera
Prof. S.R. Singh
Dr. Rajesh Singh
Dr. Umesh Singh
Shri Dashrath Singh

Young Professionals:

Shri Adarsh Kumar Singh
Shri Madhukar Sharan Patel
Shri Tushar Kant
Shri Kamlesh Kumar Yadav

CONTENTS

डा. संजय मिश्रा
वरिष्ठ सलाहकार
Dr. SANJAY MISHRA
Senior Adviser

सत्यमेव जयते

स्वच्छ भारत
एक कदम स्वच्छता की ओर

भारत सरकार
विज्ञान और प्रौद्योगिकी मंत्रालय
बायोटेक्नोलॉजी विभाग
GOVERNMENT OF INDIA
MINISTRY OF SCIENCE & TECHNOLOGY
DEPARTMENT OF BIOTECHNOLOGY
Block-2, (7th Floor) CGO Complex
Lodhi Road, New Delhi-110003

Foreword

The Department of Biotechnology (DBT) is making consistent efforts towards improving the productivity in agriculture and allied sectors such as livestock and fisheries in the country. The department envisions to reform agriculture research through adoption of technological advances, strengthening research infrastructure and human resource development in cutting-edge research. Various programmes of the Department are aimed at knowledge generation, technology / product development for enhanced productivity, nutritional fortification and improved quality parameters, abiotic / biotic stress tolerance, resource use efficiency and climate resilience. The DBT has established a Biotech-KISAN Hub at FAARD Foundation, Varanasi to link small and marginal farmers in this area to leading scientific institutions and KVKs towards increasing their agriculture output and income.

I am happy to learn that the FAARD Foundation has made a lot of efforts to popularize improved high-yielding varieties of cereals and pulses along with production technologies amongst farming communities covering over 200 ha area in the region. These interventions have resulted into increase of average crop productivity by 22% and net increase of farmers' income by 27% over conventional practices. Seed Hubs have been established for production of Breeders and Foundation Seeds of high-yielding and disease / pest resistant varieties of cereals and pulses. For capacity building, skill upgradation and entrepreneurship development, many farmers (both men and women) have been trained as Master Trainers in different activities such as seed production, Integrated Farming System (IFS), scientific goatery / fisheries, mushroom farming, bee-keeping, protected cultivation and vermicomposting. Many of these farmers have now emerged as self-practicing entrepreneurs improving their income and also generating employment in their rural settings.

My best wishes to the President, FAARD Foundation, Varanasi and his team for successfully implementing the project. We hope, the Foundation will cover more areas and farmers with innovative technologies in future.

Sanjay

(Dr. Sanjay Mishra)

Preface

Technological innovations in Agriculture and their dissemination among farmers through proper technology transfer mechanism have been the hallmark of the growth and development of agriculture in the country which made us food surplus and exporting country from a food deficit and food importing country. Now the challenge is to address the concern of nutritional security while sustaining our food security. Release of seventeen biofortified crop varieties enriched with protein, vitamins, minerals and amino acids by the Hon'ble Prime Minister on October 20, 2020 is a great step forward in this direction. In our efforts to address the farmers issues, technological interventions through Biotech KISAN project sponsored by the Department of Biotechnology, Ministry of Science and Technology, Govt. of India, we have built a platform for farmer-scientist-development personnel connect and demonstrate innovative production technologies, create Seed Hubs and seed villages with latest improved varieties of different field crops and vegetables, intensify diversification in agriculture through different IFS modules and develop trained human resource and entrepreneurs (both men and women) to achieve the goals of doubling farmers income and generating employment in their rural settings. The project is in operation in four districts of eastern U.P. viz. Chandauli and Sonbhadra (Aspirational) and Varanasi and Ghazipur (Non-Aspirati'onal) since March 2020.

In one year of the project operation, our effort to aggregate farmers through formation of SHGs/FPOs and farm produce has promoted market network and encouraged farmers to adopt innovative technologies in different sectors which has resulted in enhanced productivity and income of the farmers, augment trained manpower and entrepreneurs in different sectors and generate employment especially to women farmers besides addressing the issues of resources conservation and climate change. Diversification of crops and enterprises viz. fisheries, goatery, mushroom production, vermicomposting, bee keeping etc. has helped improve income, nutrition and generated employment. Application of nutrients on the basis of soil nutrients test values is enhancing crop yields and saving nutrients. All these have been reported in this publication. Unfortunately, launch of the Biotech KISAN project in March 2020 coincided with the arrival of COVID-19 pandemic which is continuing even today. We had to work against several odds but it did not deter us in achieving our target set for the project.

Panjab Singh
President, FAARD

Acknowledgement

This is to express my deep sense of gratitude to Dr. Panjab Singh, Former DG, ICAR and Secretary DARE and President FAARD Foundation for continuous encouragement and providing inputs in preparation of this Bulletin without which it would not have been possible to bring it in the present shape. Prof. S.R. Singh, Former Director, Institute of Agricultural Sciences, BHU deserves special appreciation for his critical comments for improvement of the manuscript. Thanks are also due to Dr. T. K. Behera, Director, ICAR-IIVR for his technical inputs and suggestions. Dr. Jagdish Singh also deserves thanks for his technical inputs and valuable suggestions from time to time. Dr. Neeraj Singh has been the main architect in formulating the layout and contents along with appropriate pictures and devoted his valuable time in its completion for which words fall short of complementation. Thanks are also to Dr. Santosh Kumar Singh for his input in improving the manuscript. Dr. Umesh Singh, Trustee of the FAARD Foundation has played a pivotal role in collecting various inputs, data and co-ordinating the publication for which he deserves my sincere gratitude. Also, the cooperation of other Trustee namely Dr. Rajesh Singh and Shri Dashrath Singh for their valuable suggestion and inputs is praiseworthy.

Various FPOs, SHGs and participating farmers have played their roles in laying out crops and vegetables demonstrations of improved varieties and proven technologies which have resulted into number of success stories giving encouragement to other farmers, fully deserve appreciation. Young Professionals namely Adarsh Kumar Singh, Tushar Kant, Kamlesh Kumar Yadav and Madhukar Sharan Patel worked tirelessly even during COVID-19 pandemic in selected villages of four districts to monitor project activities and provide feedback for which they deserve special thanks. Very sincere gratitude to Department of Biotechnology, GOI for sanctioning Biotech-KISAN Project to FAARD Foundation for addressing farmer's problems of the region. Thanks are also to Dr. H.S. Gupta, Chairman PSMC, DBT and mentor of the project and Dr. A.K. Singh, Member, PSMC, DBT for their support and guidance. Thanks are also due to Dr. Mohd. Aslam, Advisor and Ms. Priya Prasad, DBT for their continuous support and guidance during the operation of the project. Cooperation and help extended by institutes, SAUs, KVKs in providing training, inputs support and access to the facilities is gratefully acknowledged. The Proprietor of Admax Associate, Shri Triloki Nath deserves our appreciation for sculpturing the Biotech-Kisan Bulletin in its present form.

R.M. Singh
Principal Investigator

PROJECT SUMMARY

Agricultural sector plays a pivotal role in the Indian Economy. This sector is facing several problems like stagnation in yield, low adoption of new technology, volatility in prices, natural calamities, uneconomical size of land holding and very low income of farmers. Biotech KISAN Project is being implemented by FAARD Foundation and ICAR-IIVR, Varanasi since March 2020 in 21 villages of Varanasi & Ghazipur as hub districts and Chandauli & Sonbhadra as aspirational districts which, addresses most of these issues. Project aims at increasing crop productivity, diversification, intensification of vegetable cultivation and creating ''Seed Hubs'' for food crops through technology demonstrations, capacity building, establishing FPOs/SHGs for aggregating farmers and farmer's produce for better marketing network and strong farmer-scientist connect. Intervention of this project has contributed in improvement of farmers' livelihood in an environmentally sustainable way. Through technological adoption, varietal demonstration, crop/enterprise diversification etc. and new market linkages with FPOs, project could achieve improvement in food and nutrition security and also poverty reduction and equity.

During 2020-21 & 2021-22, crop demonstrations of 27 improved varieties and production technologies in cereals and pulses viz., paddy, arhar, bajra, moongbean, urdbean, wheat, barley, chickpea, field pea, and lentil were conducted at 768 farmers' fields in 198.63 ha area. These interventions increased the average crop productivity by 22.13% and net income by 26.59% over conventional practices. In Zaid 2021, moongbean, sunflower and maize crops had been introduced for the first time at 84 farmers' field in the selected villages in an area of 20.5 ha which fetched an average net income of Rs. 59,694 per ha. Similarly, demonstrations of 19 different vegetable crops in 162.34 ha area at 1291 farmers' field increased the average crop yield by 12.0% and net income by 26.7%. To address the nutritional security aspects and create awareness about the importance of nutrition garden to the rural households, 8100 kitchen garden seeds packets were also provided to farmers including COVID-19 migrants.

For developing Seed Hubs, Breeder and Foundation seed of high yielding and disease and pest resistant varieties of cereals and pulses were sown in different districts. In paddy, 1143 q Foundation Seed and 3138 q truthful label seed of MTU-7029, DRR 50, Pusa Sambha & Swarna Sub-1 were produced at selected farmers' field and provided to other farmers through FPOs for cultivation and further multiplication. In wheat 440 q of Foundation Seed of varieties HD 3086 and HD 3249; 54 q Barley variety DWRB-137 and 28 q of Lentil variety IPL-316 were produced during Rabi 2020 which is cultivated in 2021-22.

Regarding capacity building, skill upgradation and entrepreneur-ship development, 180 farmers (124 men and 56 women) were trained as master trainers in different areas viz. Seed production, Integrated Farming System (IFS), Goatery, Fisheries, Mushroom, Bee keeping, Protected Cultivation and Vermi-composting who further with the help of project team and KVKs officials trained another 940 farmers (339 men and 601 women) in different villages. Many of these farmers (men and women) now have emerged as self-practicing farmers and entrepreneurs improving their income and generating gainful employment for them in their rural settngs.

To strengthen farmers-scientist connect, the project helped farmers in formation of FPOs in different districts and effort is now on for formation of a Federation of FPOs in U.P. for a stronger network of farmers and benefit them in using the technological innovation and creating market chain for increasing their production, income and employability. A Tinkering lab has been established and advisory services are being provided to farmers for judicious use of plant nutrients based on soil health card data so as to increase the resources use efficiency especially nutrient and water which will ultimately increase their income by saving resources. Despite serious restrictions due to COVID-19 pandemic for almost two years, we have succeeded and created a very good farmers platform and linkages to have dialogue with group of farmers and other stakeholders' network to work and promote activities in rural settngs so as to benefit a large number of farmers and entrepreneurs in four operational districts and beyond.

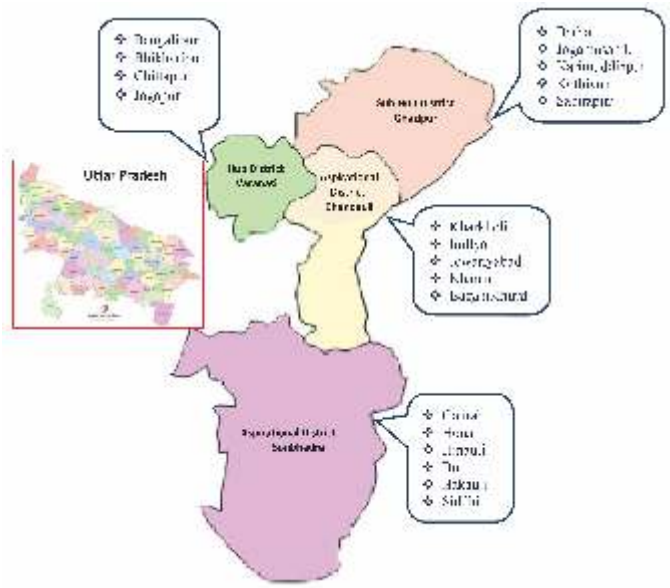
1. Introduction

Despite record growth in agriculture production, we are still confronted directly or indirectly with issues related to the contribution of agriculture in Indian economy and sustainable production and economic growth of the farmers. In eastern Uttar Pradesh and especially in the project concentration area, the major concerns are low crop productivity mostly due to low use of improved technologies, innovations and inputs, increased vulnerability to extreme climatic events (droughts, floods, submergence, extreme temperatures etc.), declining soil and water productivity, post-harvest losses, lack of proper storage and marketing facilities and lack of awareness and training facilities. If these issues are not addressed in their true perspectives, the improvement in rural economy in the region and farmers prosperity will remain a distant dream. Through Biotech KISAN Project of Department of Biotechnology (DBT), Ministry of Science and Technology, Government of India, efforts are made to address these issues and develop model villages through different interventions. The activities outlined in the project are taken up in two aspirational districts viz, Chandauli and Sonbhadra of Uttar Pradesh besides Varanasi and Ghazipur districts as Hub and Sub Hub respectively. The project is implemented by FAARD Foundation in partnership with ICAR-IIVR and with the support from SAUs, BHU, KVKs and other institutions located in the region.

1.1 Objectives of the Project

- Identify the problems of growers related to agriculture and allied field and offer solutions through various technological interventions and capacity building programs.
- Promotion of improved technologies for yield enhancement and quality seed production of cereals, pulses, and vegetables in participatory mode.
- Develop model villages based on proven technologies in agriculture and allied fields through demonstrations and capacity building for economic and nutritional security.
- Individual thematic fellowship programs for farmers especially women (Mahila Kisan Biotech Fellowship) to develop them as leaders, grass root scientists and entrepreneurs.

1.2 Project Operational Area-Districtd and Villages:



1.3 Project Activities:

1.4 Technologies demonstrated

The following improved varieties/hybrids of 11 field crops and 14 vegetable crops developed by various research organizations were demonstrated in the selected clusters of four districts.

Field Crops			Vegetable Crops		
S.No.	Crop	Variety/Hybrid	S.No.	Crop	Variety/Hybrid
1.	Paddy	Swarna Sub-1, DRR-50, Pusa Sambha-1850 MTU-7029	1.	Okra	Kashi Kranti, Kashi Lalima
2.	Wheat	HD 3249, DBW 222, DBW 187, HD 3086	2.	Chilli	Kashi Anmol, Kashi Ratna
3.	Barley	DWRB 137	3.	Bottle Gourd	Kashi Ganga
4.	Pigeonpea	NA-2, IPA-203, P-992	4.	Sponge Gourd	Kashi Rakshita
5.	Pearl Millet	Pusa Composite 701, Bio Seeds-8290	5.	Cowpea	Kashi Nidhi
6.	Chick Pea	JG 14, PUSA 3043, JG 24, GNG 2207	6.	Pumpkin	Kashi Harit
7.	Lentil	IPL 316, IPL 220	7.	Cauliflower	Kashi Gobhi-25
			8.	Brinjal	Kashi Sandesh
8.	Fieldpea	IPF 4-9, IPFD 10-12	9.	Tomato	Kashi Aman, Kashi Adarsh
			10.	Cucumber	Kashi Nutan
9.	Moong	IPM-410-3 (Shikha), IPM-205-7 (Virat)	11.	Pea	Kashi Mukti, Kashi Udai, Kashi Ageti
10.	Sunflower	PSH 2080	12.	French Bean	Kashi Sampann
11.	Maize	COHM-8	13.	Indian Bean	Kashi Khushal
			14.	Carrot	Kashi Arun

1.5 Introduction to the Hub organization-FAARD Foundation, Varanasi

FAARD Foundation was established as a charitable trust in the year 2005 for working for the betterment of life of the rural population through technology and social interventions in eastern Uttar Pradesh.

The objectives of the Foundation are as follows:

- A holistic approach towards agriculture and rural development for improving living status of rural population.
- Assessment of technological needs, identification of technologies, refinement, localization and dissemination through technological interventions among rural masses for increasing agriculture productivity and income.
- Creation of Self-Help Groups (SHGs) and setting up of small and medium enterprises (SMEs) by generating resources from public &private sectors as well as registered societies and use it in non-profit mode to promote employment and income enhancement.
- Provide market access, improving product quality through technological interventions, making inputs and resources available for agriculture and agro industrial development.
- Organize need based trainings, workshops, seminars, field days, exhibitions and technology demonstrations on selected sites for acquainting rural masses with modern technological development.

PART-I

2.1. Hub district Varanasi

2.1.1 Field crops based interventions

During 2020-22, kharif demonstrations of 03 improved varieties of paddy *viz.,* DRR 50, Swarna Sub 1 and Pusa Samba-1850 along with pigeon pea (IPA-203, P-992 & NDA-2), mungbean (IPM-410-3), urdbean (IPU-02-43) and pearl millet (Pusa Composite-701 & Hybrid Bio-Seeds-8290) were laid at 67 farmers' field in an area of 21.25 ha in selected villages of hub district Varanasi. Similarly, during rabi season demonstrations of wheat (HD-3086, HD-3249 & DBW-222), barley (DWRB-137), chickpea (Pusa-3043, JG-14 & GNG-2207), field pea (IPF 4-9 & IPFD 10-12) and lentil (IPL-316 & IPL-220) were conducted at 74 farmers' field in an area of 16.2 ha. In zaid 2021, demonstrations of moong (Sikha & Virat), sunflower (PSH 2080) and maize (COHM 8) were newly introduced under crop diversification among 11 farmers in an area of 3 ha. The performance of the improved varieties/hybrids over farmers used varieties in terms of yield and income are given in figure 1 & 2 and table 1.

