

TECHNOLOGY INVENTORY OF ONION AND GARLIC: COMMERCIALIZATION ODYSSEY



ICAR-Directorate of Onion and Garlic Research
Pune-410505, Maharashtra



Technology Inventory of Onion and Garlic: Commercialization Odyssey



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Foreword

The Indian Council of Agricultural Research, a premier organization dedicated to fostering agricultural research and development, acknowledges the transformative power of innovation in agriculture. The establishment of the Intellectual Property and Technology Management Unit within ICAR stands as a testament to the recognition of the significance of safeguarding intellectual property rights, fostering innovation, and effectively managing technological advancements in the agricultural domain.



This unit serves as a guiding force in navigating the intricate landscape of intellectual property rights, technology transfer, and innovation management. It aims to bridge the gap between cutting-edge research outcomes, technological innovations, and their practical application in the agricultural sector.

Onion and garlic, often considered humble kitchen staples, hold immense significance in culinary traditions worldwide. However, beyond their culinary value, these crops play a pivotal role in global agriculture and economy. The continuous efforts and dedication of ICAR-DOGR in research and development have not only led to technological advancements but have also empowered stakeholders within the onion and garlic sector to adopt sustainable and innovative practices. These technologies have played a pivotal role in improving the livelihoods of farmers, enhancing crop resilience, and contributing to the overall growth and development of the onion and garlic industry.

This “Technology Inventory of Onion and Garlic: Commercialization Odyssey” manual gives the comprehensive details of the technologies developed at ICAR-DOGR and their commercialisation and professional services offered, which will be useful for individuals, entrepreneurs, professionals, and stakeholders involved in the cultivation, processing, commercialization, and utilization of onion and garlic technologies. It is our sincere hope that this bulletin serves as a guiding beacon, empowering individuals and industries alike to harness the potential of technological innovations for the sustainable growth and success of the onion and garlic sectors.



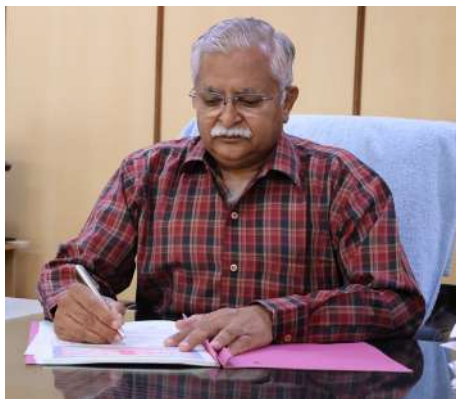
Neeru Bhooshan

ADG (IP&TM) ICAR, New Delhi

Date: 12-12-2023

Director's Message

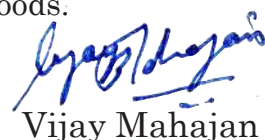
ICAR-DOGR was founded in 1998 as the only institute in the country solely dedicated to research and development in onion, garlic, and related Alliums. Its primary vision is to enhance production, productivity, export potential, and value addition in the onion and garlic sector. The institute engages in a spectrum of research activities encompassing basic, strategic, and applied research aimed at improving these crops and innovating technologies associated with them. Since its inception, the institute has achieved significant milestones, including the development of 10 onion and 2 garlic varieties.



Additionally, ICAR-DOGR developed onion graders, different storage structures for onions, mobile applications, decision support systems and more. These technologies have found practical application among farmers and stakeholders across the nation, contributing to advancements in the onion and garlic sector. ICAR-DOGR places emphasis on not only developing technologies but also on their commercialization, dissemination and capacity building among stakeholders. This involves transferring developed technologies to farmers and other stakeholders and imparting them with necessary skills and knowledge.

Following the implementation of ICAR's new Intellectual Property Management policy, ICAR-DOGR has set up Institute's Technology Management Unit (ITMU) to spearhead technology safeguarding, commercialization, and the provision of professional services within the directorate. To date, ICAR-DOGR has generated significant revenue. Specifically, the licensing of technologies has amassed Rs. 1.6 crore, while professional services have contributed Rs. 3 crore to the institute's earnings.

This technology inventory offers a consolidated overview of the directorate's technologies, their intellectual property (IP) protection, commercialization endeavors, and initiatives in professional services. These services encompass contract and collaborative research, consultancy services, and public-private partnerships, all geared towards the advancement of onion and garlic cultivation and, ultimately, the improvement of farmers' livelihoods.



Vijay Mahajan

Date: 12-12-2023

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1. About ICAR-DOGR

The ICAR-DOGR is located at Rajgurunagar on Pune -Nashik Highway, about 45 km from Pune, Maharashtra. Realizing the importance of onion and garlic in the country, Indian Council of Agricultural Research (ICAR) established National Research Centre for Onion and Garlic in VIII Plan at Nashik in 1994. Later, the Centre was shifted to Rajgurunagar on 16 June, 1998. Due to expansion of R&D activities of onion and garlic, the centre was rechristened and upgraded to Directorate of Onion and Garlic Research (DOGR) in December 2008. During its more than 25 years of journey, the directorate contributed significantly in research and development, extension and technology commercialization in India.

Vision, Mission and Mandate

Vision:

- To improve production, productivity, export and add on value of onion and garlic.

Mission:

- To promote overall growth of onion and garlic in terms of enhancement of quality production, export and processing.

Mandate:

- Basic, strategic and applied research on genetic resource management, crop improvement and production technologies for enhancing and sustaining production of onion and garlic.
- Transfer of technology and capacity building of stakeholders for enhancing productivity of onion and garlic. Coordinate research and validation of technologies through AINRP on onion and garlic.



2. Technology licensing system of ICAR

The Indian Council of Agricultural Research (ICAR) is the apex body coordinating and undertaking research, education and its applications at field level to ensure food security of consumer and economic growth of farmers. India is member of WTO and hence agreed to provide intellectual property rights (IPR) to the inventions. ICAR has also developed a system/ framework that help in managing the IP generated by scientists and institutes in National Agricultural Research System (NARS). Present framework of IP management is evolved through several decisions and actions taken by ICAR in last two decades. ICAR has developed three level system for IP management (ICAR Guidelines for Intellectual Property Management and Technology Transfer/Commercialization, revised in 2018). First level comprised of Institute Technology Management Committee (ITMC) chaired by the Director of the respective Institution second level is, Zonal Technology Management Committee (ZTMC) which advise to the institutions in the zone regarding their IP and technology management. Final level is the Intellectual Property & Technology Management (IP&TM) Unit at the ICAR headquarter and it is central unit which facilitate necessary advice and support to all ICAR institutes. Agrinnovate India Limited (AgIn) established by DARE with the mandate of commercialization of innovative technologies developed by ICAR institutes. The current bulletin provides in-depth details about the technologies developed by ICAR-DOGR, their process of commercialization, and the resulting revenue generation.



3. ITMU unit of ICAR-DOGR

The Institute's Technology Management Unit was established as part of the 'Intellectual Property Management and Transfer/Commercialization of Agricultural Technology Scheme' project, funded by ICAR and NAIF. Responsible for overseeing all intellectual property protection endeavors within the institute, ITMU also spearheads the commercialization of technologies developed in accordance with ICAR guidelines. Its primary function involves facilitating the identification of technologies warranting IP protection and subsequently aiding their commercialization. Additionally, ITMU assumes a pivotal role in formulating and executing memorandum of understanding (MoU) agreements for both contract and collaborative research aligned with the institute's focus areas, following ICAR directives.

The Institute Technology Management Committee (ITMC) serves as the principal decision-making body, deliberating on matters pertaining to technology safeguarding, commercialization, and contract research.



4. Technologies of ICAR-DOGR for commercialization

Since its establishment, ICAR-DOGR has continuously developed diverse technologies for crop improvement, production, and protection. These technologies, aimed at benefiting stakeholders, are openly disseminated. However, certain technologies such as onion varieties for seed production, onion graders, and onion storage structures have been commercialized.

4.1. Onion and Garlic Varieties

ICAR-DOGR developed 10 onion and 2 garlic varieties. The complete details of the varieties are described below.