Fig. 1: Average yield increase in field crops from demonstration as compared to farmers' practices

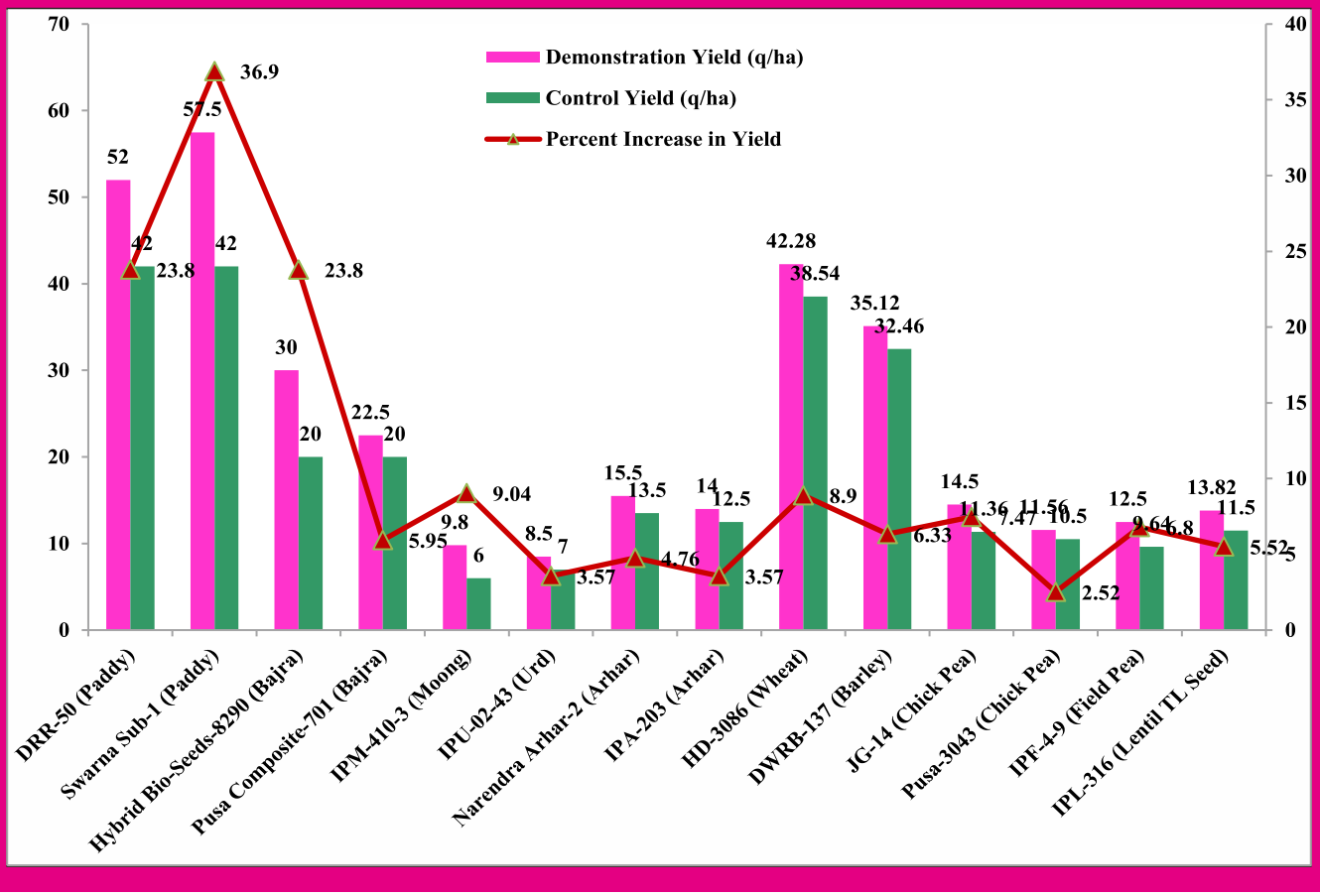


Fig. 2: Average net income increase from demonstration as compared to farmers' practices

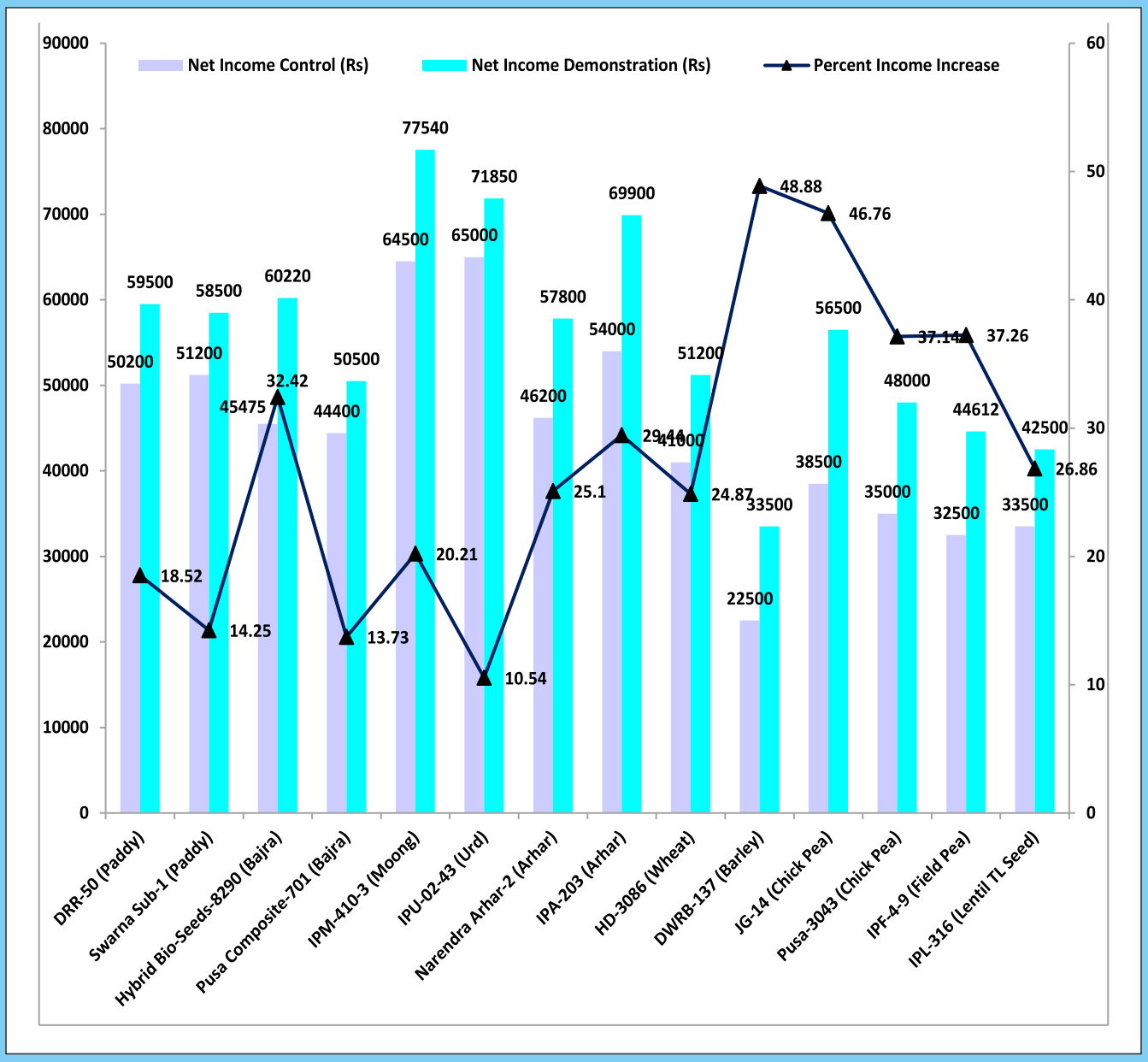


Table 1: Performance of newly introduced crops in zaid season

S.No.	Crop/Varieties	No. of Beneficiaries	Area (ha)	Average Yield (q/ha)	Average Net Income (Rs./ha)	Benefit-Cost Ratio
1.	Moong (Sikha)	02	0.75	12.09	64722.50	2.22
2.	Moong (Virat)	03	1.00	11.73	57360.00	2.05
3.	Sunflower (PSH 2080)	03	0.50	21.09	102209.70	4.15
4.	Maize Cob (COHM 8)	03	0.75	60.60	71140.60	1.93

The performances of a few selected demonstrations are shown here:

SWARNA SUB-1

Mr. Bablu Yadav from Bhikharipur village had grown paddy (Swarna Sub-1) in 0.25 ha area during kharif 2020. He was delighted with the yield of 16 q (64 q/ha) paddy crop as earlier he was harvesting merely 13 q. He sold his crop at the rate of Rs. 1864/- per q in the market and earned a net income of Rs. 16,960/- compared to average net income of Rs. 13,490/- from other variety grown in the area. He also kept his produce for seed purpose for the next season.

Farmers Feedback:

- No lodging even in heavy rainfall and less infestation of pests & diseases.
- Early maturing and high yielding variety than the local or traditional variety.
- Number of tillers is more than local varieties.

DWRB 137 (Barley)

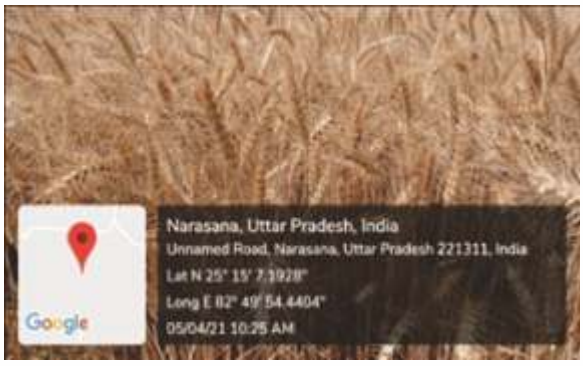
Ms. Guddi Devi of Bhikharipur village grew barley variety DWRB - 137 in 0.25 ha area. She harvested highest yield of 10 q from her demonstrated area (40 q/ha). She marketed her produce in Varanasi market at the rate of Rs. 15/- per kg & got a net profit of Rs. 11,700/-. She had grown the barley crop for the first time and was happy with the quality & quantity of produced she got.

Farmers Feedback

- DWRB137 revealed resistant reactions for yellow and brown rusts.
- DWRB137 has wider adaptation, disease resistance, agronomic resilience and bold grains.
- Farmer gets better returns from this improved variety.
- Grains are very shiny and the flour is very tasty.

HD 3086 (Wheat)

Mr. Vikash Singh of Bhikharipur village had grown wheat (HD 3086) in 0.25 ha area. He was over excited with the yield (45.5 q/ha) of his wheat crop as earlier he was harvesting merely 35 - 40 q/ha. He sold his produce at the rate of Rs 1975/- per quintal in the market and earned a net income of Rs. 53220/- per hectare compared to Rs. 47025/- from other variety grown in the area. Similarly, Ms. Soni Patel of Jogapur village, Varanasi fetched bumper yield of 46 q/ha of her wheat crop (HD 3086) and earned net income of Rs. 52825/- per hectare.



Farmers Feedback:

- This variety possesses higher grain yield as well as resistance to major disease.
- Grain quality is very good with bread quality is very soft when cooked.
- Farmer replaces their old varieties with HD 3086 due to better yield and easy marketing.

COH-8 (Maize)

Mr. Kisan Patel from Jogapur village cultivated the summer maize (COH-8) first time on his 0.25 ha area. Under the proper technical guidance of project team, he got the highest cob yield of 15.5 q (62 q/ha). He was very happy with the yield and the price he got in the market which was Rs. 20-22/- per kg and fetching a net profit of about Rs. 21,175/- which he never earned from other crops.

Farmers Feedback:

- Cob size is of good length and moderately resistant to pests.
- Grain filling in the cob was good due to which farmer got higher yield.

2.1.2 Vegetable crops based Interventions

In vegetables during kharif 2020 & 2021, successful demonstrations of cowpea (Kashi Nidhi), bottle gourd (Kashi Ganga), pumpkin (Kashi Harit), sponge gourd (Kashi Rakshita), chilli (Kashi Anmol & Kashi Ratna), cauliflower (Kashi Gobhi-25), dolichos bean (Kashi Khushal) and okra (Kashi Kranti & Kashi Lalima) were conducted at 120 farmers' field in an area of 13 ha in the selected clusters. Similarly, during Rabi season demonstrations of high yielding garden pea (Kashi Mukti), french bean (Kashi Sampann) and carrot (Kashi Arun) were conducted at 36 farmers' field on an area of 08 ha. In zaid 2021, demonstration of cowpea (Kashi Nidhi), pumpkin (Kashi Harit), okra (Kashi Kranti) and cucumber (Kashi Nutan) were conducted at 33 farmers' field in an area of 4 ha. As the result of these demonstrations, crop yield increased upto 27.0% while income upto 53.8%. Some of the beneficiaries also started producing seeds of these demonstrated vegetables varieties for large scale farming. Further, to address the nutritional security aspects of rural households, 1800 kitchen garden seeds packets were also provided to farmers including COVID-19 migrants during different cropping season for promotion of kitchen garden at their doorsteps. Impact of some major vegetable based interventions demonstrated in the farmers' fields is shown in figure 3 & 4.

Fig. 3: Cropwise average yield increase from demonstration as compared to farmers' practices

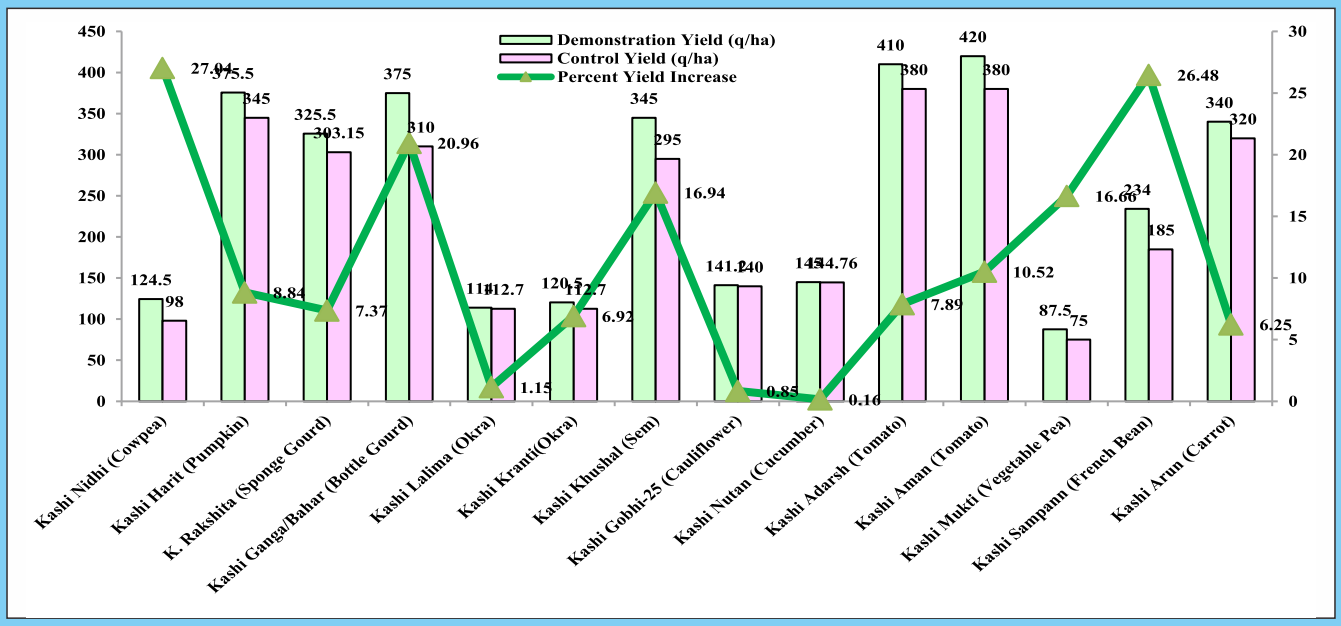
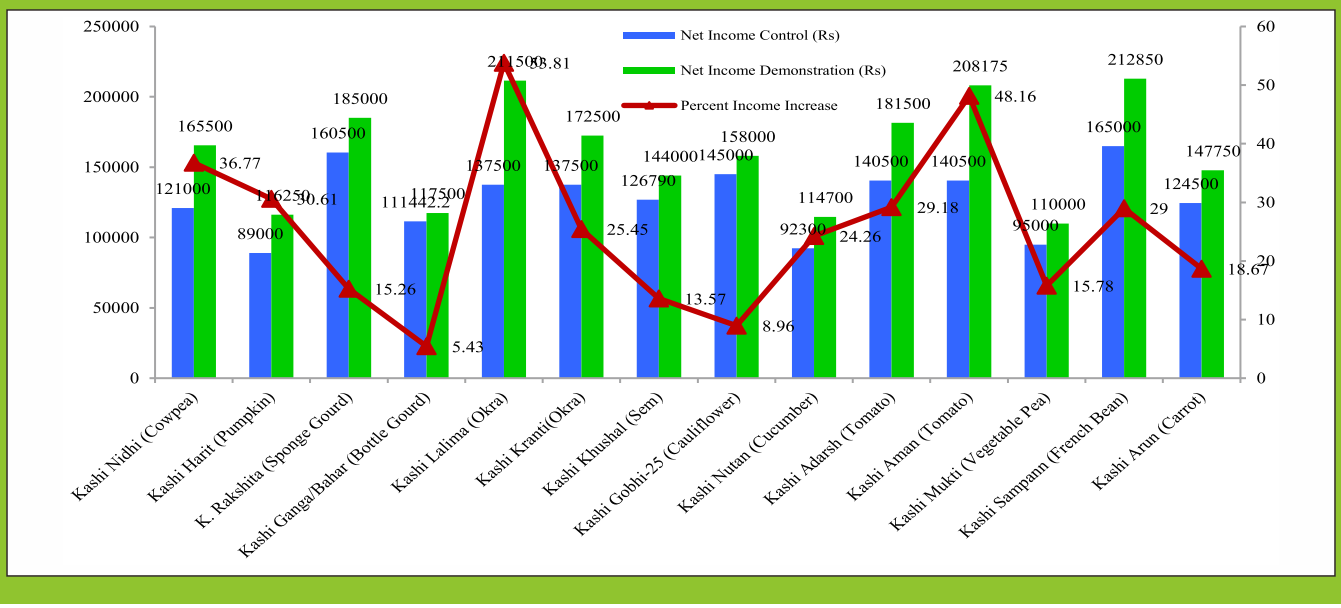


Fig. 4: Crop wise average net income increase from demonstration as compared to farmers' practices



The performance of a few selected demonstrations are shown here:
Demonstrations of pumpkin were conducted at 28 farmer's field in an area of 3.87 ha in Jogapur & Bangalipur villages. Fruits were green, spherical, weight 2.5-3.0 kg at green stage in 65-70 days of crop duration. The average yield recorded was 381.83 q/ha while the highest yield recorded was 407.55 q/ha by Mr. Bansnarayan Patel of Bangalipur village.

Kashi Harit (Pumpkin):
Mr. Bansnarayan Patel, Ms. Suresh Devi from Bangalipur and Mr. Subhash Patel from Jogapur village in Varanasi cultivated pumpkin (Kashi Harit) under demonstration in total 1 ha area and fetched yield of 412 q/ha compared to 220 q/ha from local variety.They marketed their produce at Rs.10-15/- per kg and earned a net profit of Rs.18,5500/- with an average gain of 73.47% over local practicing variety. They had made the seeds from his crop and used to grown in Rabi season also.

Farmers Feedback:
- High yield as compare to other local varieties.
- Good marketable fruit size of 2.5-3.0 kg.
- Better market price of both green and ripen fruits.