i. Bhima Super

- **Year of release:** 2013
- **CVRC:** S.O. 3666(E). 6-12-2016
- **PPVFRA:** REG/2015/2018
- **Colour:** Red
- **Season:** *Kharif* and late *kharif*
- **Yield:** 20-22 t/ha (*kharif*), 40 -45 t/ha (late *kharif*)
- **Maturity:** 100-105 DAT (*kharif*) 110-120 DAT (late *kharif*)
- **Uniqueness:** Maximum single centred bulbs and thus suitable for dehydrated rings and salad. It may have bolting up to 10-15% depending upon climatic conditions during late *kharif*.
- **Region:** Chhattisgarh, Delhi, Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan and Tamil Nadu. For late *kharif*; Gujarat, Karnataka, Maharashtra



ii. Bhima Dark Red

- **Year of release:** 2013
- **CVRC :** S.O. 2277(E). 17-8-2015
- **PPVFRA:** REG/2014/985
- **Colour:** Dark Red
- **Season:** *Kharif*
- **Yield:** 20-24 t/ha
- **Maturity:** 95-100 DAT
- **Uniqueness:** Early and uniform maturity with less bolters and doubles
- **Region:** Chhattisgarh, Delhi, Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan and Tamil Nadu



iii. Bhima Raj

- **Year of release:** 2008
- **CVRC:** S.O. 2978 (E). 26-12-2008
- **PPVFRA:** 262 of 2015
- **Colour:** Dark Red
- **Season:** *Kharif*, late *kharif* and *rabi*
- **Yield:** 24-26 t/ha (*kharif*), 40 -45 t/ha (*late kharif*), 25-30t/ha (*rabi*)
- **Maturity:** 100-105DAT (*kharif*) 115-120 DAT (*late kharif & rabi*)
- **Uniqueness:** Uniform neck fall, bolting free and suitability for all the three seasons
- **Region:** Maharashtra, Karnataka and Gujarat, for *rabi* Rajasthan, Gujarat, Haryana and Delhi



iv. Bhima Red

- **Year of release:** 2009 for *rabi* and 2013 for *kharif*
- **CVRC:** S.O. 2277(E). 17-8- 2015
- **PPVFRA:** 342 of 2016
- **Colour:** Red
- **Season:** *Kharif*, late *kharif* and *rabi*
- **Yield:** 19-21 t/ha (*kharif*), 45 -50 t/ha (late *kharif*), 30-32t/ha (*rabi*)
- **Maturity:** 105-110DAT (*kharif*) 110-120 DAT (late *kharif* & *rabi*)
- **Uniqueness:** Attractive red colour and can be grown in all the three seasons
- **Region:** For *rabi* in Maharashtra and Madhya Pradesh, *kharif* in Delhi, Gujarat, Haryana, Karnataka, Maharashtra, Punjab, Rajasthan and Tamil Nadu, late *kharif* Maharashtra, Karnataka and Gujarat



v. Bhima Kiran

- **Year of release:** 2010
- **CVRC:** S.O. 2277(E). – 17-8-2015
- **PPVFRA:** 341 of 2016
- **Colour:** Light Red
- **Season:** *Rabi*
- **Yield:** 28-32t/ha
- **Maturity:** 125-135 DAT
- **Storability:** 5-6 months
- **Uniqueness:** Uniform neck fall and good shelf life
- **Region:** Maharashtra, Karnataka, Andhra Pradesh, Delhi, UP, Haryana, Bihar and Punjab



vi. Bhima Shakti

- **Year of release:** 2011
- **CVRC:** S.O. 692(E). 5-2-2019
- **PPVFRA:** REG/2014/984
- **Colour:** Red
- **Season:** Late *kharif* and *rabi*
- **Yield:** 35-40 t/ha (late *kharif*), 28-30t/ha (*rabi*)
- **Maturity:** 125-135 DAT
- **Storability:** 5-6 months
- **Uniqueness:** Uniform neck fall and attains immediate attractive red colour after harvest.
- **Region:** For *rabi*: Maharashtra, Karnataka, Andhra Pradesh, Delhi, UP, Haryana, Bihar, Punjab, Rajasthan, Gujarat, MP, Chhattisgarh and Orissa. For late *kharif* in Gujarat, Maharashtra, Karnataka.



vii. Bhima Light Red

- **Year of release:** 2018
- **CVRC:** S.O. 261(E). – 16-1-2018
- **PPVFRA:** 261 of 2020
- **Colour:** Light Red
- **Season:** *Rabi*
- **Yield:** 36-40t/ha
- **Maturity:** 110-120 DAT
- **Storability:** 5-6 months
- **Uniqueness:** Almost free of doubles and bolters
- **Region:** Karnataka and Tamil Nadu



viii. Bhima Shweta

- **Year of release:** 2011 for *rabi* and 2014 for kharif
- **CVRC:** S.O. 2277(E). – 17-8-2015
- **Colour:** White
- **Season:** *Kharif* and *rabi*
- **Yield:** 18-20 t/ha (*kharif*), 26-30t/ha (*rabi*)
- **Maturity:**110-120 DAT
- **Storability:** 3 months
- **Uniqueness:** Uniform neck fall and useful for processing
- **Region:** Chhattisgarh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, disha, Rajasthan and Tamil Nadu.



ix. Bhima Shubhra

- **Year of release:** 2013
- **CVRC:** S.O. 2277(E). 17-8-2015
- **PPVFRA:** 120 of 2019
- **Colour:** White
- **Season:** *Kharif* and late *kharif*
- **Yield:** 18-20 t/ha (*kharif*), 36-42t/ha (late *kharif*)
- **Maturity:**110-115 DAT (*kharif*), 120-130 DAT (late *kharif*)
- **Storability:** 3 months
- **Uniqueness:** Suitability for late kharif can fill the gap for processing from October to February
- **Region:** Chhattisgarh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Rajasthan and Tamil Nadu for kharif season and late kharif in Maharashtra, Gujrat and Karnataka.



v. Bhima Safed

- **Year of release:** 2015
- **CVRC:** S.O. 261(E). 16-1-2018
- **PPVFRA:** 115 of 2019
- **Colour:** White
- **Season:** *Kharif*
- **Yield:** 18-20 t/ha
- **Maturity:** 110-120 DAT
- **Uniqueness:** Suitable for table and processing purpose
- **Region:** Chhattisgarh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, and Tamil Nadu



xi. Bhima Omkar

- **Year of release:** 2009
- **CVRC:** S.O. 261(E). 16-1-2018
- **PPVFRA:** 427 of 2016
- **Colour:** White
- **Season:** *Rabi*
- **Yield:** 10-12 t/ha
- **Maturity:** 120-135 DAT
- **Storability:** 6-8 months
- **Region:** Delhi, Gujarat, Haryana and Rajasthan
- **Uniqueness:** Soft neck variety suitable for braiding



xii. Bhima Purple

- **Year of release:** 2011
- **CVRC:** S.O. 261(E). 16-1-2018
- **Colour:** Purple
- **Season:** *Rabi*
- **Yield:** 6-8 t/ha
- **Maturity:** 120-135 DAT
- **Storability:** 6-8 months
- **Region:** Delhi, UP, Haryana, Bihar, Punjab, Maharashtra, Karnataka and AP
- **Uniqueness:** Soft neck variety suitable for braiding



4.2. Onion Graders

ICAR-DOGR has developed manual and motorized grading machines for grading of onion bulbs. Onion bulbs can be classified into five categories with grading machine based on the bulb size.

i. Manual Onion Grader

- **No. of rollers:** 2
- **Weight:** 125 kg
- **Dimensions:** 5 feet height, 6 feet length and 2 feet width
- **Grading size:** Five grades (<35mm, 35 –50 mm, 50 – 60mm, 60 –80mm and > 80 mm)
- **Capacity and accuracy:** 1 ton/hour/2 persons which is ten times more over the manual grading which is 0.1 tone/hr.
- **Advantage:** Can be used for grading of many other fruits and vegetables such as sweet orange, sapota, limes, lemon etc with little modifications.



ii. Motorised Grader

- **No. of rollers:** Counter rotating 2 pairs rollers
- **Motor:** 1hp
- **Weight:** 300 kg
- **Dimensions:** 7 feet length and 4 feet width
- **Grading size:** Five grades (<35mm, 35 –50 mm, 50 – 60mm, 60 –80mm and > 80 mm)
- **Capacity:** 1.5-2 tons/hr/person which 15-20 times more than manual grading.
- **Advantage:** Can be used for grading of many other fruits and vegetables such as sweet orange, sapota, limes, lemon etc.with little modifications.



4.3. Storage Structures



i. Low volume low-cost onion structure

This storage structure is suited for 5 to 10 tons capacity.



ii. High volume bottom & side ventilated onion storage structure:

The storage structure is suited for 25-50 tons capacity. These storage structures reduce storage losses by 20-50% depending upon the period of storage.



iii. Controlled onion storage structure

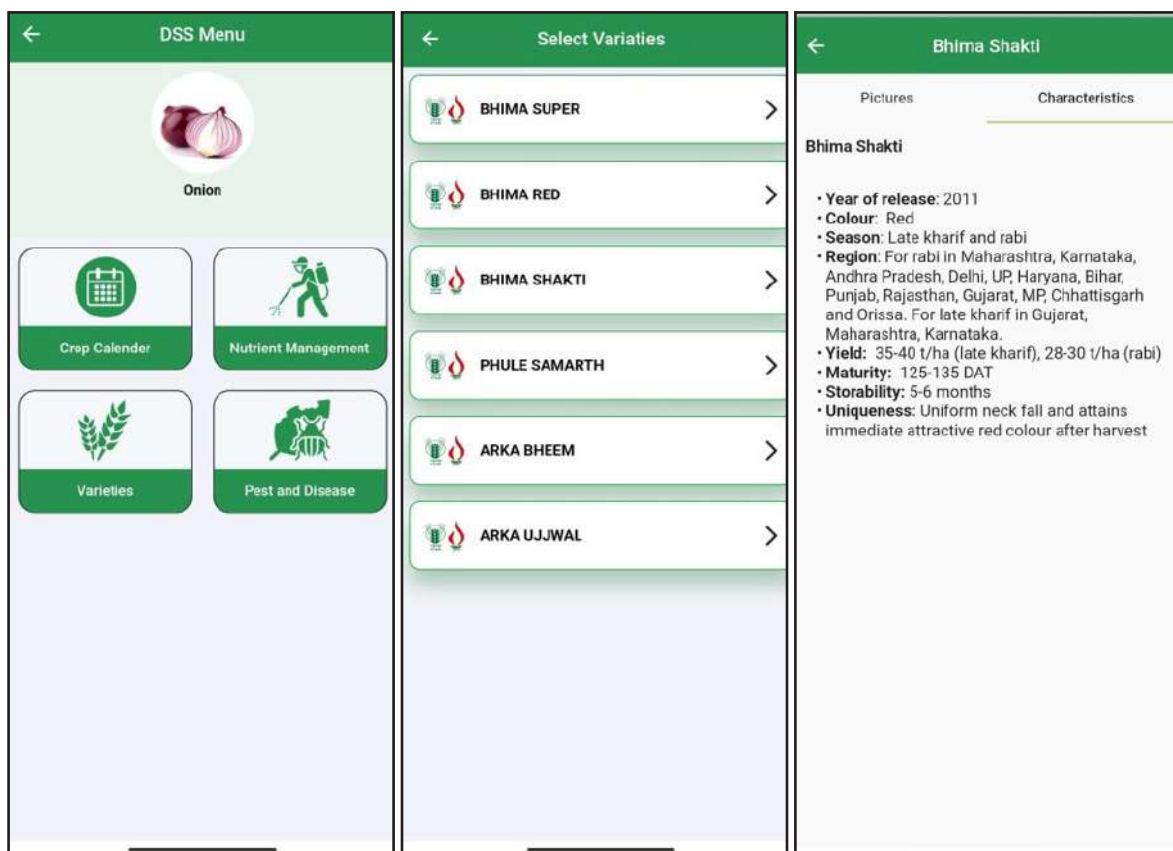
- ICAR-DOGR has developed a storage structure which can maintain the temperature of $27 \pm 2^{\circ}\text{C}$ and RH of 60 to 65% with air circulation system.
- The design and development of the controlled storage was done under Public Private Partnership mode with Kala Biotech Pvt. Ltd.
- Patent is granted for this invention titled “A storage structure for storing onion bulbs and a method thereof” (Patent No: 469459). ICAR-DOGR signed the Technology License Agreement for “Controlled Onion Storage Structure Technology” with Kala Biotech Pvt. Ltd. through AgrInnovate India Ltd., New Delhi.

4.4. Decision Support Systems and mobile application for Onion Cultivation

A mobile application and three decision support systems are developed in collaboration with ESDS Software Solution Ltd.

‘Smart Onion’

Decision support system for variety selection in Onion. In India, the adoption of improved onion varieties and recommended agricultural practices is limited due to the prevalence of local cultivars and a lack of knowledge regarding suitable varieties and agricultural techniques. To address these challenges, a decision support system called ‘SmartOnion’ has been developed. This system aims to assist farmers in making informed decisions when selecting onion varieties suitable for their specific locality, season and colour preferences as well as providing guidance on timely farming operations to improve yield. Based on the information provided by the farmer, the system processes the data and provides recommendations on the most suitable variety to cultivate.

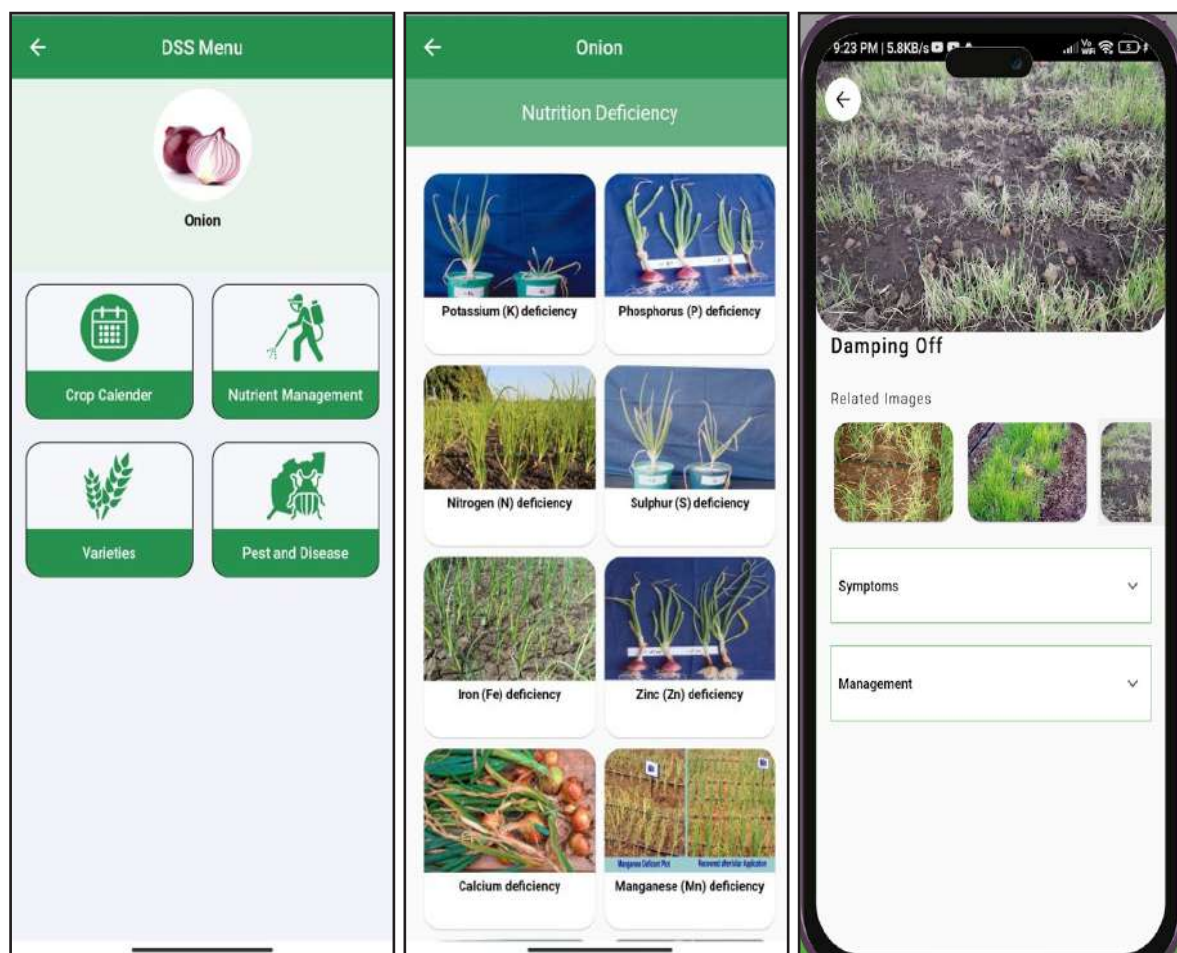


‘ONDSS’

A Decision Support System for Balanced Nutrient Management in Onion. To facilitate the farmers for balanced application of the fertilizer in onion crop, the decision-making process in the ONDSS is based on two main factors: the soil health report available to the farmer and the scientifically recommended nutrient dose derived from the general nutrient uptake pattern of the onion crop. By considering either of these factors, farmers can determine the appropriate nutrient application for their crops. To facilitate this, the ONDSS provides a dose calculator that suggests the precise amount of fertilizer to apply. This calculation takes into account the source of the fertilizer, the method of application, and the area of the crop. By utilizing this tool, farmers can ensure that they are applying the correct quantity of fertilizer tailored to their specific farming practices. In addition to nutrient management, the ONDSS also guides farmers in identifying and managing nutrient deficiencies. It includes a symptom-based deficiency identification system, enabling farmers to recognize signs of nutrient deficiencies in their crops.

‘ODPAdviser’

A Decision Support System for Disease and Pest Management in Onion. To assist farmers in making the right decisions for disease and pest management in onions, a decision support system called ‘ODPAdviser’ has been developed. The ODPAdviser system is designed to guide farmers through the process of identifying pests and diseases. It utilizes representative photographs of symptoms to aid in accurate identification. Once the identification is established, the ODPAdviser system offers recommendations for management practices and chemical applications. By using the ODPAdviser system, farmers can take timely action to manage pests and diseases.



‘Onion Crop Advisor’

Mobile application for farmers:

“Onion Crop Advisor” mobile application—a comprehensive tool designed and developed to provide farmers with easy access to onion farming information, empowering them to make informed decisions about adopting improved package practices, market choices, weather updates, and day-to-day operations. The mobile application offers a variety of features to support onion farmers. It provides text and video-based advisories, ranging from seed sowing to harvesting and post-harvest operations. Furthermore, the application includes blogs and a crop calendar, keeping farmers informed about the latest happenings, events, and programs organized by the Directorate. The mobile application also serves as a decision support system, offering tools and features that help farmers manage nutrients, pests, and diseases effectively. It serves as a one-stop resource for farmers, providing them with access to critical information, insights, and tools necessary for successful onion farming.

DSS: “Decision Support System”

One step solution to farm decisions for onion cultivation

Onion cultivators guide for

Right crop nutrition

Selection of right variety

Right plant protection measures

Day to day operations

5. Licensing of Technologies

The comprehensive procedure for licensing of ICAR-DOGR technologies to different stakeholders is detailed below.