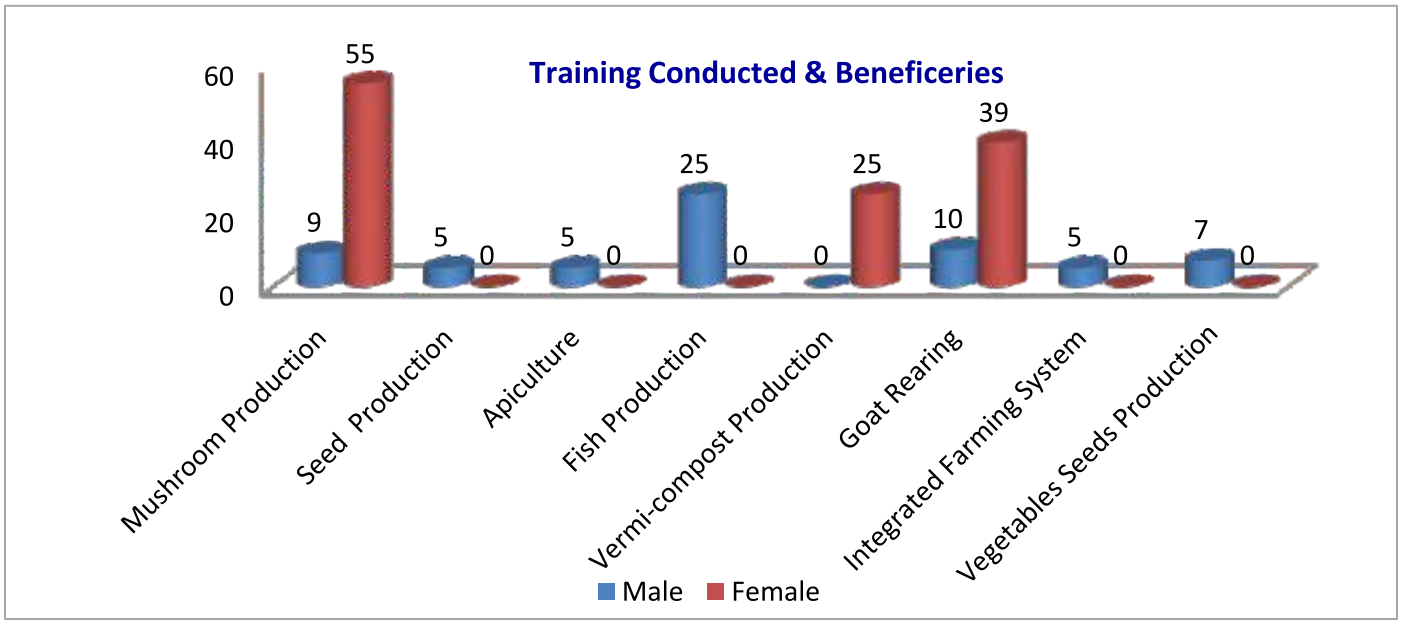


Kashi Kranti (Okra): Mr. Subhash Patel from Jogapur village cultivated okra (Kashi Kranti) in 0.25 ha area and harvested 31.25 q of okra fruit. He received a better market price of Rs.16/- to 25/- per kg and earned a net profit of Rs. 51500/-. As the result of successful adoption of this variety the average income of farmers increased by 14.5% as compared to other practicing varieties.

2.1.3 Capacity building and success story of entrepreneurship development:
Entrepreneurship development is mostly focusing on knowledge and skill development through various capacities building programme like training, interaction meetings, kisan gosthies, kisan melas etc. Further, beneficiaries are also promoted for adopting the proven technologies for developing start-ups and also act as master trainers in the village for disseminating the technology among other rural youth/farm women. So far, apart from 3 kisan gosthies in different villages and 1 farmers fair at ICAR-IIVR, a total of 12 training programme (3 on mushroom production, 2 each on fish &

goat rearing, 1 each on seed production, apiculture, vegetable seed production, vermi compost and integrated farming system) were successfully conducted for 66 male and 119 female farmers (figure 5).

Fig.5. Capacity building programs in Varanasi district.



2.1.4 Farmers Fair: A 'Farmers Fair' was organized at ICAR-IIVR campus on 30th January 2021. Chief Guest on this occasion, Dr. A. K. Singh, DDG (Agril. Extension) ICAR, New Delhi had emphasized the farmers for agricultural diversification by incorporating horticultural crops, organic farming, fish farming, mushroom production, animal husbandry etc in their traditional rice-wheat farming. Prof. Panjab Singh, President, FAARD Foundation and facilitator of this project encouraged the farmers for developing FPOs and explained how they could be able to harness its benefits by disposing their huge agricultural produce. Prof. Singh welcomes the progressive farmer Mr. Chandra Shekhar Singh, who was recently honored with Padma Shri along with other dignitries viz., Dr. Bijendra Singh, Vice chancellor ANDUAT, Ayodhya; Dr. Ramesh Chandra, Director, Institute of Agri. Sciences, BHU and Dr. Rajnath Prasad, Director, ICAR-IIVR during the occasion.

About 650 farmers from Varanasi, Ghazipur, Chandauli and Sonbhadra districts had participated in this farmer's fair and shared their successful experience and problems faced in farming. Furthermore, along with ICAR-IIVR, 13 private and government organizations demonstrated their technologies in this fair. On this occasion 40 Biotech KISAN Fellowship of worth Rs. 10000/- each were awarded to the selected farmers (16 Men and 24 Women) from the four project operational districts for their significant contribution in transfer of improved recommended agriculture technologies to ultimate users for livelihood security.

Success Story-1 Entrepreneurship development in goatery

Mr. Kisan Patel & Mr. Phul Kumar of Jogapur village and Mr. Bansnarayan & Mr. Girja Sankar from Bangalipur village, Varanasi are rearing goats for last few years but, facing economical losses due to lack of technical know-how. Under Biotech KISAN project, they actively participated in four days (18-21, 2021) training at ICAR-CIRG, Makhdoom. They were successfully trained in both theoretical and practical aspects aimed at valuing the role and importance of goat rearing in economic upliftment involving various topics viz., breed characteristics of Sirohi and Barbari goats for meat production, first aid, usefulness of antiparasitc drugs, dressing of wounds in injured animals, different management practices to be adopted after kidding for goats as well as kids, housing and overall management, selection and breeding strategy/practices for breed improvement in goats, care and management of kids for meat production, sign and symptoms of oestrous and insemination procedures, formulation and dispensation of balanced feed mixture for bucks and does, common diseases of goats and their treatment, various contagious diseases and their prevention by vaccination, importance and economic benefit of various milk and meat products, different methods of identification in goats, castration, dehorning and trimming of hoofs and their benefits, preparation of detailed project report for goat farming to be taken up as business and preparation of income and expenditure account in goatery.

As a result of this training, all 4 farmers gained and honed their skills which was reflected in the increased strength of goats in their possession consisted of 10 bucks, 45 does and 24 kids of Barbari/non-descript breeds i.e. presently, in total 79 bucks/does/kids are being reared by them. They enhanced their earning by selling goat milk, meat & kids.Thus by adopting agriculture along with goat rearing; they have demonstrated an example of mixed farming which has proven to be an important source of livelihood for their family.

Success Story-2 Entrepreneurship development in fish farming

Five farmers of Varanasi district got training on fish framing from National Bureau of Fish Genetics Resources (NBFGR), Lucknow during (28-31 December, 2020). After successful training 4 farmers namely Mr. Sanju Patel (Jogapur village), Mr. Lakshman Patel (Jogapur village), Mr. Deepak Pal (Chittapur village) and Mr. Munna Lal (Bangalipur village) developed a pond of 0.25 ha eachat their villageand reared recommended two species of fish i.e., Rohu & Silver Carp. At initial stage mortality rate was high (20%) but after getting regular technical advisory from NBFGR scientists on proper fish health management, they are now happy and apart from their business, they are also providing training to other rural youth in the village.

As fresh fish is in high demand in the markets of their locality, marketing is not a problem. They were planning further to develop more number of fish culture ponds as profit is comparatively more in fish culture than other agriculture enterprises. This year earnings from fish culture were an average of 2.5 lakhs whereas the net profit on an average was

1.25 lakhs. On an average 20 tonne of fish was harvested, which is quite encouraging. It could be concluded that these men are now a fisheries entrepreneur and a community role model in fisheries. They have been also instrumental in encouraging about a dozen more villagers to become fish farmers - as there is a huge demand of fishes in their local area.

Success Story-3 Entrepreneurship development in Mushroom Production

Women from selected villages *viz.* Bhikharipur & Jogapur of Varanasi district started production of mushroom (oyster) in their homes and get good returns and family nutrition.

Mrs. Saroj Devi and 10 more women farmers of Bhikharipur village, Varanasi received training in mushroom production at ICAR-IIVR, Varanasi and started cultivation of oyster mushroom with 20-25 bags which yielded 30-35 kg and sold mushroom to the people in village and local Mandi @ Rs.125 /- per kg. Later, a self-help group (Baba Saheb Bhim Rao Ambedkar Mahila Samiti) is developed with Ms. Saroj Devi and 20 women of the village have started mushroom production with 100 bags. This production was sold in the market at the rate of Rs. 100-125/- per kg. Net Profit gains by this women's self-help group on 100 bags of oyster mushroom was Rs. 11,500/-.The waste that come out after mushroom production, was used as compost materials for the nutri-garden demonstrated at their door-step.

2.2. Sub Hub district Ghazipur

2.2.1 Field crops based interventions

In the year 2020 & 2021 during kharif season, demonstrations of 05 improved varieties of paddy *viz.,* DRR 50, Swarna Sub-1, MTU-7029 & Pusa Sambha-1850 along with pigeon pea (IPA 203, P-992 & NDA-2), mungbean (IPM-410-3), urdbean (IPU 02-43) and pearl millet (Pusa Composite - 701 & Hybrid Bio-Seeds 8290) were conducted at 106 farmers' field on an area of 47.27 ha in selected villages. Similarly, during rabi season demonstrations of wheat (HD 3086), barley (DWRB-137), chickpea (Pusa 3043, JG-14, GNG 2207 & JG 24), field Pea (IPF 4-9 & IPFD-10-12), linseed (JLS 73) and lentil (IPL 316 & IPL-220) were conducted at 100 farmers' field on an area of 24.6 ha.The crop wise impact of all field crops demonstrations conducted during kharif and rabi at farmers' field is presented in figure 6 and 7. In Zaid season, moong (Sikha & Virat), sunflower (PSH 2080) and maize (COH 8) crops has been introduced first time in the selected village as these crops were not grown by the farmers in zaid season which gave a significant results (table 2) and positive feedbacks by the farmers based on the crops yield and price fetched from markets.

Fig. 6: Average yield increase in field crops from demonstration in compare to farmers' practices

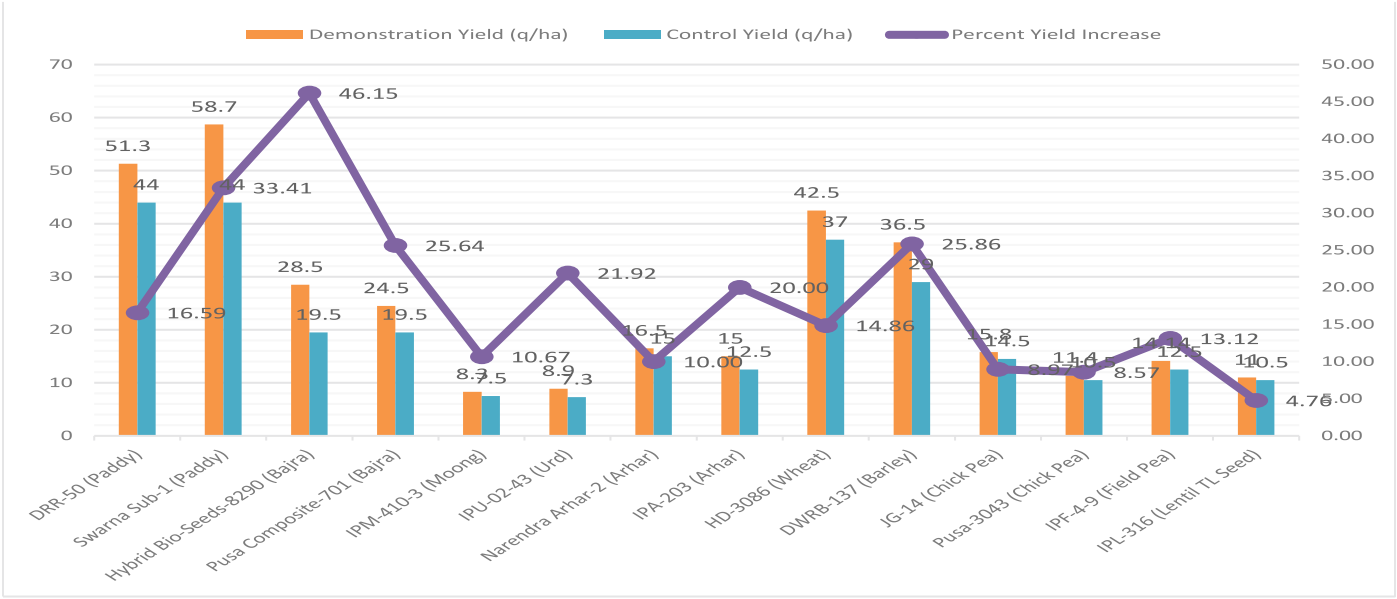


Fig. 7: Average net income increase from demonstration in compare to farmers' practices

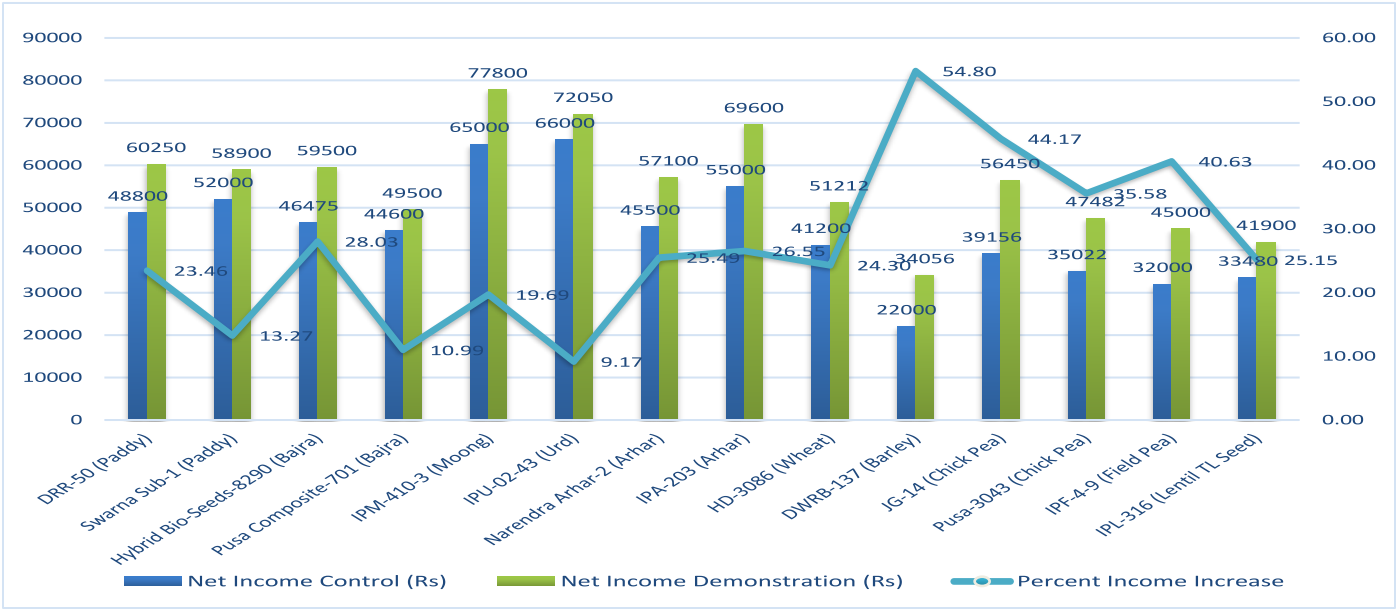


Table 2: Performance of newly introduced crops in zaid season

S.No.	Crop/Varieties	No. of Beneficiaries	Area (ha)	Average Yield (q/ha)	Average Net Income (Rs./ha)	Benefit-Cost Ratio
1.	Moong (Sikha)	9	2.25	12.28	58202	1.86
2.	Moong (Virat)	7	2.00	11.11	49336	1.56
3.	Sunflower (PSH 2080)	13	3.25	19.79	90445	3.77
4.	Maize (COH 8)	10	2.50	35.50	30767	0.86

The performances of a few selected demonstrations are shown here:

Swarna Sub-1 (Paddy)

Journey of success started for Mr. Ravi Pratap Singh from Barhat village, Ghazipur after he got the seeds of paddy (DRR-50) under Biotech KISAN project. He grew it in 1 ha area during kharif 2020. He was overwhelmed with the bumper yield of 55 q of his paddy crop as earlier from old varieties he was able to harvest merely 42-45 q from same piece of land. This crop was sold @ Rs. 1864 per q in the market and hence he earned a net income of Rs. 62240 as compared to average income of Rs. 40804 from other varieties grown in his area.

Similarly, Mr. Krishna Kant Rai from Jogamusahib village, a post graduated progressive grower engaged in farming becomes a role model for most of farmers in his area. Mr. Rai followed rice-wheat cropping system since last 30 years and use to harvest 50-55 q of paddy from his 1 ha area. During 2020, demonstration of paddy (SSB1) conducted in the same piece of land fetched the yield of 64 q which he sold @ Rs.1887 per q in the market and hence earned net income of Rs.79,860 as compared to average income of Rs. 67,401 from earlier variety.

HD 3086 (Wheat)

Mr. Shiv Banbasi of Barhat village, Ghazipur farming on lease land fetched bumper yield of 42.96 q/ha of this wheat variety HD 3086 under technical guidance of scientists, as earlier he was harvesting merely 35-37 q/ha from same piece of land. He marketed his crop at the rate of Rs. 1975 per q and hence earned a net income of Rs. 52,846 as compared to average income of Rs. 38,002 from other variety grown in the area. That shows a 39.1% of increase in income and 16.1 % increase in production as compared with the local varieties. Mr. Jagdish Singh of Barhat village, Ghazipur had grown wheat (HD 3086) in 1 ha area. He was over excited with the bumper yield (47.2 q) of his wheat crop as earlier he was harvesting merely 40 q from same piece of land. He sold his crop at the rate of Rs 1975/q in the market andearned a net income of Rs. 93,220 as compared to average income of Rs. 79,000 from other variety grown in the area.

Farmers Feedback:

- This variety possesses higher grain yield as well as resistance to major diseases.
- Grain quality is very good with bread quality very soft when cooked.
- Farmer replaces their old varieties with HD 3086 due to better yield and easy marketing.

JG 14 (Chick pea): During rabi season 2020-21 chickpea (JG-14) demonstration had been done in 1 ha of land with 6 beneficiaries in Jogamushahib, Barhat, Kothiya & Sabitapur villages. The Average yield recorded was 15.80 q/ha with highest yield of 18.47 q/ha by Mr. Ram Kumar Rai of Jogamushahib village.

IPL 316 (Lentil): It is a valuable human food, mostly consumed as dry seeds in Indian sub-continent as 'Dal' by removal of outer skin and separation of cotyledons. During Rabi season 2020-21 this variety of lentil was demonstrated in an area of 3.46 ha with 15 beneficiaries in Jogamushahib & Barhat villages which fetched an average yield of 11 q/ha with highest yield of 16 q/ha by Mr. Harihar Singh of Barhat village.

Farmers Feedback:

- High yielding variety with grains shape & size are good.
- Disease resistant variety, no disease spotted during the entire season.
- Quality of grain is very vigorous.