Licensing of onion varieties for seed production:

- **Step 1:** Interested company/organization need to write application letter to the Director, ICAR- DOGR mentioning their willingness to get license for particular variety. Interested party may be private seed company or farmers producer company or farmers producer organization which must have valid company registration certificate and license for seed production and sale.
- **Step 2:** Director and ITMC will discuss and will accept or deny the consent to the interested company.
- **Step 3:** ITMU unit of ICAR-DOGR will send response to interested company with detailed terms and conditions for licensing of variety.
- **Step 4:** Licensing fee (decided by ITMC of the Directorate) need to be paid by interested company to ICAR-DOGR. Finance and account department of ICAR-DOGR will verify the payment and inform the company about the same. The amount of licensing fee may vary as per the decisions taken time to time for new licences.
- **Step 5:** Final draft MoU will be decided by mutual discussion between ITMU unit of ICAR-DOGR and interested company.
 - » **Key points:**
 - » **Compulsory Denomination:** The licensee will be required to print the same name of registered variety on seed packets.
 - » **Use of ICAR-DOGR Mark:** ICAR-DOGR logo should be printed on seed packet.
 - » **Seed Quality Assurance:** Licensee should maintain the seed quality and purity. ICAR-DOGR will have the right to inspect and monitor the seed crop raised and quality of the seed produced
 - » **Royalty:** Licensee need to pay 3% royalty or as decided time to time on total annual seed sale of the licensed variety to ICAR-DOGR in every year.

- » **Approval:** The draft of MoU will be approved by the Director ICAR-DOGR, along with terms and conditions
- **Step 6:** Finally, the MoU between ICAR-DOGR and interested company will be signed at ICAR-DOGR, Rajgurunagar on Rs. 100 non-judicial stamp paper.
- **Step 7:** Breeder seed and breeder seed certificate will be handed overed to the licensee after payment for seed at the Seed unit, ICAR-DOGR. Minimum 1 kg breeder seed will be provided to the company.

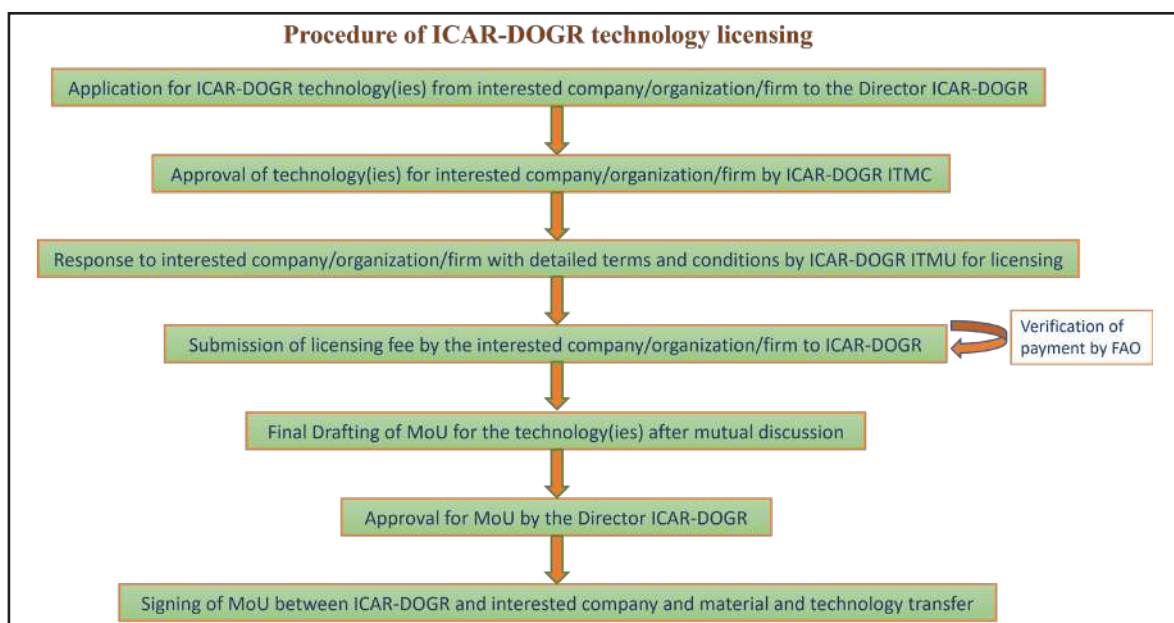


Fig 1: Stepwise procedure for technology licensing at ICAR-DOGR

Licensing of other technologies:

The outlined procedure for licensing of varieties is similarly adhered to for licensing other technologies, albeit with approved modifications on a case-by-case basis.

6. Revenue generated from technology licensing

ICAR-DOGR initiated its first technology licensing in the fiscal year 2013-14. Since then, a total sum of Rs. 1,62,17,001 has been generated through licensing various technologies to diverse stakeholders. A comprehensive breakdown of the revenue generated is provided below.

Table 1: Year wise revenue generated from technology licensing till October, 2023

Financial year	No. of MoUs	Revenue (Rs.)
2013-14	1	1,00,000
2014-15	2	1,40,000
2018-19	1	25,000
2019-20	4	2,52,000
2020-21	10	10,00,000
2021-22	96	96,00,001
2022-23	38	37,00,000
2023-24 (Oct)	14	14,00,000
Total	166	1,62,17,001

Table 2: Technology wise revenue generated

Sr. No.	Name of Technology	No. of Companies/ FPOs	Revenue Generated (Rs)	
			Licensing Fee	Royalty
1	Bhima Shakti	79	74,32,000	23,749
2	Bhima Dark Red	28	27,25,001	
3	Bhima Kiran	26	26,00,000	
4	Bhima Super	21	20,20,000	3,92,924
5	Bhima Red	4	4,25,000	1,770
6	Bhima Shubhra	4	4,00,000	
7	Bhima Raj	2	2,00,000	
8	Onion grader	1	15,000	28,836
9	Controlled onion storage structure	1	-	-
Total		166	1,62,17,001	4,47,279
Grand total			1,66,64,280	

Variety wise MoUs for licensing

The variety “Bhima Shakti,” one among the ten onion varieties developed by ICAR-DOGR, has gained significant popularity due to its lower storage losses compared to other varieties. This fact is distinctly evident from the graph provided below.

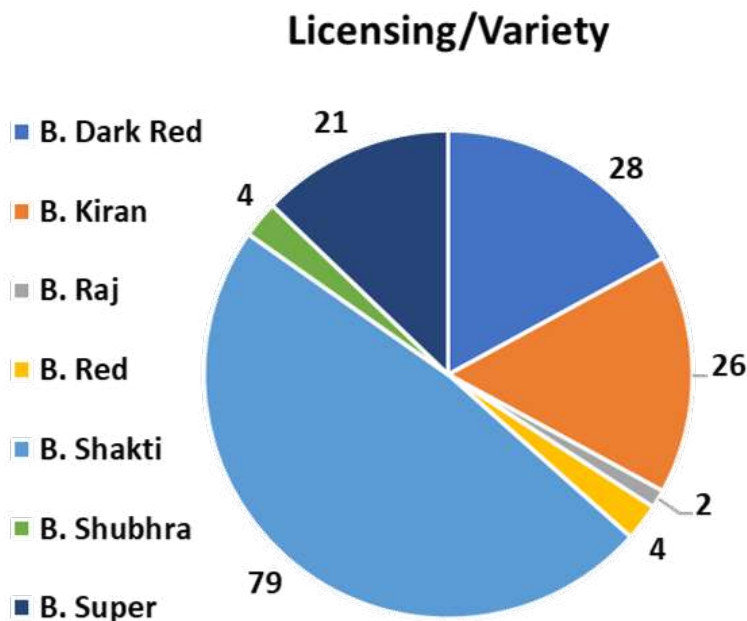


Fig 2: Variety wise MoUs for licensing

Table 3: List of companies signed MoU for commercialization of technologies

Sr. No	Name of the Licensee	Date of licensing	Technology
1.	Krusha Parivartan Onion Producer Company Ltd, Tuljapur, Maharashtra.	17-07-2018	Bhima Dark Red
2.	Dinkar Seeds Pvt Ltd., Gujarat	08-06-2021	Bhima Dark Red
3.	Kiyo Agri. Pvt. Ltd. MP	08-06-2021	Bhima Dark Red
4.	Patidar Traders, MP	08-06-2021	Bhima Dark Red

Sr. No	Name of the Licensee	Date of licensing	Technology
5.	Shri Chavan Beej Bhandar, MH	08-06-2021	Bhima Dark Red
6.	Vishal Seeds Agro Industries Pvt. Ltd., Buldhana	24-06-2021	Bhima Dark Red
7.	Krija Hy-Gene Seeds Pvt. Ltd., Jalna, Maharashtra	30-06-2021	Bhima Dark Red
8.	Growseeds Crop Science Pvt. Ltd., Jalna, Maharashtra	30-06-2021	Bhima Dark Red
9.	RSR Seeds Corporation, Aurangabad, Maharashtra	30-06-2021	Bhima Dark Red
10.	Patil Crop Science Pvt. Ltd., Jalna, Maharashtra	30-06-2021	Bhima Dark Red
11.	M/s Divya Seeds Company, Jalna, MH	14-07-2021	Bhima Dark Red
12.	Innvo Crop Science Pvt Ltd., Jalna	14-07-2021	Bhima Dark Red
13.	Jindal Crop Science Pvt Ltd., Jalna	14-07-2021	Bhima Dark Red
14.	Apurva Seeds, Jalgaon	17-07-2021	Bhima Dark Red
15.	Eco Agri Seeds Pvt Ltd. Hyderabad	22-07-2021	Bhima Dark Red
16.	Kasmade seeds and chemical private limited	30-07-2021	Bhima Dark Red
17.	M/s Vanashri Seeds Nashik	06-08-2021	Bhima Dark Red
18.	Bhumiputra Seeds, Buldana, Maharashtra	12-08-2021	Bhima Dark Red
19.	Prathmesh Seeds Nashik, Maharashtra	20-08-2021	Bhima Dark Red
20.	DCM Shriram Limited, New Delhi	31-08-2021	Bhima Dark Red
21.	Daftari Seeds , Wardha, Maharashtra	28-09-2021	Bhima Dark Red

Sr. No	Name of the Licensee	Date of licensing	Technology
22.	UlinkAgritechPvt. Ltd., Pune, Maharashtra	26-10-2021	Bhima Dark Red
23.	Siddhivinayak Seeds, Dewas, Madhya Pradesh	16-11-2021	Bhima Dark Red
24.	Gopishwar Seeds Pvt. Ltd., Buldhana	29-11-2021	Bhima Dark Red
25.	Om Gayatri Farmer Producer Company Limited	24-06-2022	Bhima Dark Red
26.	Shri Baliraja Seeds & Chemicals	24-06-2022	Bhima Dark Red
27.	AgrimitraFPC, Mirzapur	03-10-2022	Bhima Dark Red
28.	Semeza crop systems, Jalgaon (MH)	19-07-2023	Bhima Dark Red
29.	Calix Agri-genetics Pvt. Ltd. Jaipur Rajasthan	02-12-2020	Bhima Kiran
30.	Vishal Seeds Agro Industries Pvt. Ltd., Buldhana	24-06-2021	Bhima Kiran
31.	Patil Biotech Pvt. Ltd., Jalgaon, Maharashtra	25-06-2021	Bhima Kiran
32.	Shri Samarth Seed Company, Jalna, Maharashtra	30-06-2021	Bhima Kiran
33.	KeshavpushpAgro. Ind. Pvt. Ltd., Aurangabad, Maharashtra	30-06-2021	Bhima Kiran
34.	Patil Crop Science Pvt. Ltd., Jalna, Maharashtra	30-06-2021	Bhima Kiran
35.	M/s Gajanan Traders, Nashik, Maharashtra	09-07-2021	Bhima Kiran
36.	M/s Shri Datta Seeds Company, Nashik (MH)	13-07-2021	Bhima Kiran
37.	New Maharashtra Traders, Jalgaon, Maharashtra	22-07-2021	Bhima Kiran
38.	M/s Vanashri Seeds Nashik	06-08-2021	Bhima Kiran
39.	New Bagwan Brothers	31-08-2021	Bhima Kiran

Sr. No	Name of the Licensee	Date of licensing	Technology
40.	Prathmesh Seeds Nashik, Maharashtra	22-09-2021	Bhima Kiran
41.	SendriyaShetiSonakPimpalgaon Producer Company	23-09-2021	Bhima Kiran
42.	Staralankar Farmer Producer Company	23-09-2021	Bhima Kiran
43.	Kasmade Seeds and Chemical Private Limited	28-09-2021	Bhima Kiran
44.	Maharajya Group Farmers Producer Company Limited, Nashik	28-09-2021	Bhima Kiran
45.	PromodernaAgritech LLP, Aurangabad Maharashtra	16-11-2021	Bhima Kiran
46.	Rushikesh Seeds and Biotech, Budana, Maharashtra	17-11-2021	Bhima Kiran
47.	Pollen Bioseeds	24-11-2021	Bhima Kiran
48.	Girnakhore FPCL, Deola, Nashik	30-11-2021	Bhima Kiran
49.	Atharv Seeds, Jalna, Maharashtra	05-01-2022	Bhima Kiran
50.	Grape Master Organic FPC Limited, Nashik	05-01-2022	Bhima Kiran
51.	Veedant Seeds & Biotech Pvt Ltd	24-06-2022	Bhima Kiran
52.	SaiMauli seeds, Nashik	21-10-2022	Bhima Kiran
53.	Saradnya seeds Pvt Ltd, Nashik	27-01-2023	Bhima Kiran
54.	Mansoon Seeds Pvt. Ltd. Pune, Maharashtra	16-03-2022	Bhima Raj
55.	Star Alankar Farmer Producer Company Ltd.	24-06-2022	Bhima Raj
56.	SafalmantraAgro Farms Private Limited (SAFPL), Navi Mumbai,	12-11-2014	Bhima Red
57.	Indo US Bio-Tech Limited Amedabad	23-04-2022	Bhima Red
58.	Jindal Crop Sciences Pvt. Ltd.	24-06-2022	Bhima Red
59.	Pancharatna Seeds Company	20/08/2022	Bhima Red

Sr. No	Name of the Licensee	Date of licensing	Technology
60.	AmarsinhAgro Producer Company Ltd., Ahmednagar, Maharashtra	14-06-2019	Bhima Shakti
61.	Indo American Hybrid Seeds (India) Pvt. Ltd. Bengaluru, Karnataka	17-09-2019	Bhima Shakti
62.	Dinkar Seeds Private Limited, Sabar-kantha, Gujarat	06-06-2020	Bhima Shakti
63.	JSC Seeds Company Pvt. Ltd., 29 New Mondha Bus Stand Road, Jalna, 431203, Maharashtra	03-09-2020	Bhima Shakti
64.	Shri Aaradhya Seeds Aurangabad, Maharshtia	17-09-2020	Bhima Shakti
65.	AgroNarmada Seeds Company Ltd. Pune, MH	05-10-2020	Bhima Shakti
66.	PARSHV Genetics LLP,Jhabua, MP	05-10-2020	Bhima Shakti
67.	Dhanlaxmi Crop Sciences Pvt. Ltd, Himmatnagar, Gujarat	21-10-2020	Bhima Shakti
68.	Calix Agri-genetics Pvt. Ltd. Jaipur Rajasthan	02-12-2020	Bhima Shakti
69.	ODSF Agroproducer Company Ltd., Osmanabad, Maharashtra	13-11-2020	Bhima Shakti
70.	M/s Shevgaon Taluka Farmers Producer Company Ltd., Shevgaon.	08-06-2021	Bhima Shakti
71.	Kiyo Agri. Pvt. Ltd. MP	08-06-2021	Bhima Shakti
72.	Patidar Traders, MP	08-06-2021	Bhima Shakti
73.	Shri Chavan Beej Bhandar, MH	08-06-2021	Bhima Shakti
74.	Sheetal Hybrid Seeds Private Limited., Jalna	08-06-2021	Bhima Shakti
75.	Prenic FPC Ltd. Nashik Maharashtra	10-06-2021	Bhima Shakti
76.	Patil Biotech Pvt. Ltd., Jalgaon, Maharashtra	25-06-2021	Bhima Shakti

Sr. No	Name of the Licensee	Date of licensing	Technology
77.	KeshavpushpAgro. Ind. Pvt. Ltd., Aurangabad, Maharashtra	30-06-2021	Bhima Shakti
78.	VNR Seed Pvt.Ltd., Raipur, Chhattisgarh	01-07-2021	Bhima Shakti
79.	M/s Divya Seeds Company, Jalna, MH	14-07-2021	Bhima Shakti
80.	Jindal Crop Science Pvt Ltd., Jalna	14-07-2021	Bhima Shakti
81.	Surushe Seeds Maker, Buldhana	16-07-2021	Bhima Shakti
82.	Eco Agri Seeds Pvt Ltd. Hyderabad	22-07-2021	Bhima Shakti
83.	Krushibindu Farmer Producer Company Limited (mh)	23-07-2021	Bhima Shakti
84.	Sahebrao Seeds India Pvt. Ltd.	04-08-2021	Bhima Shakti
85.	Ankai Farmers Producers Company Limited	06-08-2021	Bhima Shakti
86.	Godapravar FPC Limited, Ahmednagar	09-08-2021	Bhima Shakti
87.	JayghoshAgro Tech Pvt. Ltd., Nashik	11-08-2021	Bhima Shakti
88.	Mandvi Valley Agro Pvt. Ltd	12-08-2021	Bhima Shakti
89.	Prathmesh Seeds Nashik, Maharashtra	20-08-2021	Bhima Shakti
90.	Krushikranti HightechAgro Producer Company Limited	25-08-2021	Bhima Shakti
91.	Mahalaxmi Hybrid Seeds India Pvt. Ltd.	30-08-2021	Bhima Shakti
92.	BalaghatAgro Producer Company, Beed Maharashtra	22-09-2021	Bhima Shakti
93.	Rahee Natural Seeds Pvt. Ltd.	22-09-2021	Bhima Shakti
94.	Swara Samruddhi Seeds, Nashik	22-09-2021	Bhima Shakti
95.	Sampada Seeds Pvt Ltd., Jalna	23-09-2021	Bhima Shakti
96.	Maharajya Group Farmers Producer Company Limited, Nashik	28-09-2021	Bhima Shakti