Sunflower (PSH-2080)

Ms. Bhanumati Devi of Jogamusahib village of Ghazipur district had grown the sunflower crop in 0.25 ha of land and got the yield of 5.26 q. She adopted cultivation of sunflower for first time and very much afraid about the yield of crop but after getting good yield, she was very happy with the profit of Rs. 24,203. Similarly, Mr. Piyush Yadav of Barhat village had grown sunflower (PSH-2080) in 0.25 ha. He also cultivated the sunflower first time and under the technicalguidance he got the yield of 5.5 q. He sold in the market at the rate of Rs 6015/q and got the profit of Rs. 23,434. As the result of successful demonstration of sunflower in the village others farmers have also shown the interest of growing sunflower from the next season.

Farmers Feedback:

- Head size very good due to which farmers got higher yield.
- Sunflower cultivation gave higher income as compare to other crop.

2. 2.2 Vegetable crops based interventions

During kharif 2020 & 2021, in vegetables there are successful demonstrations of cowpea (Kashi Nidhi), bottle gourd (Kashi Ganga), pumpkin (Kashi Harit), sponge gourd (Kashi Rakshita & Kashi Jyoti), chilli (Kashi Anmol), brinjal (Kashi Sandesh), dolichos bean (Kashi Khushal) and okra (Kashi Kranti & Kashi Lalima) developed by ICAR-IIVR, Varanasi were conducted at 134 farmers' field in an area of 32.58 ha in the selected clusters. Similarly, during Rabi season demonstrations of ICAR-IIVR developed high yielding garden pea (Kashi Ageti, Kashi Nandini & Kashi Udai), french bean (Kashi Sampann) and carrot (Kashi Arun) were conducted at 49 farmers' field in an area of 8.1 ha area. In Zaid 2021, demonstration of cowpea (Kashi Nidhi), pumpkin (Kashi Harit), okra (Kashi Kranti), bottle gourd (Kashi Ganga), sponge gourd (Kashi Rakshita) and cucumber (Kashi Nutan) were conducted at 34 farmers' field in an area of 5.39 ha. The crop wise impact of all vegetable crops demonstrations conducted at farmers' field in selected villages of Ghazipur district is presented in figure 8 and figure 9. Further, apart from massive vegetable crops demonstrations in the selected region, to address the nutritional security aspects of rural households, 2100 kitchen garden seeds packets were also provided to farmers including COVID-19 migrants.

The performance of a few selected demonstrations is shown here:

Kashi Nidhi:

Mr. Munna Bind from Sabitapur, Ghazipur had grown cowpea (Kashi Nidhi) in 0.5 ha area and harvested 7075 kg of marketable quality of cowpea during COVID period. He received a better price in the market (Rs.25 to 28 per kg) and earned a net profit of Rs. 116,886/-. Hence, the average income of farmers increased by 8.9 % mainly due to high yield, low cost of cultivation and better market price.

Similarly, Mr. Dinesh Rai and Mr. Arun Rai from Jogamuashib cultivated cowpea (Kashi Nidhi) on 0.25 ha area in kharif 2020 and 2021 and harvested average 34.42 q of cowpea and received a better price in the market during COVID (Rs.25-30 per kg) and earned a net profit of Rs.62,000/-. As the result the total area in the village under this crop increased by 31.25 %. The reasons for increase in cropped areawere high yield, low cost of cultivation and better market price.

Farmers Feedback:

- High yielding variety than the local variety available in the market.
- Good pod size and keeping quality suitable for distant marketing.
- Can be grown in both kharif & zaid season.
- Less infestation of pest and diseases compare to other local variety.

Kashi Ganga (Bottle gourd): This is an early variety derived from the cross IC-92465 x DVBG-151. Potential yield 480-550 q/ha. It is tolerant to anthracnose and suitable for rainy and summer season cultivation. During 2020, demonstrations of bottle gourd were conducted at 39 farmer's field in an area of 2.45 ha in Jogamushahib, Sabitapur & Karimuddinpur village. Fruits were light green, length 30 cm, diameter 7 cm, fruit weight 800-900 g and the average yield recorded was 345.60 q/ha while the highest yield of 467 q/ha was fetched by Mr. Ram Kumar Rai of Jogamushahib village.

Farmers Feedback:

- Shape & Size of the fruit were good.
- Got the better price in the market due to marketable size and keeping quality.
- High yielding variety compare to other local varieties.

2.2.3 Seed Hub

Seed is the basic input in Agriculture and good quality seed is the primary requisite for obtaining optimum crop stand, healthy crop and productivity. Every season farmers are running in search of good quality seed and spending lots of money. However, in view of large gap between production and supply, some of the farmers are resorting to locally available poor quality seed thus fetching less productivity and income. Hence, adoption of on-farm seed production under the supervision of scientists through farmer participatory approach can improve farmers' income besides ensuring the availability of good quality seed. To achieve this objective of developing a seed hub under Biotech KISAN, Breeder Seeds of lentil were provided to Farmer Producer Companies of Ghazipur for producing Foundation and Certified Seed to be used by other farmers in coming season. Attempt is to make these villages self-sufficient in quality seeds of different crops including vegetables.

Seed Production of Lentil (IPL-316):

Breeder Seed of lentil (IPL 316) was provided to Mr. Ram Kumar Rai of Shivansh Krishak Producer Company Limited of village Jogamushahib for Foundation Seed production in 2 ha. He produced 28 q of Foundation Seed which will be further multiplied for Certified Seed production and distribution amongst farmers in the next season. This variety of lentil is very well suited for this area and the production is very good (14 q/ha) as compared to existing variety which yields around 8-10 q/ha. The seeds are shiny and the plant looks very healthy till maturity. This variety needs to be popularized in the area so the farmers get good returns by growing this improved lentil variety.

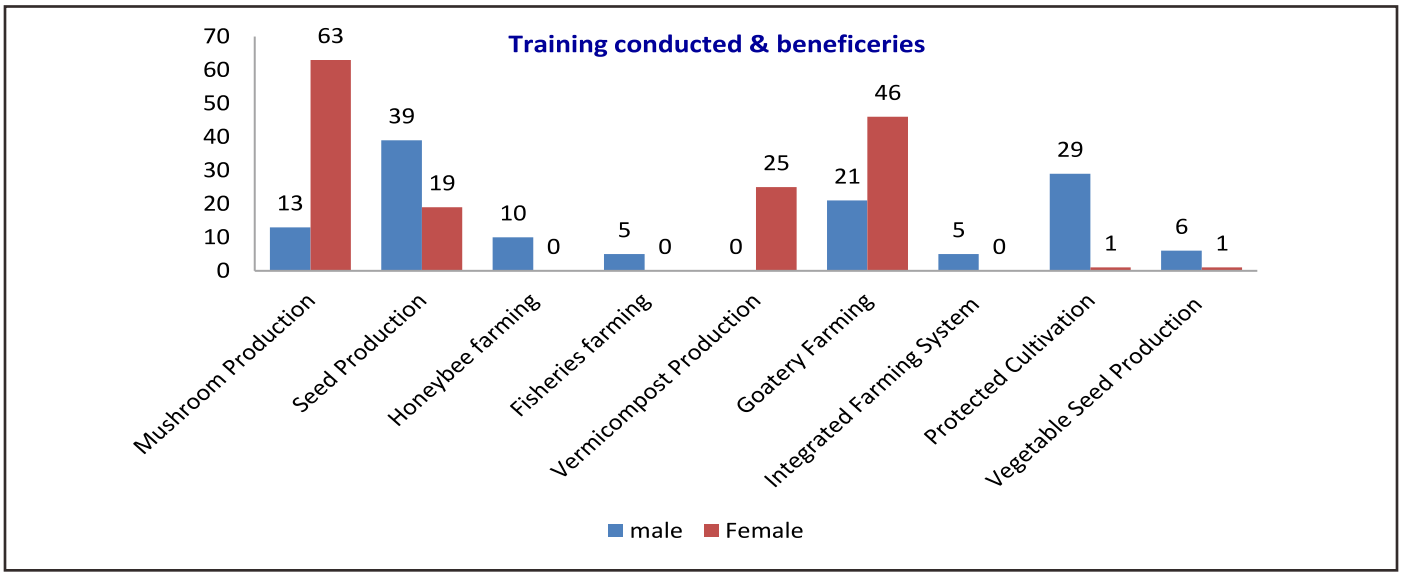
Seed Production of Paddy (MTU-7029) : Paddy variety (MTU 7029), Special features are: duration 150-155 days, average yield: 55-65 q/ha, short bold, brown husk grains, semi dwarf plant height with dark green foliage, profuse tillering having resistance to BLB, developed by ICAR-APRRI, Andhra Pradesh.

During kharif season in 2021-22, Breeder Seed of paddy (MTU 7029) was grown for Foundation Seed production in an area of 2.50 ha land of Mr. Ram Kumar Rai & Mrs. Saroj Singh from Jogamushahib & Barhat village associated with Shivansh Krishak Producer Company Ltd. and Shri Ratandev Kisan Producer Company Ltd respectively. The total production of foundation seeds was 150q. This Foundation Seed will be further multiplied for Certified Seed production and distributions amongst farmers.

2.2.4 Capacity building and success story for entrepreneurship development

The project promotes a range of community/farmer-based organizations at the cluster level. Capacity building programs such as training, interaction, meetings, kisan gosthies, kisan mela etc. are necessary for knowledge and skill development. The main focus of these programs is entrepreneur development. Further beneficiaries are also promoted for adopting the learnt technologies for developing start-ups and also act as master trainers in the village for disseminating of technology among other rural youth/farm women. So far, apart from 12 kisan gosthies in different villages and 1 farmers fair at Barhat Village, in Ghazipur district, a total of 12 training programmes (4 on Mushroom Production, and 1 each on Apiculture, Fish Production, Integrated Farming System, Protected Cultivation 2 on, Goat Rearing, Seed Production) were successfully conducted for 283 farmers where 128 male and 155 female farmers participated (figure 10).

Fig.10. Capacity building programs in Ghazipur district.



Farmers Fair: A 'Farmers Fair' was organized at Barhat village of Ghazipur District on 14 thNovember 2021. On this occasion Chief Guest, Dr. Surya Pratap Sahi (Agriculture Minister, Uttar Pardesh) and Guest of Honour, Dr. Sangita Balwant (Minister of State, Uttar Pradesh) addressed the farmers and appealed them to enhance their livelihood by adopting improved recommended technologies, crop diversification and growing quality produce for competitive markets and export. Prof. Panjab Singh (President FAARD Foundation, Ex D.G ICAR, New Delhi), Dr. A. K. Singh (Director, ICAR-IARI, New Delhi), Dr. Bijendra Singh (VC, ANDUAT, Faizabad) along with other dignitaries and DBT project monitoring team members -Dr. H.S. Gupta (DBT, GOI) and Dr. Neeta Khandekar (Director, IISR, Indore) were also present on this occasion. They advised the farmers for agricultural crop diversification by incorporating horticultural crops, organic farming, fish farming, mushroom production, animal husbandry etc in their traditional rice-wheat farming.

More than1000 farmers from adopted as well as nearby villages of Ghazipur and Varanasi districts had participated in this farmer's fair and also during technical session shared their experience and constraints in farming. Furthermore, along with ICAR-IIVR, 21 stalls from public and private sectors were displayed. On this occasion 10 Biotech KISAN Fellowship of worth Rs. 10000/- each were given to the selected farmers (04 Men and 06 Women) from the hub districts viz., Ghazipur for their significant contribution in adoption & promotion of improved recommended agriculture technologies under this project.

Success Story-1 Entrepreneurship development in goatery

Due to its good economic prospects, goat rearing under intensive and semi-intensive system for commercial production has been gaining momentum for the past couple of years. High demand for goat and its products with potential of good economic returns have been driving many progressive farmers, farm women and rural youths to take up the goat enterprise on a commercial scale. The emerging favorable market conditions and easy accessibility to improved goat technologies are also catching the attention of entrepreneurs. Efforts made under Biotech KISAN project through various capacities building programmes motivated an unemployed rural youth, Mr. Shishir Kumar Rai, resident of village-Jogamuashib, district-Ghazipur, Uttar Pradesh towards adopting goatery as commercial enterprise. He had attended the Training Programme on commercial goat farming organized under Biotech KISAN Project, at ICAR-CIRG, Makhdoom during 18-21 Jan 2021 andstrengthened his goat farming in the village after training with the help of mentors from ICAR-CIRG. It was 2020 when after discussion with project team, Mr. Rai started goatery with 18 Barbari goats reared under stall-fed intensive system of management. Initially he faced a number of problems like high cost of production, mortality and low price of the produce but later this year after training he received proper technical guidance from the scientists of CIRG on health management of goats. This year he is also planning to enhance his business by rearing some other goats' breeds like Jamunapari, Black Bangal etc. to increase his income. Similarly, another farmer of Barhat village Mr. Pradeep Kumar Maurya got the training of goat rearing at makhdoom during 18-21 Jan 2021 and started his journey in this entrepreneurship by rearing 45 goats of local breeds in his village. He faced number of difficulties in his new startup but with the help of technical guidance of scientists of CIRG he was successful in this endeavor. This year he earned about Rs.45,000/- from his local breed goats. Mr. Sohel Ansari of same village rears goats since 2015 but the main problem he faced over three year was slow increase in the size and weight of goats and insufficient knowledge about feed. Under Biotech KISAN Project he got the training at ICAR-CIRG. After training he developed his own home-made feed for goats through which the weight and size of the goats increased in short duration of time. Twenty-five goats of local breed sold by him since last year on an average rate of Rs. 7000/- each fetched him gross income of Rs. 1, 75,000/- with net profit is 1,00,000/-.

Success Story-2 Entrepreneurship development in Fish Farming

Fish farming involves raising fish commercially in ponds, tanks or enclosures and involves building the earthen, tarpaulin or concrete pond, fertilizing the pond, stocking the fingerlings in good water and feeding the fish till market size. Aspirational district, chandauli is declared as fish-hub for promoting commercial fish farming. This encouraged the farmers of eastern Uttar Pradesh in general and chandauli and surrounding districts in particular to adopt this enterprise. Considering the great perspective, Biotech KISAN since beginning encouraged farmers of Chandauli and Ghazipur for commercial fish farming. As a result, number of farmers of Shivansh Krishak Producer Company Ltd. & Jamdagni Kshetra Farmer Producer Company Ltd. Jogamusahib & Tajpur, Ghazipurhas adopted commercial fish farming. In this continuation, five farmers of Ghazipur district (Mr. Chandan Kashyap, Mr. Ashish Kumar Singh, Mr. Piyush Kumar Singh, Dr. Ram Kumar Rai, Mr. Nandlal Rai) participated in the fish farming training programme at ICAR-NBFGR, Lucknow on 28-30 December,2021 One of our Biotech KISAN fellow farmer, Mr. ChandanKashyap of Sabitapurvillage, Ghazipur district after trainingin fish farming, dug a pond of 1 acre at Jogamusahib village with the help of associated Shivansh Krishak

Producer Company Ltd and reared two species of fish is Rohu and Silver Carp. At initial stages mortality rate was high (20%) but after getting technical advisory from NBFGR Scientists on proper fish health management, in September he sold the entire fish pond for 3 lakh and got a net income of Rs. 1.72 Lakh. Mr. Ram Kumar Rai & Mr. Nandlal rai of Jogamusahib Village have dug the pond in 1 ha land this year and under the technical guidance of NBFGR scientist team he is going to rear Indian breeds i.e., Rohu, Ktala, & Nain in the pond the year. They trained many farmers in the village about fish farming.

Success Story-3 Entrepreneurship development in Mushroom Production

Under Biotech KISAN Project efforts are made to increase the income of small and marginal farmers through capacity building in agriculture and allied field like mushroom production which can easily be managed by women in the village. In order to achieve this, motivated trained women from selected villages viz., Jogamushahib (Ghazipur) started production of mushroom (Oyster and Milky) in their homes and got good returns and family nutrition.

For achieving this Mrs. Shashikala Devi, Poonam Devi & Usha Rai of Jogamusahib, ghazipur received training in mushroom production at ICAR-IIVR, Varanasi and started cultivation of oyster mushroom with 20-25 bags which yielded 30-35 kg and sold mushroom to the people in village and local mandi at the rate Rs.125 /kg.

Mrs. Sashikala Devi, Punam Devi, Usha Rai and 25 female farmer group (Jai Jogir Baba Mahila Samiti) started mushroom production from 80 bags which was sold in the market at the rate of 100-120 kg. Net Profit by different Women's Self-Help Group on 100 bags of Oyster Mushroom was Rs. 11,500. The wastes that come out after mushroom production was used as compost material for the nutri-garden demonstrated at their door-steps.

PART-II

3.1 Aspirational district Chandauli

3.1.1 Crop based interventions

During the year 2020-22,in kharif season demonstrations of 03 improved varieties of paddy *viz.,* DRR 50, Swarna Sub 1 & Pusa Samba-1850 along with pigeon pea (IPA 203 & NDA-2), mungbean (IPM-410-3), urdbean (IPU 02-43) and pearl millet (Pusa Composite - 701 & Hybrid Bio-Seeds 8290) were laid at 143 farmers' field in an area of 26.3 ha in selected clusters. Similarly, during Rabi season demonstrations of wheat (HD 3086, HD 3249, DBW 222 & DBW 187), barley (DWRB-137), chickpea (GNG 2207, Pusa 3043 & JG-14), field pea (IPF 4-9 & IPFD 10-12) and lentil (IPL 316) were conducted at 56 farmers' field in an area of 16.5 ha.The impact of these demonstrations in terms of average yield and net income are presented in figure 11 and figure 12. In Zaid season, moong, sunflower and maize crops has been introduced first time in the selected village which showed a positive feedbacks by the farmers in terms of crops yield and markets price that was fetched by them in the market. The significant results of zaid demonstrations are presented in table 3.