Sr. No	Name of the Licensee	Date of licensing	Technology
97.	Shri Kantabai Vitthal Agro Producer Company Limited	04-10-2021	Bhima Shakti
98.	Gaurinand FPC Limited	04-10-2021	Bhima Shakti
99.	Gargi Seeds Jalgaon	05-10-2021	Bhima Shakti
100.	New Era Seeds Jalgaon	05-10-2021	Bhima Shakti
101.	Pasaidan Farmer Producer Company Limited, Ahmednagar	22-10-2021	Bhima Shakti
102.	UlinkAgritechPvt. Ltd., Pune, Maharashtra	26-10-2021	Bhima Shakti
103.	Samruddhi Plant Sciences, Pune	28-10-2021	Bhima Shakti
104.	Samruddhi Agri Tech Pvt. Ltd. Ahamdnagar	01-11-2021	Bhima Shakti
105.	Siddhivinayak Seeds, Dewas, Madhya Pradesh	16-11-2021	Bhima Shakti
106.	Vasna Shetkari PCL, Satara, Maharashtra	16-11-2021	Bhima Shakti
107.	Deola FPC Limited, Nashik Maharashtra	24-11-2021	Bhima Shakti
108.	Gopishwar Seeds Pvt. Ltd., Buldhana	29-11-2021	Bhima Shakti
109.	Zenith Hybrid Seeds Private Limited, New Delhi	20-12-2021	Bhima Shakti
110.	Gentex Agri Inputs Private Limited, Ahmedabad Gujarat	24-12-2021	Bhima Shakti
111.	Vijay Seeds Company Limited, Jalna, Maharashtra	14-02-2022	Bhima Shakti
112.	Mansoon Seeds Pvt. Ltd. Pune, Maharashtra	16-03-2022	Bhima Shakti
113.	Star Alankar Farmer Producer Company Ltd.	24-06-2022	Bhima Shakti
114.	Ruchi Green Seeds	24-06-2022	Bhima Shakti
115.	Om Gayatri Farmer Producer Company Limited	24-06-2022	Bhima Shakti
116.	Shri Baliraja Seeds & Chemicals	24-06-2022	Bhima Shakti

Sr. No	Name of the Licensee	Date of licensing	Technology
117.	Radha Shyam Seeds & Biotech Pvt. Ltd	24-06-2022	Bhima Shakti
118.	Jain Agri Park	24/06/2022	Bhima Shakti
119.	Sakol Farmers Agro producer company Ltd.	20/08/2022	Bhima Shakti
120.	Pollen Bioseeds	20/08/2022	Bhima Shakti
121.	Smiling farmers seeds pvt. ltd	20/08/2022	Bhima Shakti
122.	Sidhant seeds, Auragabad	03-10-2022	Bhima Shakti
123.	M/S. Mahadev Agri clinic and Agribusiness Centre, Ayodhya	14-10-2022	Bhima Shakti
124.	Kapileshwar agro and biotec services, odisha	21-11-2022	Bhima Shakti
125.	Rajganesh natural seeds, satara	21-11-2022	Bhima Shakti
126.	Thinkpure organic produce Ltd, Akola	21-11-2022	Bhima Shakti
127.	Swadarshan farmer producer company, Babhaleshwar, Ahemadnagar	21-11-2022	Bhima Shakti
128.	Rushee Seeds Pvt Ltd, Newasa	16-03-2023	Bhima Shakti
129.	Mayuresh Seeds, Jalgaon	07-06-2023	Bhima Shakti
130.	VSRO Bio organics, Patas, Pune	07-06-2023	Bhima Shakti
131.	YNK seeds pvtltd, Chikhli, Buldana, Maharashtra	11-07-2023	Bhima Shakti
132.	Semeza crop systems, Jalgaon (MH)	19-07-2023	Bhima Shakti
133.	Songro Natural Seeds Private Ltd, Jalna	09-08-2023	Bhima Shakti
134.	Kille galna FPC, Malegoan	05-09-2023	Bhima Shakti
135.	Jindal Crop Sciences Pvt. Ltd.	24-06-2022	Bhima Shubhra
136.	Divya Seeds Company	20/08/2022	Bhima Shubhra
137.	Pancharatna Seeds Company	20/08/2022	Bhima Shubhra
138.	Mayur seeds corporation, Jalgoan	30-11-2022	Bhima Shubhra

Sr. No	Name of the Licensee	Date of licensing	Technology
139.	Jindal Crop Sciences Pvt. Ltd., Jalna, Maharashtra	27-08-2013	Bhima Super
140.	Dinkar Seeds Private Limited, Sabarkantha, Gujarat	28-05-2019	Bhima Super
141.	AmarsinhAgro Producer Company Ltd., Ahmednagar, Maharashtra	14-06-2019	Bhima Super
142.	Parshv Genetics LLP, Jhabua, MP	05-10-2020	Bhima Super
143.	Sheetal Hybrid Seeds Private Limited., Jalna	08-06-2021	Bhima Super
144.	ODSF Agro Producer Company, Osmanabad, Maharashtra	30-06-2021	Bhima Super
145.	VNR Seed Pvt.Ltd., Raipur, Chhattisgarh	01-07-2021	Bhima Super
146.	Kohinoor Seed Field India Pvt. Ltd., Delhi	23-07-2021	Bhima Super
147.	Bhumiputra Seeds, Buldana, Maharashtra	12-08-2021	Bhima Super
148.	Rahee Natural Seeds Pvt. Ltd.	22-09-2021	Bhima Super
149.	Daftari Seeds , Wardha, Maharashtra	28-09-2021	Bhima Super
150.	Vishal Seeds Agro Industries Pvt. Ltd., Buldhana	02-12-2021	Bhima Super
151.	Indo US Bio-Tech Limited Amedabad	23-04-2022	Bhima Super
152.	Yajnarup Vision Tech Private Limited	24-06-2022	Bhima Super
153.	Pasaidan Farmers Producer company Ltd.	24-06-2022	Bhima Super
154.	Jain Agri Park	24/06/2022	Bhima Super
155.	Kapileshwar agro and biotec services, odisha	21-11-2022	Bhima Super
156.	Rajganesh natural seeds, satara	21-11-2022	Bhima Super
157.	Rushee Seeds Pvt Ltd, Newasa	16-03-2023	Bhima Super
158.	Padmini seeds Pvt Ltd, Parbhani	07-06-2023	Bhima Super
159.	Songro Natural Seeds Private Ltd, Jalna	09-08-2023	Bhima Super

Sr. No	Name of the Licensee	Date of licensing	Technology
160.	Kille galna FPC, Malegoan	05-09-2023	Bhima Shakti
161.	Narmada traders, Sangamner (MH)	26-10-2023	Bhima Shakti
162.	Prosperra genetics Pvt Ltd, Hyderabad	26-10-2023	Bhima Shakti
163.	Alamdar seeds, Kutch	26-10-2023	Bhima Shakti
164.	Alamdar seeds, Kutch	26-10-2023	BhimaKiran
165.	Rahimat purvi bhag shetkari producer company, satara	01-11-2023	Bhima Shakti

State-wise licensing of ICAR-DOGR varieties

ICAR-DOGRs’ recommendations are being used by onion and garlic farmers spread all over the country. Our technologies, especially varieties are licensed in 10 states of country. Maharashtra is largest producer of onion and therefore more number variety licensing (131) was done in this state.

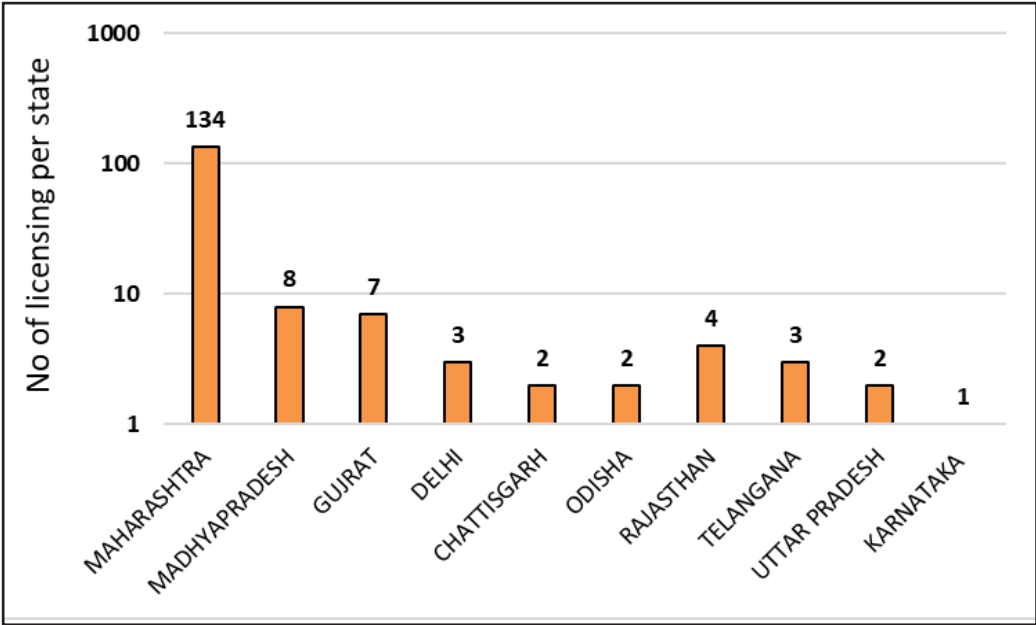


Fig 3:State-wise licensing of ICAR-DOGR varieties

Year wise technology licensing

Following the implementation of IP management and technology commercialization mechanisms within ICAR, there has been a continual increase in technology licensing. Notably, after 2019-20, there has been a remarkable

exponential growth in technology licensing of ICAR-DOGR. In the fiscal year 2021-22, ICAR-DOGR entered into 96 Memorandums of Understanding (MoUs), and in the subsequent fiscal year 2022-23, the Directorate signed 38 licensing agreements.