Fig. 11: Average yield increase in field crops from demonstration in compare to farmers' practices

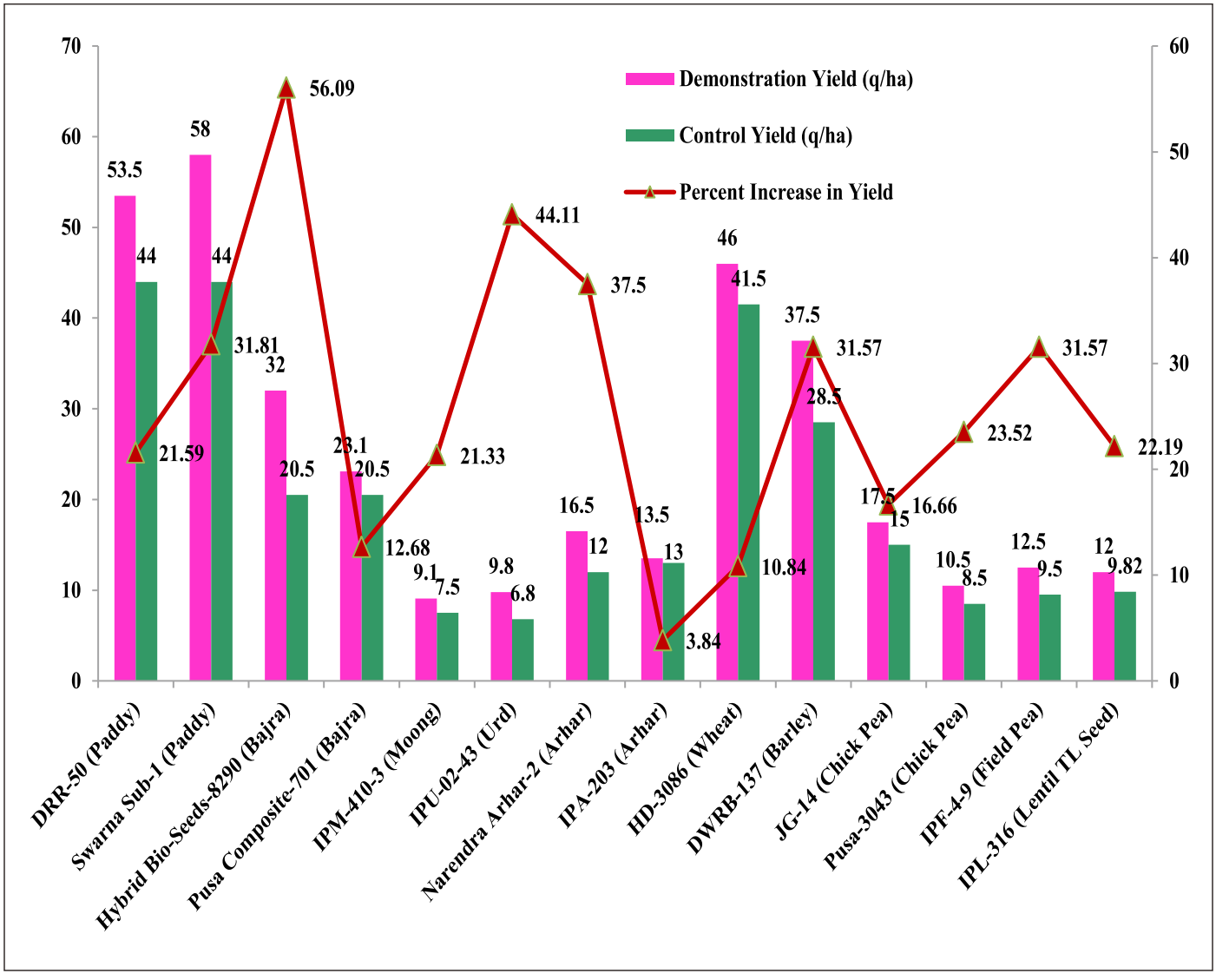


Fig. 12: Average net income increase from demonstration in compare to farmers' practices

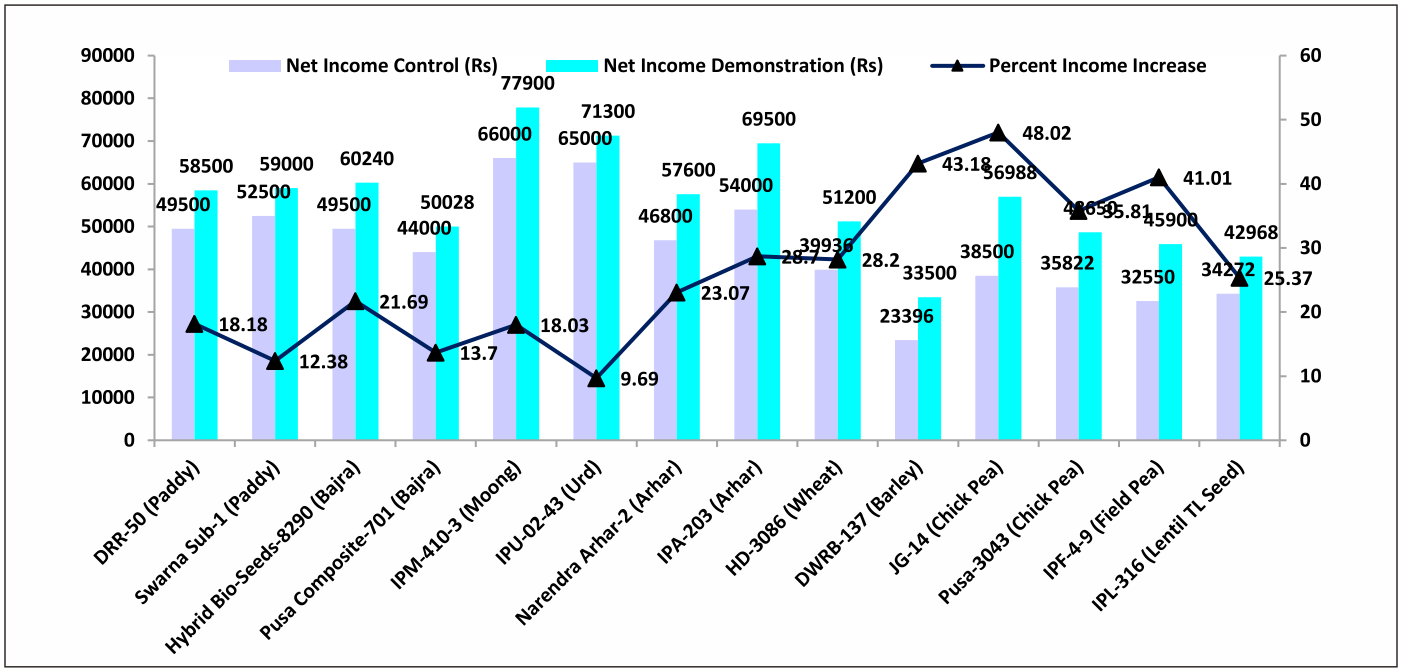


Table 3: Performance of newly introduced crops in zaid season

S.No.	Crop/Varieties	No. of Beneficiaries	Area (ha)	Average Yield (q/ha)	Average Net Income (Rs.)	Benefit-Cost Ratio
1.	Moong (Sikha)	5	1.25	12.35	60358.00	3.06
2.	Moong (Virat)	5	0.75	11.20	52353.20	2.80
3.	Sunflower (PSH 2080)	3	0.75	20.73	95647.95	4.31
5.	Maize Cob (COH 8)	3	0.75	34.58	30042.27	1.86

The performances of a few selected demonstrations are shown here:

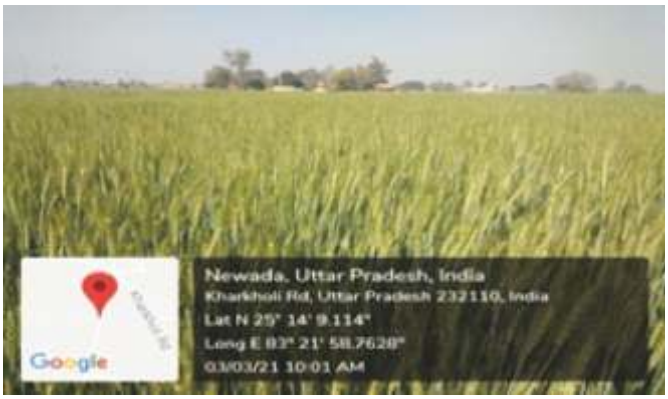
SWARNA SUB-1(Paddy):

Mr.Shivlochan Yadav from Jewariyabad village Chandauli had grown paddy (SSB1) in 1.0 ha area during kharif 2020. He was overwhelmed with the bumper yield of 60 q of his paddy crop as earlier he was harvesting merely 50-52 q from same piece of land. He sold his crop at the rate of Rs. 1864/- per q in the market and hence earned a net income of Rs. 74,410/- compared to average income of Rs. 60,490/- from other variety grown in the area.

Farmers Feedback:

- No lodging even in heavy rainfall and tolerant to pests & diseases.
- Early maturing and high yielding variety than the local or traditional variety.
- Number of tillers is more than local varieties.

HD 3086 (WHEAT): Mr. Gopal Prasad and Mrs. Manju Devi of Imiliya village, Chandauli fetched bumper yield of 48.50 q/ha of her wheat crop (HD 3086) as earlier they were harvesting merely 38 q/ha from same piece of land. They marketed the crop at the rate of Rs. 1930/- per q and hence earned net income of Rs. 89,825/- compared to average income of Rs. 76,025/- from other variety grown in the area.



Mr. Sachidanand Singh from Kharkholi Village, Chandauli grown barley variety DWRB -137 in 0.25 ha area from the seed provided under Biotech KISAN Project after technical guidance provided by project scientists. He got highest yield of 9.75 qt. compare to other variety (7.5q) available in the market. He marketed his produce in Chandauli market at the rate of Rs. 15/kg & got net profit of Rs. 12,700/- with an average gain of 39.81% in demonstrated plot over local practicing variety in the project operational area.

IPM-410-3 (Moong): Highly resistant to mungbean yellow mosaic disease and powdery mildew. During zaid season this variety of moong was first time demonstrated in 1.25 ha of land with 5 beneficiaries in Imiliya, Kharkholi & Jewariyabad villages. The average yield recorded was 12.35 q/ha. The highest yield was in Kharkholi village i.e., 14 q/ha by Mr. Sujit Kumar Singh.

Farmers Feedback:

- High Yielding as compared to local variety.
- Highly resistant to Yellow Mosaic disease and powdery mildew while local variety are susceptible to these diseases.

JG 14(CHICK PEA): During Rabi 2020-21 Gram/Chickpea (JG-14) was demonstrated in 0.73 ha of land with 5 beneficiaries in Imiliya, Kharkholi & Bagahikhurd villages. The average yield recorded was 17.50 q/ha with highest yield in Imiliya village 19.50 q/ha by Mr. Girish Narayan Singh.

3.2 Vegetables based interventions

In vegetables during 2020-22, successful demonstrations of cowpea (Kashi Nidhi), bottle gourd (Kashi Ganga & Kashi Bahar), pumpkin (Kashi Harit), sponge gourd (Kashi Rakshita & Kashi Jyoti), chilli (KashiRatna & Kashi Anmol), brinjal (Kashi Sandesh), cauliflower (Kashi Gobhi 25) , dolichos bean (KashiKhushal) and Okra (Kashi Kranti & Kashi Lalima) developed by ICAR-IIVR, Varanasi were conducted during Kharif season at 155 farmers' field in an area of 18.5 ha in the selected clusters. Similarly during Rabi season demonstrations of high yielding tomato (Kashi Adarsh & Kashi Aman), garden pea (Kashi Udai & Kashi Nandini), french bean (Kashi Sampann), carrot (Kashi Arun) and onion (NHRDF Red 4) were conducted at 72 farmers' field in an area of 16.76 ha. In Zaid 2021, demonstration of cowpea (Kashi Nidhi), bottle gourd (Kashi Ganga), pumpkin (Kashi Harit), sponge gourd (Kashi Rakshita), Kashi Kranti (okra) and Kashi Nutan (cucumber) were conducted at 32 farmers' field in an area of 4.02 ha. Apart from massive vegetable crops demonstrations during different season, 1850 kitchen garden seeds packets were also provided to farmers including COVID-19 migrants for nutritional security by promoting kitchen garden at their door steps. Impact of some major vegetable based interventions demonstrations at farmers' fields in terms of average productivity and net income are presented in figures 13 & 14.

Fig. 13: Crop wise average yield increase from demonstration in compare to farmers' practices

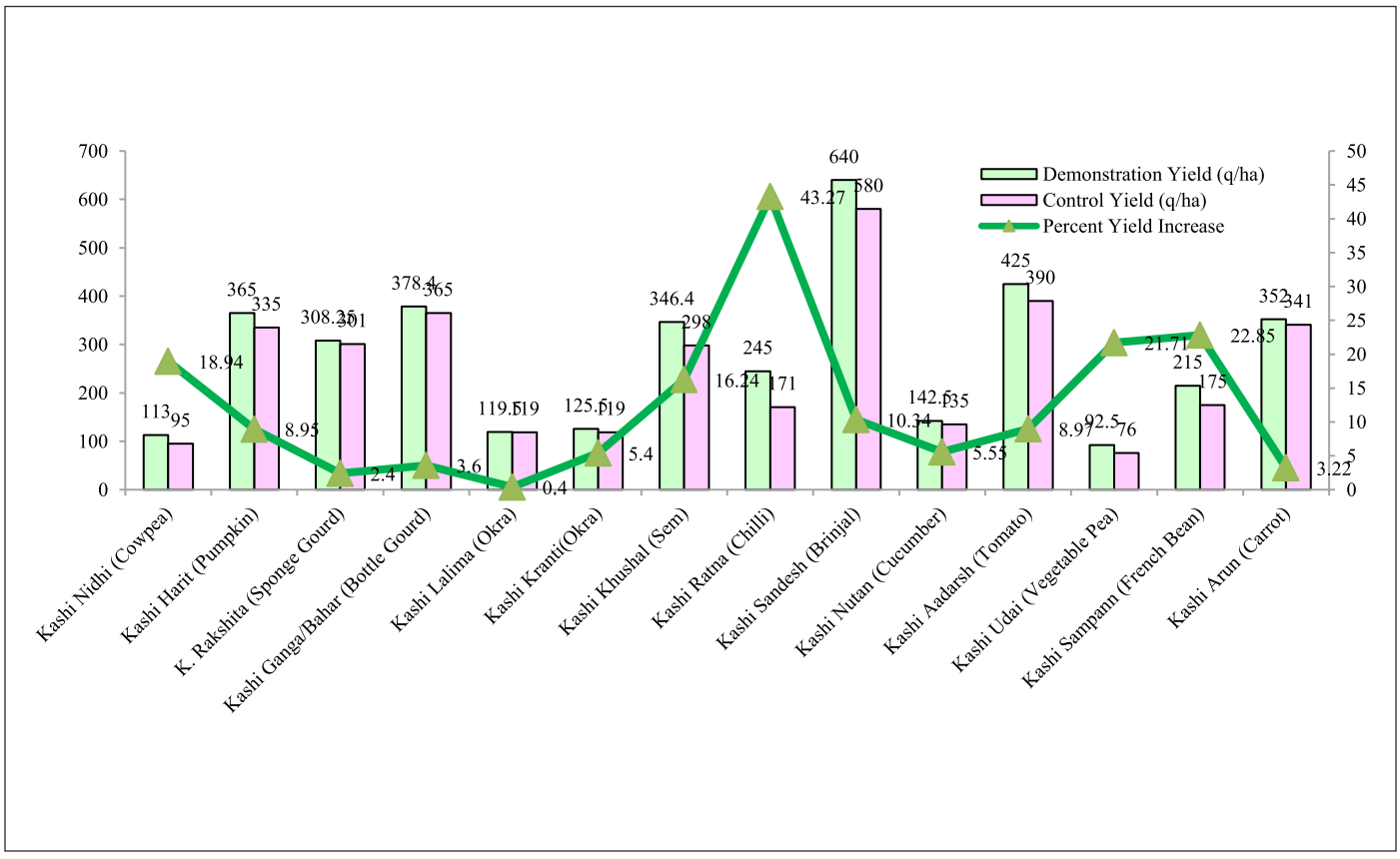
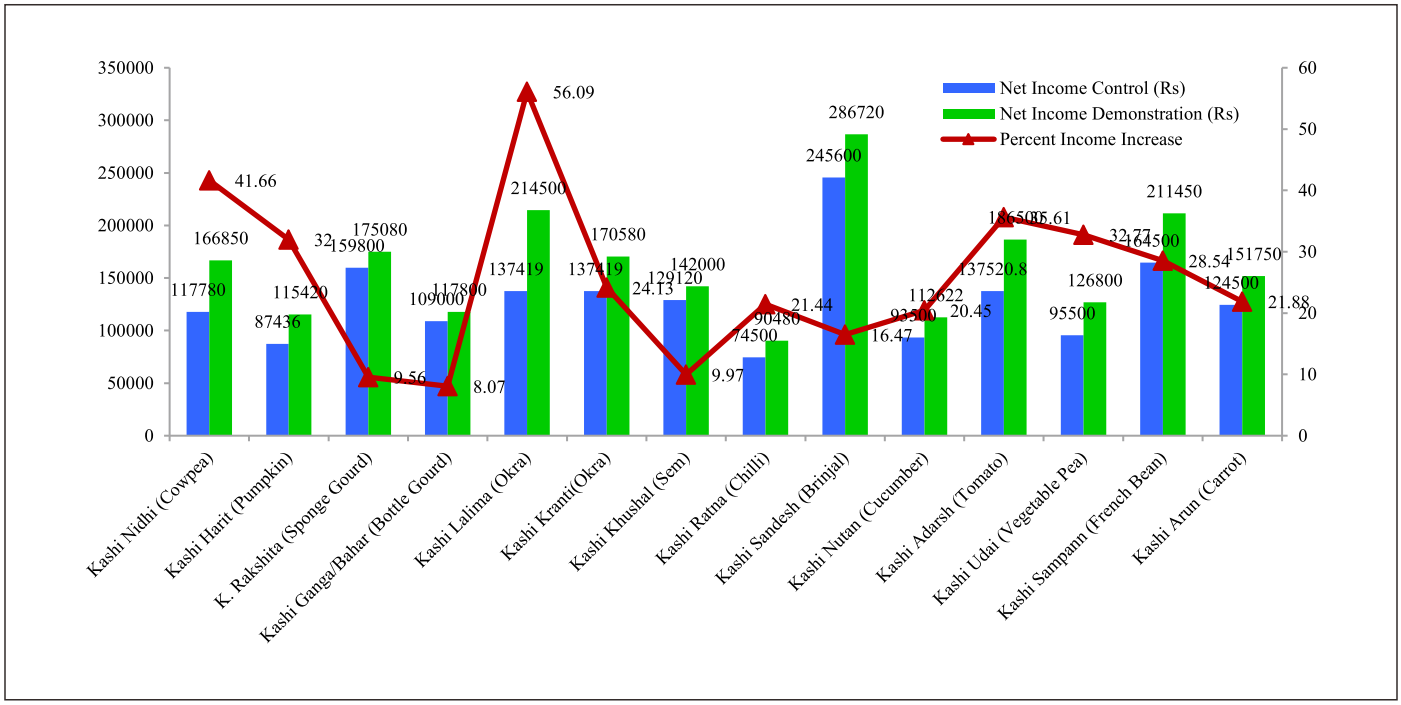


Fig. 14: Crop wise average net income increase from demonstration in compare to farmers' practices



The performance of a few selected demonstrations is shown here:

Kashi Nidhi (Cowpea):

Mr. Chandrika Prasad Maurya and Mr. Ramsudhar Maurya from Kharkholi, Chandauli had grown cowpea (Kashi Nidhi) in their 0.5 ha and 0.25 ha area respectively andharvested 132 q/ha of marketable quality of cowpea during COVID period. They received a better price in the market (Rs.25/- to 28/- per kg) and earned a net profit of Rs. 1,97,734/- per ha. Hence, the average income of these farmers increased by 38.9 % mainly due to high yield, low cost of cultivation and better market price.

Farmers Feedback:

- High yielding Variety than the local variety available in the market.
- Good pod size and keeping quality suitable for distant marketing.
- Can be grown in both Kharif & Zaid seasons.
- Less infestation of pest and diseases compare to other local variety.