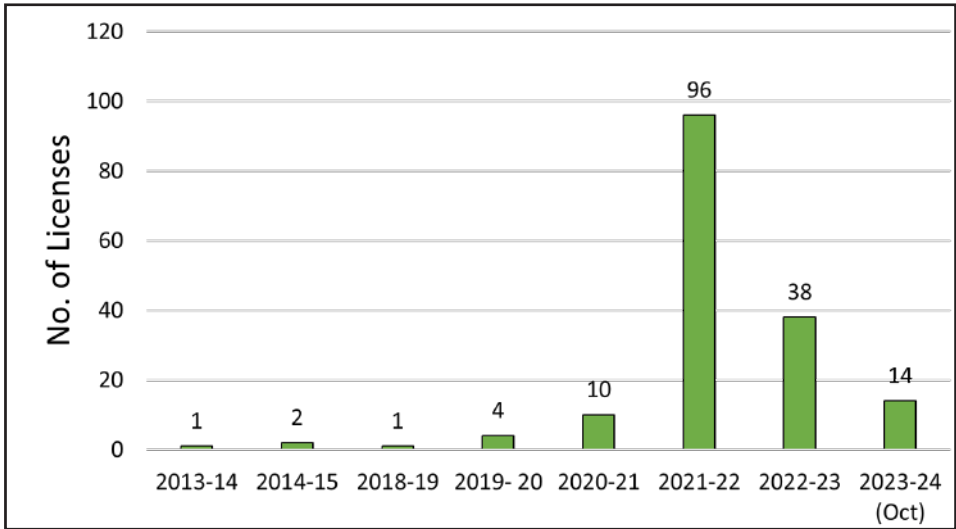


Fig 4: Year wise technology licensing

Year wise revenue generation from technology licensing

As the number of technology licenses grew, the revenue earned by the institute also surged. In the fiscal year 2021-22, the institute generated 96 lakh rupees through the licensing of onion varieties. Subsequently, in the year 2022-23, the institute earned 37 lakh rupees in revenue from technology licensing.

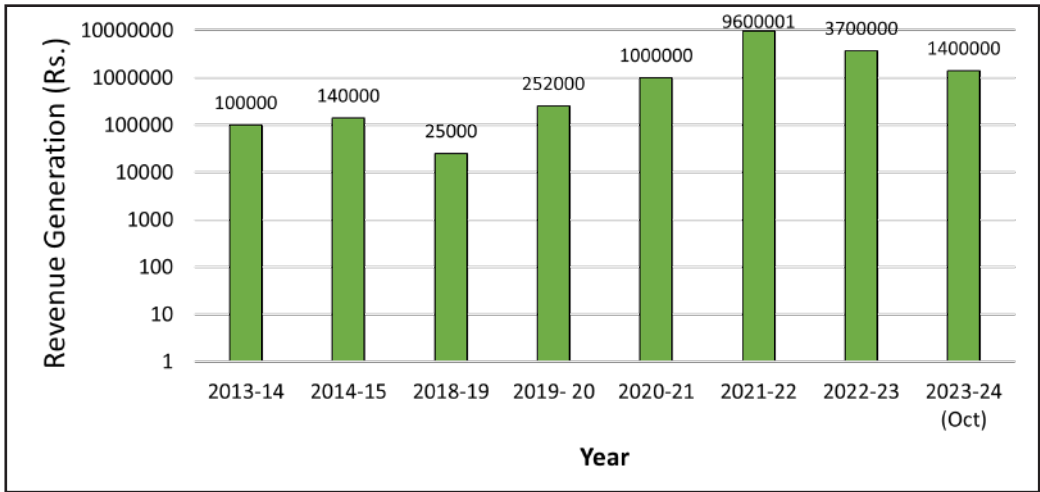


Fig5: The revenue generation from technology licensing

Top five technologies of ICAR-DOGR

Within the top five technologies, variety B. Shakti singularly contributes more than 45% of the total technology licensing acquired by the institute followed by Bhima Dark Red, Bhima Kiran, Bhima Super and Bhima Shubra. This substantial contribution underscores its popularity and the high demand among farmers and seed producers.

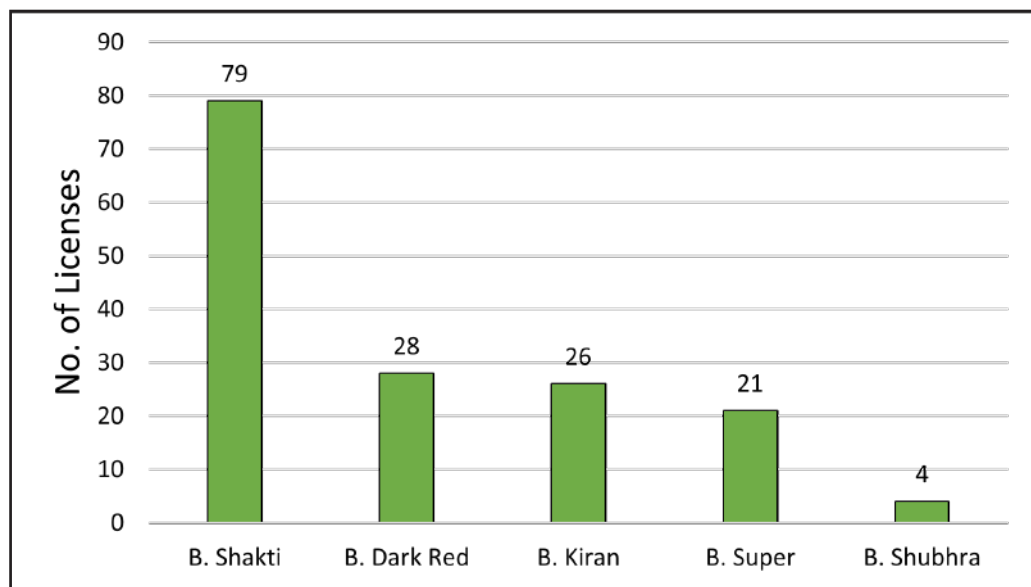


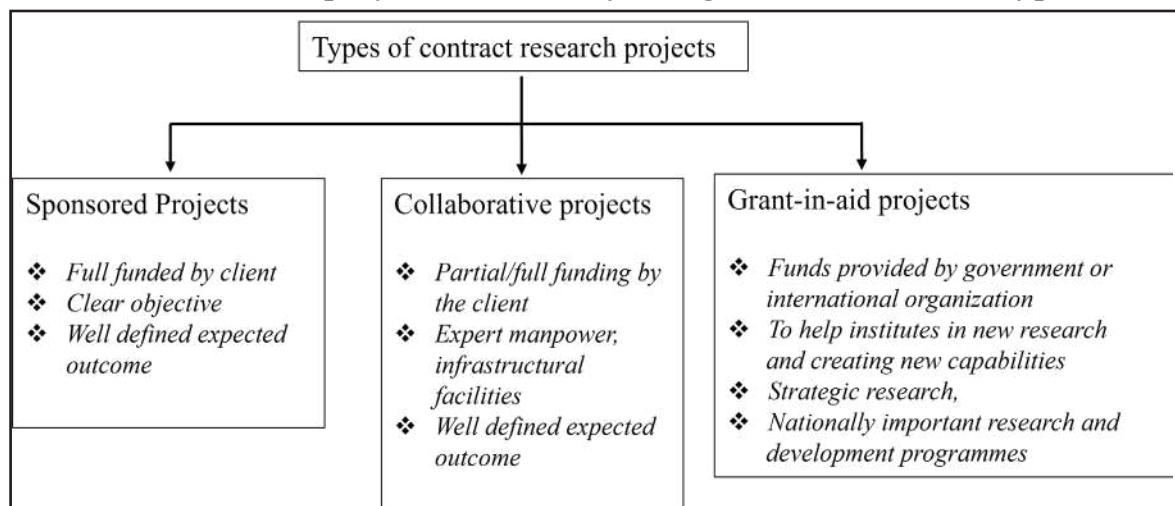
Fig 6: Top five technologies of ICAR-DOGR as per share in licensing

7. Contract Research

ICAR-DOGR engages in contract research trials in addition to its continuous research endeavours, tailored to meet the needs of stakeholders. Contract research involves conducting specific research activities through contractual agreements with external entities, whether government or private, aimed at advancing scientific knowledge, resource generation, refining existing knowledge, skills, and technologies, among other objectives. The research projects align with the mandated areas of ICAR-DOGR are conducted within that framework.

Types of contract research projects

Contracts research project are broadly categorised in to three types



Procedure for sponsored contract research

- Step-1: Interested agency/company/ organization need to express their interest by writing a mail or letter to the director of ICAR-DOGR for conducting contract research trial.
- Step-2: PME cell of ICAR-DOGR identifies the scientific staff of institute based on work load, qualifications, and experience followed by the approval of the Director.
- Step-3: PME cell then seeks proposal from ICAR-DOGR scientist and ensure that the proposal is in conformity with the rules and guidelines, and shall then submit the same along with recommendations to the competent authority (Director, ICAR-DOGR) in the proforma prescribed in Annexure CR-1.
- Step-4: After approval of the proposal, the contracting party will be

asked for signing of an MoU. ITMU of ICAR-DOGR will draft the MoU and take care of the IPR issues in the contract research proposal and ensure they are in conformity with the ICAR Guidelines for Intellectual Property Management and Technology Transfer/Commercialization. Key points in drafts are duration of trial, monitoring of trial and cost of contract research.