Kashi Kranti (Okra):
Demonstrations of this okra variety were conducted at 55 farmer's field in an area of 3.25 ha in Imiliya, Kharkholi & Bagahikhurd villages. The average yield recorded 125.50 q/ha while the highest yield recorded in Kharkholi village i.e. 138.54 q/ha by Mr. Ramdarash Kushwaha.

Mr. Ramdarash Kushwaha from Kharkholi village had grown okra (Kashi Kranti) in 0.25 ha area and harvested 34.63 q of okra fruit. He received a bettermarket price of Rs.16 to 25 /kg and hence earned a net profit of Rs.52,400/-. As the result ofsuccessful adoption of this okra variety Kashi Kranti in the selected village income of farmers increased by 14.3 % in average compared to other practicing varieties.

Kashi Anmol (Chilli): During kharif season, demonstrations of this chilli variety were conducted at 16 farmer's field in an area of 1 ha in Imiliya, Kharkholi & Bagahikhurd villages. The average yield recorded was 245 q/ha while the highest yield was in Kharkholi village i.e. 265 q/ha by Mr. Lalbihari Maurya. Due to synchronous fruiting in nature 43% of growers cultivated late wheat after chilli.

Farmers Feedback:

- High Yielding variety and Easy to transport even for distant market.
- Synchronous fruiting during December helped in fetching better market price.

3.1.3 Seed Hub
Seed is the basic input in Agriculture and good quality seed is the primary requisite for obtaining optimum crop stand, healthy crop and productivity. Every season farmers are running in search of good quality seed and spending lots of money. However, in view of large gap between production and supply, some of the farmers are resorting to locally available poor quality seed thus fetching less productivity and income. Hence, adoption of on-farm seed production under the supervision of scientists through farmer participatory approach can improve farmers' income besides ensuring the availability of good quality seed. To achieve this objective of developing a seed hub under Biotech KISAN, Breeder Seed of Cereals (Wheat and Barley) and Pulses (Chick pea and lentil) were provided to Farmer Producer

Companies of Chandauli, Ghazipur & Sonbhadra for producing foundation and Certified Seed to be used by other farmers in coming season. Attempt is to make these villages self-sufficient in quality seeds of different crops including vegetables.

Seed Production of Wheat (HD 3086) : Wheat variety HD 3086 (Pusa Gautami) of ICAR-IARI, New Delhi suitable for irrigated timely sown conditions showed an average yield of 54.56 q/hectare with a genetic potential of 71.1 q/ha. This variety matures on an average of 143 days after sowing and showed a very high level of resistance against stripe rust and leaf rust.

During Rabi season in 2020-21, Breeder Seed of wheat (HD-3086) was grown for Foundation Seed production in 3.75 ha land of Mr. Ajay Kumar Singh of Imiliya village associated with Ishani Farmers Producer Company Ltd. He produced 188 q of quality Foundation Seed.

Seed Production of Wheat (HD 3249): HD 3249, a bread wheat variety was developed by ICAR-Indian Agricultural Research Institute, New Delhi for timely sown irrigated conditions of North Eastern Plains Zone (NEPZ) of the country. It has semi-spreading growth habit, dark green foliage colour, droopy flag leaf, non-pigmented auricle, medium waxiness on leaf sheath & ears, possesses medium long straight peduncle with medium dense, tapering ear heads, light brown awns with plant height of 95cm. It took around 77-80 days for 50% heading and 140- 145 days for maturity. It was found to be highly resistant to wheat blast and showed resistant reaction for leaf and brown rusts. It was also found to be resistant to Karnal bunt, powdery mildew, flag smut and moderately resistant to leaf blight. Its grain contained protein was 10.67%.

During 2020-21, Breeder Seed of thisvariety was provided for Foundation Seed production in an area of 1.0 ha to Mr. Ajay Kumar Singh of Imiliya village who produced 52.7 q of good quality Foundation Seed. Foundation Seed of both these varities was distributed among FPO members during November 2021.

Seed Production of Paddy (MTU 7029 & Pusa Sambha 1850)

Paddy variety MTU 7029 (Swarna), Special features are: duration 150-155 days, average yield: 55-65 q/ha, short bold, brown husk grains, semi dwarf plant height with dark green foliage, profuse tillering having resistance to BLB, developed by ICAR-APRRI, Andhra Pradesh.

Pusa Samba 1850 is a MAS derived blast resistant near-isogenic line of BPT 5204 (Samba Mahsuri) which possesses three genes governing blast resistance namely, Pi54, Pi1 and Pita, with seed to seed maturity of 140-145 days and average yield of 4.77 t/ha with a potential yield of 6.6 q/ha.

Breeder Seed of MTU 7029 & Pusa Sambha 1850 was provided to Mr. Ajay Kumar Singh of Village Imiliya for Foundation Seed production in 7 ha & 2.5 ha area respectively. He produced 500 q & 150q of Foundation Seed of MTU 7029 & Pusa Sambha 1850 respectively.

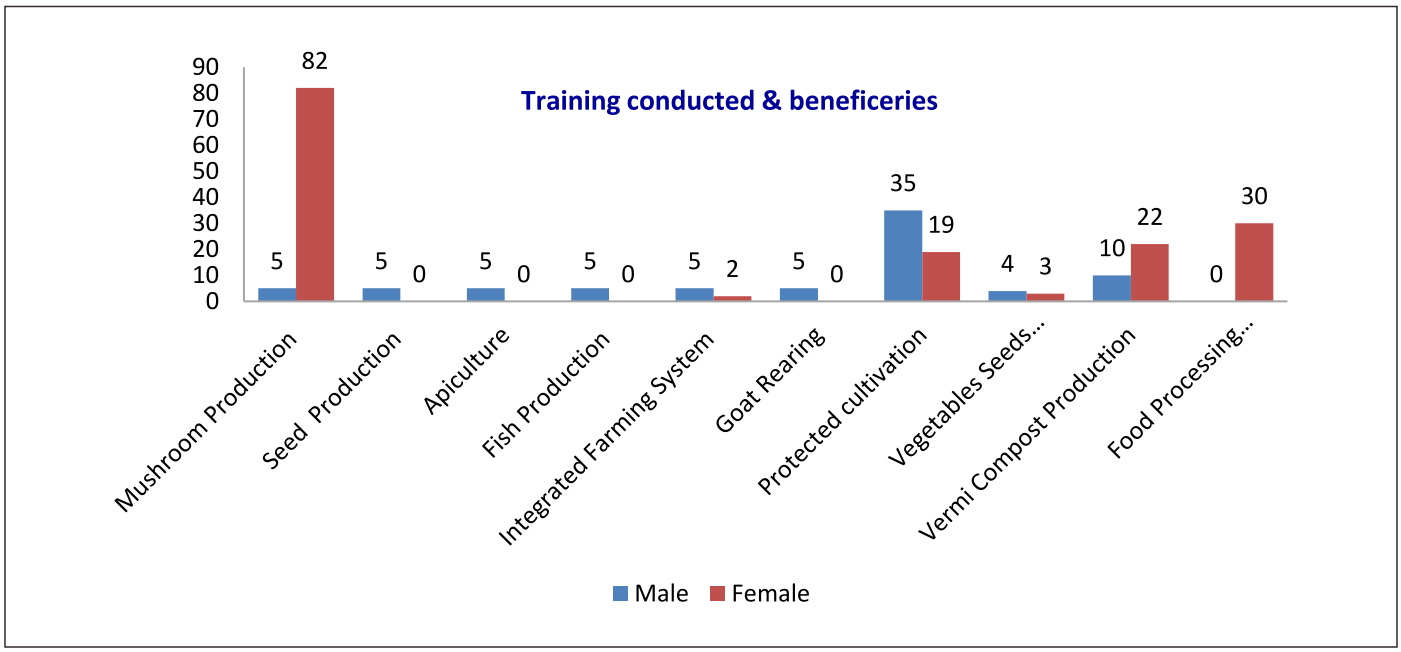
Seed Production of Wheat (DBW 222): DBW222, a spring wheat variety with semi-erect habit, flowers in around 95 days, matures in 143 dayswith potential yield of 82.1 q/ha. The variety has dark green foliage with waxiness. The ears are tapering and white in colour with medium density, having medium length awns that are white in colour and bent peduncle. The non-pubescent glumes have elevated shoulder shape with very long beak lengths, amber coloured grains, oblong shape, hard texture and bold grains.

In 2021-22, Breeder Seeds of wheat (DBW 222) has been grown for Foundation Seed production in an area of 1 ha by of Mr. Ajay Kumar Singh of Imiliya Village.

3.1.4 Capacity building and success story for entrepreneurship development

Entrepreneurship development is mostly focusing on knowledge and skill development through various capacity building programmes like training, interaction meetings, kisan gosthies, kisan melas etc. Further beneficiaries are also promoted for adopting the proven technologies for developing start-ups and also act as master trainers in the village for disseminating of technology among other rural youth/farm women. So far, apart from 12 Kisan Gosthies in different villages and 1 farmer fair at Imiliya, a total of 15 training programmes (4 on mushroom production, 3 on protected cultivation and 1 each on seed production, apiculture, fish production, food processing & production, vegetable seed production, vermi compost production, goat rearing & integrated farming system) were successfully conducted for 79 male and 158 female farmers (Figure 15).

Fig. 15. Capacity Building programs in Chandauli district.



Farmers Fair: Under DBT sponsored Biotech KISAN Project a 'Farmers Fair' was organized at Imiliya village, Chandauli on 31st October 2021. Dr. A. K. Singh, DDG (Agril. Extension) ICAR, New Delhi was the chief guest on this occasion. He advised the farmers for formation of FPOs/FIGs along withcrop diversification by incorporating vegetable crops, fish farming, mushroom production, animal husbandry etc in their traditional farming. Prof. Panjab Singh, President, FAARD Foundation and facilitator of this project encouraged the farmers for developing FPOs and explained how they could be able to harness its benefits by disposing their huge agricultural produce.

More than 550 farmers from aspirational districts Chandauli had participated in this farmer's fair and also shared their experience and constraints faced in farming. Further, along with ICAR-IIVR, 10 private and government organizations demonstrated their technologies through displaying their informative stalls. On this occasion 10 Biotech KISAN Fellowship of worth Rs. 10,000/- each were awarded to 04 men and 06 women farmers from aspirational districts for their significant contribution in agriculture s for livelihood security under this project.

Success Story-1 Entrepreneurship development in Goatery

Goat is very important livestock for small, marginal and land less farmers as a source of their subsidiary income due to their ability to survive and produce under extreme climatic and management conditions. It assures income to rural farmers with low input cost. A good population of non-descript local goat is present in this area but due to poor performance the income from the goat production is inadequate. Black Bangal and Barbari are famous breeds known for superior meat quality, best quality skin and sexual maturity and very good adaptability.Landless farmers from Imiliya village namely Mr. Devendra Kumar Gautam, Mr. Gopal Prashad and Mr. Ajay Kumar Gautam of Chandauli district could manage to rear the goats without any commercial feed and the number of goats increase up to 14 in one and half years. Under Biotech-KISAN Project they got the training at ICAR-CIRG, Makhdoom during 18-21 January, 2021. They are now commercially engaged in the goat farming and getting the profit from it with less investment. They sold goat milk and goat for meat and earned the average profit of Rs. 40,000/- per annum. Now they are happy that they started the rearing of goat and getting reasonable income from it without much investment.

Success Story-2 Entrepreneurship development in Fish Farming

Fish farming involves raising fish commercially in ponds, tanks or enclosures and involves building the earthen, tarpaulin or concrete pond, fertilizing the pond, stocking the fingerlings in good water and feeding the fish till market size. Aspirational district, Chandauli is declared as Fish-Hub for promoting commercial fish farming. This encouraged the farmers of eastern Uttar Pradesh in general and Chandauli and surrounding districts in particular to adopt this enterprise.

Considering the great perspective, a number of farmers (Mr. Mrityunjay Singh farmers of Ishani Farmers Producer Company Ltd., Mr. Dharmendra Singh, Mr. Ehsan Ali and Gaurav Singh and Mr. Akhilesh Kumar) have adopted commercial fish farming after training in fish farming at NBFGR, Lucknow during 28-31 December, 2020. They dug ponds in 5 acres at Imiliya village and reared two Species of fish i.e., Rohu and Silver Carp. At initial stage mortality rate was high (20%) but after getting technical advisory from NBFGR scientists on proper fish health management, they have improved. Apart from their business, they are also providing training to other rural youth in the village. They earned average profit of Rs.2,76,000/- in a year.

Success Story-3 Entrepreneurship development in Mushroom Production

Under Biotech KISAN Project Mrs. Pooja Pandey from Bagahi-Khurd, Mrs. Parmila Devi, Ms. Kalawati Devi, Ms. Renu Devi from Kharkholi, Barahani Block, Chandauli district had got training on "Women Mushroom Production" during 10-11 January 2021 at Kharkholi and they started oyster mushroom production of 200 bags and got production of 170 kg of oyster mushroom, sold in local market at the rate of Rs. 120/kg (Rs.20400/-). Total cost of cultivation was Rs.6000/- and earned a net profit of Rs. 14400/- within 30 to 35 days which helped a lot to continue their children education and livelihood security. After seeing the success of these women other women of Bagahi-Khurd and Kharkholi village have also started growing oyster mushroom with the creation of Self Help Group of women (10-12 womens).

Success Story-4 | Entrepreneurship development in Seeds Processing

With the efforts of FAARD Foundation, Underthe Drishti Pariyojana seed processing Unit has been installed in Imiliya village, Chandauli at Ishani Agro Farmer Producer Company. The total cost of processing unit is 62 lakhs along with subsidy of 60 lakhs. The processing unit has been installed in the area of 600 square meters. The total capacity of the processing unit is about 2 tonne per hour of seeds and the cost of processing of seed is Rs. 2 to 2.5 /- per kg of seed. Farmers will get high quality seed at their nearest place. Raw material (Seeds) for processing will be available from the nearby villages. With the help of processing unit there will be low cost of seed processing to the farmers as they will savepetrol, diesel and time while traveling to other places for seed processing.

Success Story-5 | Protected cultivation under Polyhouse

Under the Biotech-KISAN Project, naturally ventilated polyhouse has been established in the aspirational district Chandauli at the farm of Mr. Lalbihari Maurya of Kharkholi village during 2021. In a short span of time, Mr. Maurya raised healthy nursery of brinjal, chilli, capsicum and tomato for open field cultivation which not only saved his time but also helped in catching the early market for their produce and fetched higher profit. Mr. Maurya responded that apart, from early crop, there are less infestation of diseases and insects in this polyhouse. Mr. Lal Bihari Maurya also cultivated the coriander (Ganga) and fetched 1.2 q fresh leaves and sold it @ Rs. 30-35/kg and gain net return of Rs.3500/-. After cucumber crop, during Sept-Oct 2021, he cultivated hybrid capsicum and tomato for better return.

PART-III

4.1 Aspirational district Sonbhadra

4.1.1 Crop based interventions

During 2020-22, in kharif season, demonstrations of 3 improved varieties of Paddy *viz.,* DRR 50, Swarna Sub 1 & Pusa Samba 1850 along with pigeon pea (IPA-203, P-922 & NDA-2), mungbean (IPM-410-3), urdbean (IPU 02-43) were laid at 165 farmers' field in an area of 31.31 ha in selected clusters. Similarly, during rabi season demonstrations of wheat (HD 3086, HD 3249, DBW 187 & DBW 222), barley (DWRB-137), chickpea (Pusa 3043, GNG 2207 & JG-14), field pea (IPF 4-9 & IPFD 10-12) and lentil (IPL 316 & IPL 220) were conducted at 57 farmers' field in an area of 15.2 ha.The impact of these demonstrations in terms of yield and net income is presented in figure 16 & 17. In Zaid season, moong, sunflower and maize crops has been introduced first time in the selected village as these crops were not grown by the farmers in zaid season fetched a significant gain in crops yield and net income. The results of these newly introduced crops are presented in table 4.

Fig. 16: Average yield increase in field crops from demonstration in compare to farmers' practices

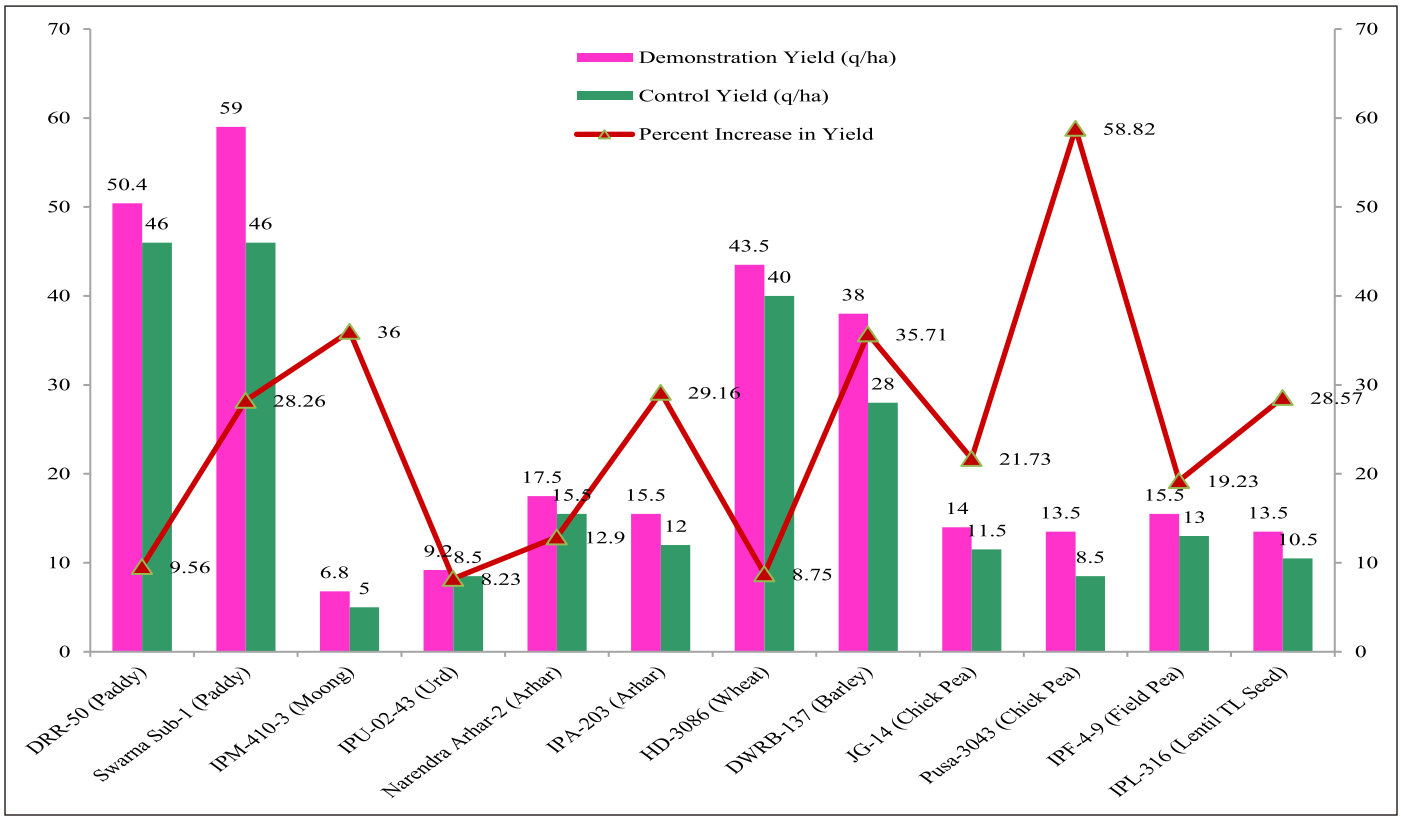


Fig. 17: Average net income increase from demonstration in compare to farmers' practices

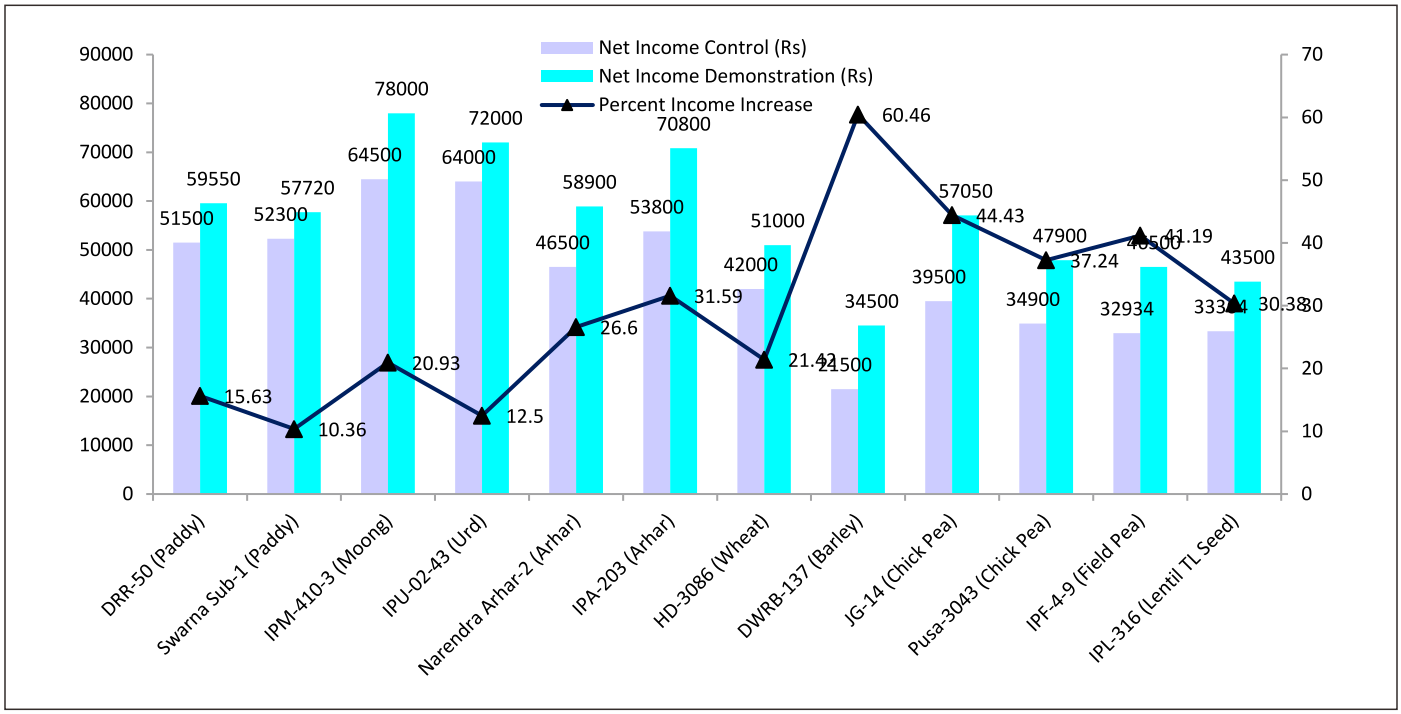


Table 4: Performance of newly introduced crops in zaid season

S.No.	Crop/Varieties	No. of Beneficiaries	Area (ha)	Average Yield (q/ha)	Average Net Income (Rs.)	Benefit-Cost Ratio
1.	Moong (Sikha)	05	1.25	12.68	62987.00	2.15
2.	Moong (Virat)	05	1.25	11.57	55455.00	1.92
3.	Sunflower (PSH 2080)	04	0.50	23.95	97461.87	3.00
4.	Maize Cob (COH 8)	04	1.00	60.50	51762.50	1.33

The performances of a few selected demonstrations are shown here:

SWARNA SUB-1 (Paddy):

Each Mr. Vidyapati from Gaurahi and Mr. Vikas Singh from Hona village, Sonbhadra had cultivated paddy (SSB1) in 1.0 ha area during kharif 2020. They were overwhelmed with the bumper yield of 64 q of his paddy crop as earlier they were harvesting merely 50-52 q from same piece of land. They sold the crop at the rate of Rs. 1864/- per q in the market and hence earned a net income of Rs. 79,410/- compared to average income of Rs. 62,490/- from other variety grown in the area.

Farmers Feedback:

- No lodging even in heavy rainfall and tolerant to pests & diseases.
- Early maturing and high yielding variety than the local or traditional variety.
- Number of tillers is more than local varieties.

Pusa Samba 1850(Paddy):

During kharif 2021, blast resistant variety Pusa Samba-1850 in paddy was demonstrated in Gaurahi, Hona & Bat villages at 9 farmers' field in an area of 2.5 ha fetched an average yield of 55.58 q/ha. The highest yield of this variety was recorded as 58 q/ha by Mr. Loknath of Bat village.

Mr. Loknath from Bat and Mr. Rajnarayan from Gaurahi village Sonbhadra followed rice-wheat cropping system since long back and use to harvest 11-12 q of paddy from their 0.25 ha area. During 2021 demonstration of paddy (Pusa Samba 1850) were conducted in the same land fetched the yield of 14 q with net income of Rs.16,560/-compared to average income of Rs.11,340/- from other varietygrown in the area.

Farmers Feedback:

- No lodging even in heavy rainfall and tolerant to pests & diseases.
- Early maturing and high yielding variety than the local or traditional variety.
- Number of tillers is more than local varieties.

HD 3086 (Wheat): Shown a very high level of resistance against stripe rust and leaf rust. During rabi season in 2020-21, wheat (HD-3086) had been demonstrated at Gaurahi, Hona & Hinauti village in 1.25 ha area at 5 farmers' field which fetched an average yield of 43.50 q/ha. The highest yield recorded was 47q/ha by Ms. Usha Devi of Gaurahi village.

Farmers Feedback:

- This variety possesses higher grain yield as well as resistance to major disease.
- Grain quality is very good with bread quality is very soft when cooked.
- Farmer replace their old varieties with HD 3086 due to better yield and easy marketing.

Ms. Usha Devi of Gaurahi Village, Sonbhadra fetched bumper yield of 47 q/ha of her wheat crop (HD 3086) as earlier she was harvesting merely 39 q/ha from same piece of land. She marketed her crop at the rate of Rs. 1930/q and hence earned net income of Rs. 92,825/- compared to average income of Rs. 77,025/- from other variety grown in the area.

PSH 2080 (Sunflower):

Mr. Radhe Shayam of Gaurahi Village, Sonbhadra had grown Sunflower (PSH-2080) in 0.25 ha. He also cultivated the sunflower first time and under the technical guidance he got the yield of 6.37 q. He sold in the market at the rate of Rs 6015/q and got the profit of Rs.26,386/-. As the result of successful demonstration of sunflower in the village others farmers have also shown the interest of growing sunflower from the next season.

Farmers Feedback:

- Head size very good due to which farmers got higher yield.
- Sunflower cultivation gave higher income as compare to other crop.

IPA-203 (Pigeon Pea): During kharif season in 2020, demonstrations of pigeon pea (IPA-203) were conducted at 34 farmer's field in an area of 3 ha in Gaurahi, Bat & Hona villages. The average yield was recorded 15.50 q/ha while highest yield fetched 18 q/ha by Mr. Shiv Kumar of Hona Village.

4.1.2 Vegetables based interventions

In vegetables during Kharif season, successful demonstrations of cowpea (Kashi Nidhi), bottle gourd (Kashi Ganga), pumpkin (Kashi Harit), sponge gourd (Kashi Rakshita), chilli (Kashi Anmol & Kashi Ratna), brinjal (Kashi Sandesh), cauliflower (Kashi Gobhi 25), dolichos bean (Kashi Khushal) and okra (Kashi Kranti & Kashi Lalima) developed by ICAR-IIVR, Varanasi were conducted at 540 farmers' field in an area of 33.06 ha in the selected clusters. Similarly, during Rabi season demonstrations of high yielding tomato (Kashi Aman & Kashi Adarsh), garden pea (Kashi Udai, Kashi Mukti & Kashi Agati), french bean (Kashi Sampann) and carrot (Kashi Arun) were conducted at 56 farmers' field in an area of 7.25 ha. In Zaid 2021, demonstration of cowpea (Kashi Nidhi), bottle gourd (Kashi Ganga), pumpkin (Kashi Harit), sponge gourd (Kashi Rakshita), Kashi Kranti (okra) and Kashi Nutan (cucumber) were conducted at 30 farmers' field in an area of 3.68 ha. The results of these demonstrations are presented in figure 18 and 19 in terms of average yield and net income respectively. Further, apart from massive vegetable crops demonstrations in the selected region, to address the nutritional security aspects of rural households, 1850 kitchen garden seeds packets were also provided to farmers including COVID-19 migrants for availability of fresh vegetables for family consumption.

Fig. 18: Crop wise average yield increase from demonstration in compare to farmers' practices

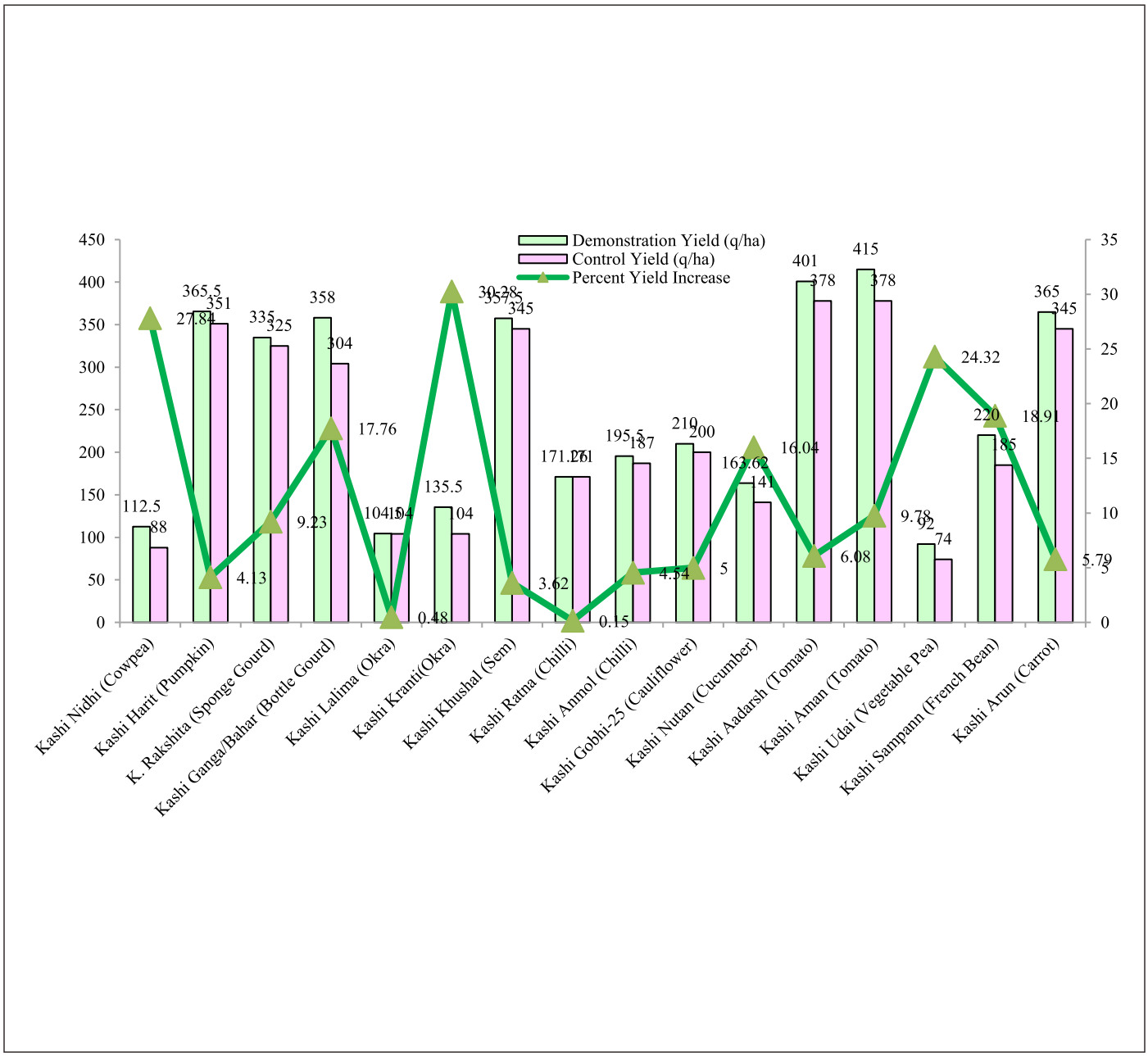
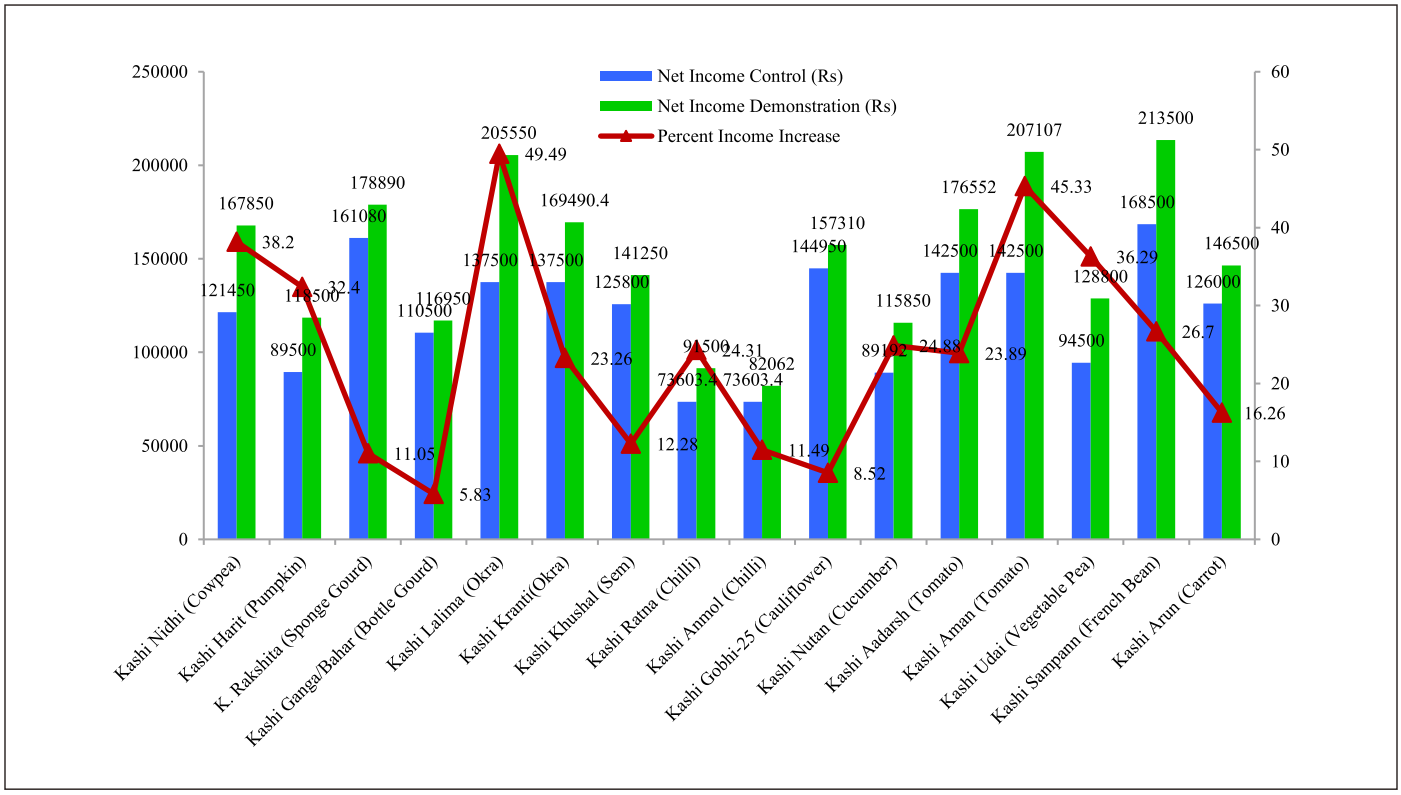


Fig. 19: Crop wise average net income increase from demonstration in compare to farmers' practices



The performances of a few selected demonstrations are shown here:

Kashi Ganga (Bottle Gourd):

Mr. Babulal from Gaurhai village, Sonbhadra had grown bottle gourd (Kashi Ganga) in 0.25 ha and harvested 118 q which is 45.23 % higher compared to other varieties grown by farmers. He received priceof Rs. 700 to 1000/-per q local market and earned a net profit of Rs.72, 000/-. As the result of this successful demonstration the average income of farmers in the village increased by 16 %, mainly due to higher yielding and better quality.

Farmers Feedback:

- Shape & Size of the fruit were good.
- Got the better price in the market due to marketable size and keeping quality.
- High yielding variety compare to other local varieties.

Kashi Anmol (Chilli):

Mr. Vidyapati from Gaurahi, Sonbhadra had grown chilli (Kashi Anmol) in 0.25 ha areaand harvested 53.75 q of green chilli and received a competitive price of Rs.14 to 22/- per kg and hence earned a net profit of Rs. 85,280/-. As the result of successful demonstration of chilli (Kashi Anmol) in the selected village the average income of farmers increased by 16.5 % in compared to other practicing varieties due to high yielding, and better marketable quality.

Mrs. Subhagi Devi from Gaurahi, Sonbhadra planted chilli (Kashi Anmol) on 0.25 ha area in kharif 2021 and harvested 1080 kg of green chilli and received a better price in the market (Rs.10-24/-per kg) and earned a net profit of Rs.13,340/-. As the result the total area in the village under this crop in increased by 8.2 %. The reasons for increase are high yield, low cost of cultivation and better market price.

Farmers Feedback:

- High Yielding variety and Easy to transport even for distant market.
- Synchronous fruiting during December helped in fetching better market price.
- Less infestation of pest and diseases compare to other local variety.

Kashi Kranti (Okra): During 2020-21, demonstrations of this okra variety were conducted at 40 farmer's field in an area of 2.23 ha in Gaurahi & Bat villages. The average yield recorded was 132.75 q/ha, while the highest yield fetched by Bhagawat Singh of Gaurhai village was 148.5 q/ha.

4.1.3 Seed Hub

Seed is the basic input in Agriculture and good quality seed is the primary requisite for obtaining optimum crop stand, healthy crop and productivity. Every season farmers are running in search of good quality seed and spending lots of money. However, in view of large gap between production and supply, some of the farmers are resorting to locally available poor quality seed thus fetching less productivity and income. Hence, adoption of on-farm seed production under the supervision of scientists through farmer participatory approach can improve farmers' income besides ensuring the availability of good quality seed. To achieve this objective of developing a seed hub under Biotech KISAN, breeder seeds of cereals (wheat and barley) and pulses (chick pea and lentil) were provided to Farmer Producer Companies of Sonbhadra for producing foundation and certified Seeds to be used by other farmers in coming season. Attempt is to make these villages self-sufficient in quality seeds of different crops including vegetables.

Seed Production of Lentil (IPL 220): This isbio-fortified variety having higher Fe (73-114 mg/kg), Zn (51-63 kg/ha), Se (630 microgram/kg), protein (23.89%) and yield potential (14-16q/ha) .This variety is resistant to major diseases including rust, fusarium wilt and stemphylium blight.

Mr. Vinod Kumar Pandey of Siddhi village associated with Uma Maheshwar Farmers Producer Company Limited grew breeder seed of IPL 220 in 1 ha area and produced 10 q of Foundation Seed which will be further multiplied for Certified Seed production during next Rabi season and distributed amongst farmers.

Seed Production of Wheat (HD 3086) : Wheat variety HD 3086 (Pusa Gautami) of ICAR-IARI, New Delhi suitable for irrigated timely sown conditions showed an average yield of 54.56 q/hectare with a genetic potential of 71.1 q/ha. This variety matures on an average of 143 days after sowing and showed a very high level of resistance against stripe rust and leaf rust.

During Rabi season in 2020-21 Breeder Seed of wheat (HD-3086) was grown in an area of 5 ha land by Mr. Vinod Kumar Pandey of Siddhi village for Foundation Seed production. He produced 262 q of foundation seeds which will be further multiplied for Certified Seed production during next Rabi season and distributed amongst farmers.

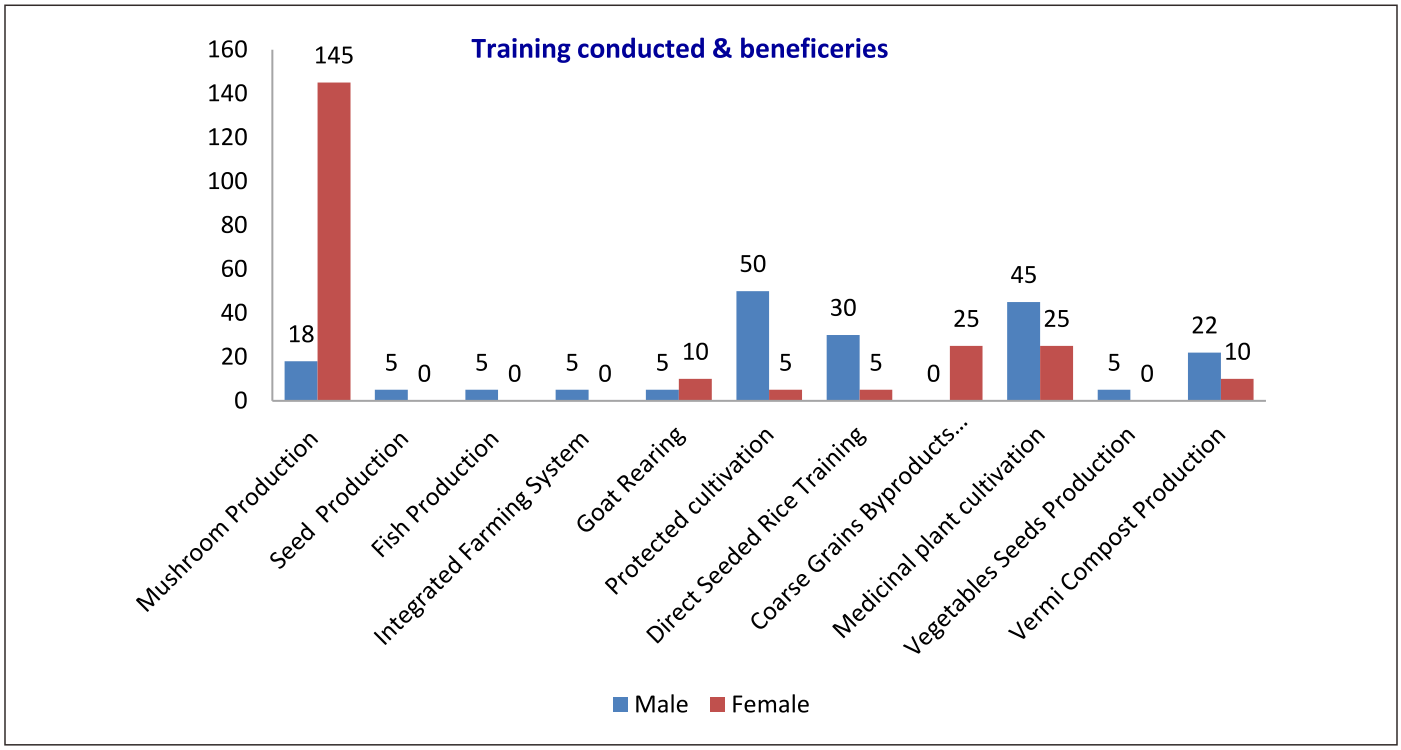
Seed Production of Barley (DWRB 137): Barley DWRB 137 is a six row barley variety, for irrigated timely sown conditions of North Eastern Plains Zone. DWRB-137 showed an average grain yield of 37.93q/ha. This variety exhibited overall good malting quality with 90 per cent bold grains, grain beta glucan of 4.9 %, malt yield of 87.1 %, and diastatic power of 102 0L in six row segment. The variety has erect growth habit, short plant height, erect flag leaf and compact plant type with dense and pale green spikes during heading.

In 2020-21, during Rabi season breeder seeds of barley (DWRB-137) was grown for Foundation Seed production in an area of 1.0 ha land by Mr. Vinod Kumar Pandey. He produced 54.0 q of Foundation Seed which will be further multiplied for Certified Seed production during next Rabi season and distributed amongst farmers.

4.1.4 Capacity building and success story for entrepreneurship development

Entrepreneurship development is mostly focusing on knowledge and skill development through various capacities building programme like training, interaction meetings, kisan gosthies, kisan melas etc. Further beneficiaries are also advised for adopting the learnt technologies for developing start-ups and also act as master trainers in the village for disseminating of technology among other rural youth/farm women. So far, apart from 5 kisan gosthies in different villages and 1 kisan mela at ICAR-IIVR, a total of 17 training programme (5 on mushroom production, 3 on protected cultivation and 1 each on seed production, fish production, direct seeded rice, goat rearing, integrated farming, medicinal plant cultivation, vermin compost production, vegetable seeds production and coarse grains byproducts production system) were successfully conducted for 190 male and 225 female farmers (Figure 20).

Fig. 20. Capacity building programs in Sonbhadra districts.



Farmers Fair: A 'Farmers Fair' was organized at Sri Dayashankar Singh Kushwaha Degree College, Lohara, Sonbhadra on 3rd April 2022. Chief Guest on this occasion, Dr. Mohd. Aslam, Consultant & Former Advisor, DBT, Govt. of India had emphasized the farmers for agricultural diversification by incorporating horticultural crops, organic farming, fish farming, mushroom production, animal husbandry etc in their traditional rice-wheat farming. Prof. Panjab Singh, President, FAARD Foundation and facilitator of this project encouraged the farmers for developing FPOs and explained how they could be able to harness its benefits by disposing their huge agricultural produce. Prof. Singh welcomes the

dignitries viz., Dr. T.K. Behera, Director, ICAR-IIVR, Varanasi and Dr. Sudhanshu Singh, Director, IRRI, Varanasi during the occasion.

About 550 farmers from Varanasi and Sonbhadra districts had participated in this farmer's fair and shared their successful experience and problems faced in farming. Furthermore, along with FAARD & ICAR-IIVR, 14 private and government organizations demonstrated their technologies in this fair. On this occasion 20 Biotech KISAN Fellowship of worth Rs. 10000/- each were awarded to the selected farmers (9 Men and 11 Women) from the four project operational districts for their significant contribution in transfer of improved recommended agriculture technologies to ultimate users for livelihood security.


4.1.5 Kisan Gosthi, Field Visitand Success Stories

Under DBT sponsored Biotech KISAN Project a kisan mela andfield visit was organized at Gaurahi & Siddhi Village, Sonbhadra on 15th November 2021. Dr. H. S. Gupta (Chairman PSMC) and the chief guest of this occasion advised the farmers for agricultural diversification by incorporating improved crop varieties, organic farming, fish farming, mushroom production, animal husbandry etc.

Prof. Panjab Singh, President, FAARD Foundation and facilitator of this project encouraged the farmers for developing FPOs and explained how they could be able to harness its benefits by disposing their huge agricultural produce.

Success Story-1 Entrepreneurship development in Goatery

Mr. Vikash Kumar Singh (Hona Village), Mr. Krishna Kumar (Rampur village) and Mr. Sambhu (Hona village), sonbhadra got the training on commercial goat farming organized under Biotech KISAN Project, at ICAR-CIRG, Makhdoom during 18-21 Jan 2021 and strengthened their goat farming in the village after training with the help of mentors from ICAR-CIRG and became the master trainers for the others in the village and nearby villages.

Mr. Vikash Singh gave the training on every aspect of goat rearing to Ms. Chandrawati Devi resident of village- Gaurahi, who reared 15 goats of Barbari breed (dual purpose breed) and some desi breed of goats under stall-fed intensive system of management. Initially she faced a number of problems like high cost of production, mortality and low price of the produce but later this year after training and proper technical guidance, she received from the Mr. Vikash Singh on health management of goats, she has improved and got the profit of Rs.40,000/- to Rs.50000/- yearly by selling the goat milk and goat meat.

Success Story-2 | Entrepreneurship development in Mushroom Production

Mrs. Butka Devi, a tribal woman of selected village Siddhi, received training in mushroom production under the project. After training, women farmers started oyster mushroom production with 20-25 bags which yielded 30-35 kg and gave mushroom to the people of the villages to eat and sold 25 kg at the rate of Rs 100 per/kg and got the profit of Rs. 2100. Tribal women of village Siddhi have started production by forming Jagriti Mahila Group (20 women) and Paramhans Kisan Sewa Samiti, Gaurahi village (12 members) producing mushroom on 200 bags. This production is being sold in the market at the rate of 100-120/- per kg. Net profit by different Women's Self-Help Group on 100 bags of oyster mushroom was Rs. 11,500.The waste that came out from oyster mushroom production was used as composting for the nutritional garden demonstrated at their door-steps.

Success Story-3 | Entrepreneurship development in Fish Farming

Fish farming involves raising fish commercially in ponds, tanks or enclosures and involves building the earthen, tarpaulin or concrete pond, fertilizing the pond, stocking the fingerlings in good water and feeding the fish till market size. Mr. Vinod Kumar Pandey (Siddhi Village), Mr. Baba (Siddhi village), Mr. Nageswar (Gaurahi village) Mr. Chhotelal (Bat village) an advanced farmer of village Siddhi, were already doing fisheries, but due to lack of training, the profits in fisheries was very low. Under the Biotech-KISAN project they received training at National Bureau of Fish Genetic Resources (NBFGR) during 26-30 Dec, 2020. After the training they started the fish farming due to which their production grew rapidly and 18 q of large size fish was obtained from their pond in an area of 0.12 ha,which they sold @ Rs. 120-130/ kg and earned a profit of Rs. 1,10,000/-.

Success Story-3 | Protected cultivation under Polyhouse

Under the Biotech-KISAN Project, naturally ventilated polyhouses (200 sq m) have been constructed in the aspirational district Sonbhadra at door-step farm of Mr. Vidyapati in Gaurahi village.This polyhouse proved a boon for him as after gaining a net profit of Rs. 18,700/- fromparthenocarpic cucumber and cowpea crop in summer. He produced early nursery of chilli, capsicum, cauliflower and tomato from his own open field cultivation as well as sold excess to other farmers in the village. Mr. Vidyapati also cultivated hybrid capsicum and in determinant type tomato in winter for better return.

PART-IV

5.1. Establishment & Accomplishments of Tinkering Lab

Soil testing: A tinkering lab has been established to ensure the farmers to promote use of balance fertilizers for improved soil health and productivity. Soil samples from the different districts i.e., Chandauli, Sonbhadra, Varanasi and Ghazipur were analyzed on the parameters of pH, EC, nitrogen, phosphorus, potassium and micronutrients (table 5). Soil health cards were distributed to the farmers for the balanced use of fertilizers in kharif season crops. Recommendations of balanced fertilizers for paddy and wheat crop were given to the farmers. In the analysis it was found that farmers are using DAP more as compared to urea. Samples from Varanasi, Chandauli, Sonbhadra and Ghazipur were low in organic carbon (%) and available nitrogen (kg/ha) content, while available phosphorus was in medium to high range. Available potassium in all the four districts was in medium range, available sulphur content was sufficient while available zinc content from the samples of different districts was in lower to medium range.

Soil Testing Lab Established at FAARD Foundation

Table 5.Results of soil samples analysis of different districts

Parameters	Sonbhadra		Chandauli		Varanasi		Ghazipur	
	Range	Mean	Range	Mea	Range	Mea	Range	Mea
¦ Ph	7.09 - 7.66	7.44	6.42 - 8.13	7.22	6.36 - 7.88	7.16	7.21 - 7.65	7.38
¦ EC	0.19 - 0.40	0.29	0.19 - 0.29	0.23	0.17 - 0.41	0.27	0.24 - 0.46	0.27
¦ 1OC%	0.18 - 0.65	0.36	0.17 - 0.50	0.29	0.19 - 0.45	0.34	0.15 - 0.47	0.31
¦ Available N (Kg/ha)	104 - 452	254	97 - 283	219	190 - 276	242	188 - 262	232
¦ Available P (Kg/ha)	21.7 - 58.1	47.33	27.2 -	43	22.3 - 79.8	49.6	35.5 -	42
¦ Available K (Kg/ha)	168.6 - 219	193.2	156.3 - 288.8	227	172 - 228	218	138.7 - 212	198
¦ Available Zinc (mg/kg)	0.7 - 1.6	1.2	0.6 - 1.86	0.9	0.6 - 1.5	0.7	0.6 - 1.86	1.3
No. of Samples	64		63		76		61	

5.2. Media coverage and publicity

Kisan Melas, Kisan Gosthies, Field Visits, FPOs Meets, Press Meetings, Inter-institutional Meetings, Faard Core Group Meetings and different training programs have been reguraly organised. This mechanism has created a good awareness in the region especially eastern U.P. through new innovations and technologies demonstrated under Biotech KISAN Project. WhatsApp Groups of FPOs, FAARD Foundation and Biotech KISAN group have been instrumental in fast spreading the messages among FPO groups and individual farmers. Quarterly publication of FAARD Samvaad magazine and circulation among farmers and other stake holders is updating them with recent technological developments and success stories. The glimpses of some of these activities are presented in visuals.


Training prog for improved seeds
A three-day training programme for the production of improved seeds organised by the Foundation for Advancement of Agriculture and Rural Development (FAARD) in collaboration with the Indian Institute of Vegetable Research (IIVR) began at the Institute of Agricultural Sciences, Banaras Hindu University on Thursday. The event has been organised under Biotech Kisan project of the Department of Biotechnology. Farmers from


किसानों की आय दोगुना करने की समन्वित खेती पर बल

Farmers Fair : 18th January 2023

Farmers Fair: A 'Farmers Fair' was organized at Krishi Vigyan Kendra, Kallipur, Varanasi on 18th January 2023. Chief Guest on this occasion, Shri Surya Pratap Sahi, Agriculture Minister, Govt. of UP emphasized farmers that due to advanced technology in agriculture sector the country moving towards self-sufficiency in food grains production as well as export. The use of unbalanced chemicals and the situation arising from the falling ground water is a matter of concern. He said we need to take advanced technology along with nutritious farming. Prof. Panjab Singh, President, FAARD Foundation and Hub Facilitator of this project said, we have gone ahead in agriculture production, now there is a need to provide better income to the farmers for their produce. He said, efforts are also made to increase the participation of women in agriculture sector. Increase the participation of women in Farmer Producer companies will also increase agriculture income. Prof. Singh welcomes honourable Agriculture Minister Shri Surya Pratap Sahi, along with other dignitaries viz., Dr. Bijendra Singh, Vice chancellor ANDUAT, Ayodhya; Dr. T.K Behera, Director, ICAR-IIVR, Varanasi. on this Ocassion Prof. R.M Singh, Former Dean, Institute of Agriculture Science, BHU, Dr. Neeraj Singh, Principal Scientist, ICAR-IIVR, Prof. S.R Singh, former Director, Institute of Agriculture Science, BHU and Trustees of FAARD Foundation and other core group members were also present. About 900 farmers from Varanasi, Ghazipur, Chandauli and Sonbhadra districts had participated in this farmer's fair and shared their successful experience and problems faced in farming.

Farmers Fair : 28th January 2023

Farmers Fair: A 'Farmers Fair' was organized at Baba Paramhans Vidyalaya, Vill+Post - Khadan, Dhanapur, Chandauli on 28th January 2023. Chief Guest on this occasion, Dr. US Gautam, Deputy Director General (DDG-Extension), Indian Council of Agricultural Research, New Delhi had emphasized the farmers for agricultural diversification by incorporating different technologies i.e. horticultural crops, organic farming, fish farming, mushroom production, animal husbandry etc in their traditional rice-wheat farming. Prof. Panjab Singh, President, FAARD Foundation and Hub Facilitator of this project encouraged the farmers for developing FPOs and explained how they could be able to harness its benefits by disposing their huge agricultural produce. Prof. Singh welcomes the Scientist and other dignitries viz., Dr. Bijendra Singh, Vice chancellor ANDUAT, Ayodhya; Dr. Shudhanshu Singh, Director, IRRI and Dr. Sunil Singh, Businessman (NRI). on this Ocassion, Core Group Members and Trustee of FAARD Foundation were also present. About 650 farmers from Varanasi, Ghazipur, Chandauli and Sonbhadra districts had participated in this farmer's fair and shared their successful experience and problems faced in farming.

FAARD FOUNDATION फार्ड फाउण्डेशन

कृषि प्रगति एवं ग्रामीण विकास संस्था

FOUNDATION FOR ADVANCEMENT OF AGRICULTURE AND RURAL DEVELOPMENT

Saraswati Kunj,
Narainpur (Dafi), P.O.- Naipura,
Dist. Varanasi – 221011
Telephone : 91-542-2575678
Email : faardvaranasi@gmail.com