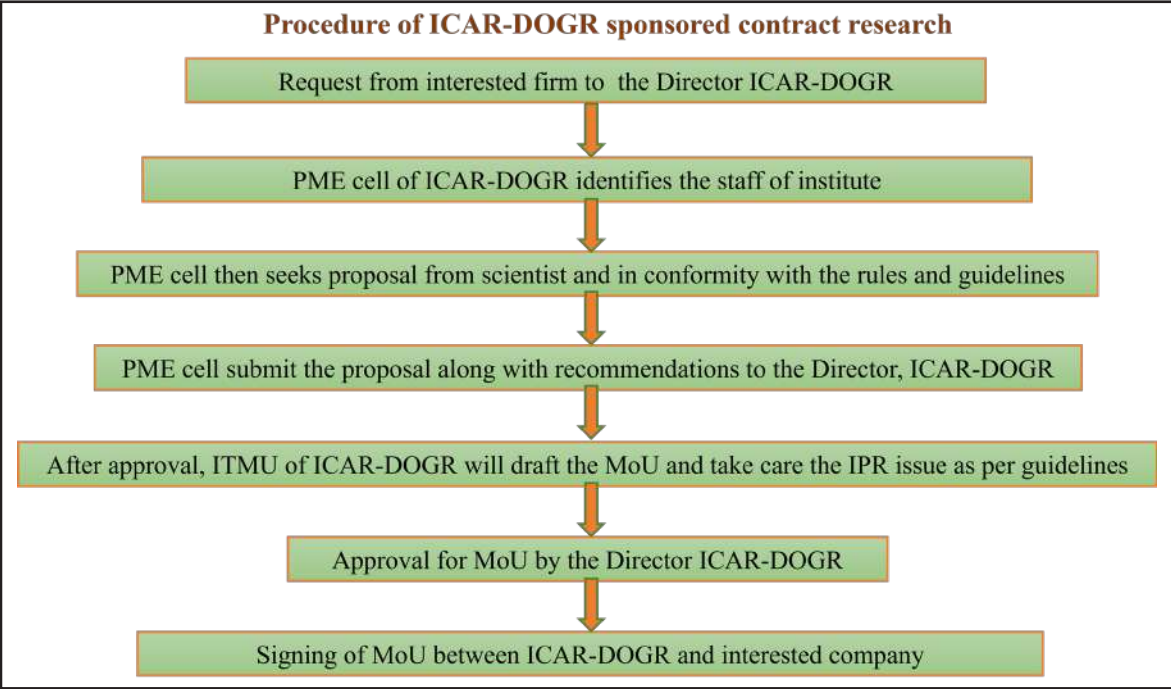


Fig 7: Procedure for conducting Contract Research trials with ICAR-DOGR

Sponsored contract research projects executed at ICAR-DOGR

From the fiscal year 2012-13 up to the current period, ICAR-DOGR has undertaken a total of 32 sponsored contract research trials, as outlined in Table 4. Among the various sectors, the maximum number of trials, totaling nine, were conducted in the Nutrients sector, followed closely by eight trials in the Fungicides sector, as depicted in Figure 8. Contract research trials were also executed for the evaluation smart storage structures and IoT based devices for minimizing post-harvest losses of onion.

Table 4: Sponsored contract research projects executed at ICAR-DOGR

Sr. No.	Company	Title	Project Investigator	Amount (Rs.)	Year of Contract
1.	Syngenta Pvt. Ltd.	Evaluation of Bio-efficacy of Thiamthoxam 14.1 + Lambda Cylahothrim 10.6% w/w (Alika) against thrips on onion for late kharif and rabi	Dr. Suresh Gawande	2,02,250	2012-13
2.	Syngenta Pvt. Ltd.	Evaluation of Bio-efficacy of Azoxystrobin 18.2%+ dienconazole 11.4%SCw/w (Amistae Top) against onion disease complex for two seasons	Dr. Suresh Gawande	2,25,000	2013-14
3.	BASF India Ltd., Mumbai	Evaluation of Cycloxydim 20% EC (BAS 51725H) with and without MSO adjuvants	Dr.Than-gasamy A.	3,35,000	2013-14
4.	Agrinos Pvt. Ltd.	Evaluation of high yielding technology products of onion	Dr.Than-gasamy A	1,70,000	2013-14
5.	BASF India Ltd., Mumbai	Evaluation of Bio-efficacy and phytotoxicity of Pyraclostrobin 12.8% + Boscalid 25.2% WG (Pristine 38% WG) against Purple blotch and Stemphylium blight of Onion	Dr. Vanita Salunkhe	3,35,000	2015-16
6.	Sulphur Mills Ltd., Mumbai	Evaluation of Turbo ZS on quality and yield of onion crop	Dr.Than-gasamy A.	4,60,000	2015-16
7.	Embio Ltd., Mumbai	Evaluation of Biomanure (BIOFIX) for onion production	Dr.Than-gasamy A.	4,60,000	2015-16

Sr. No.	Company	Title	Project Investigator	Amount (Rs.)	Year of Contract
8.	United Phosphorous Ltd. Mumbai	Evaluation of Water absorbent for onion production	Dr.Than-gasamy A.	5,00,000	2015-16
9.	Coromandel International Ltd., Secunderabad	Sulphur fortified NPKS 24:24:0:8 fertilizer in onion	Dr. Kalyani Gorrepati	4,03,000	2015-16
10.	Sea6 Energy Pvt. Ltd., Bangalore	Evaluating the effect of Sea6 Biostimulants formulations on the yield of onion	Dr. Pranjali Ghodke	2,70,000	2015-16
11.	UPL Pvt. Ltd. Val-sad, Gujarat	Evaluation of bio-efficacy of UPH 716 herbicide on weeds of onion	Dr. Yogesh Khade	4,44,000	2016-17
12.	BASF India Ltd., Mumbai	Evaluation of bio-efficiency, phytotoxicity of BAS 703 01 F (Merion 500 SC) against Purple blotch and Stemphyllium blight diseases of onion	Dr. Suresh Gawande	5,76,700	2016-17
13.	Syngenta India Pvt. Ltd., Pune	Evaluation of bio-efficiency, phytotoxicity and effect on natural enemies of VIRTAKO 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1%) on insect pests of onion crop	Dr. V. Karuppai-ah	3,80,550	2017-18
14.	Lean Crop Technology Solution Pune	To validate the use “LeanNutri” (Soil test and data algorithm based nutrient management solution in soil and onion)	Dr.Than-gasamy A	2,00,110	2017-18

Sr. No.	Company	Title	Project Investigator	Amount (Rs.)	Year of Contract
15.	UPL India Ltd	Evaluation of bio efficacy and phytotoxicity of Avancer glow fungicide against disease complex of onion.	Dr. Suresh Gawande	5,76,700	2018-19
16.	BASF India Ltd., Mumbai	Evaluation of bio-efficiency, phytotoxicity of BAS 22228 F against Purple blotch and Stemphyllium blight diseases of onion	Dr. Suresh Gawande	5,76,700	2018-19
17.	Lean Crop Technology Solution Pvt. Ltd., Baner Pune, Maharashtra	Forecasting of pest and disease incidence in onion using various climatological factors and also with hyper-spectral camera for earlier prediction of disease	Dr. Suresh Gawande	70,800	2019-20
18.	EI Dupont India Ltd. Hyderabad, Telangana	Evaluation of bio-efficiency and phytotoxicity of Picoxystrobin 7.05% + Propiconazole 11.71% w/w SC (Galileo way) against Purple blotch, Stemphyllium blight disease of Onion.	Dr. Suresh Gawande	6,80,506	2018-19
19.	BMH transmotion Pvt. Ltd., Nagpur	Evaluation of Natural draft onion storage technology	Dr. Kalyani Gorrepati	3,14,370	2019-20
20.	BASF India Ltd., Mumbai	Evaluation of bio efficacy and phytotoxicity of thiophanate methyl 450 g/l + pyraclostrobin 50 g/l (Xelora 500 g/l) against Aspergillus, fusarium and other seedling disease of garlic.	Dr. Suresh Gawande	6,96,790	2019-20

Sr. No.	Company	Title	Project Investigator	Amount (Rs.)	Year of Contract
21.	Kay Bee Bio-organics Pvt. Ltd.	Study of Bio-efficacy of Thrips Raze against onion thrips, Thrips tabaci Lindeman	Dr. V. Karuppai-ah	3,39,840	2019-20
22.	Sumitomo Chemical India Ltd.	Bio-efficacy and phytotoxicity evaluation of Paclobutrazol 40% SC (Plant growth regulator) on plant growth and yield of onion and its effect on succeeding crop for two seasons	Dr. Pranja-li Gedam	7,95,600	2020-21
23.	Biostadt India Ltd, Mumbai	To evaluate the efficacy of Amaze-X on onion with special reference quality and yield contributing parameters	Dr. Pranja-li Gedam	5,71,210	2020-21
24.	Sirius India Limited (Anglo American Crop Nutrients Pvt. Ltd) New Delhi	POLY-4 Rate Response Trial on Onion and Garlic	Dr.Than-gasamy A.	49,31,220	2021-22
25.	Smartchem Technologies Limited, Pune	Bio-efficacy of Bensulf SUPERFAST on Onion	Dr.Than-gasamy A.	14,80,900	2021-22
26.	UPL, Mumbai	Evaluation of Bio-Efficacy of Gph 1821 For Controlling Weeds in Onion	Dr.Than-gasamy A.	14,69,100	2021-22
27.	ITC mission Sune-hara Kal	Capacity building and demonstration of improved technologies to enhance water use efficiency in onion	Dr. Rajiv B. Kale	6,99,272	2022-23

Sr. No.	Company	Title	Project Investigator	Amount (Rs.)	Year of Contract
28.	TATA Steel Ltd, Kolkata	Evaluation of AgroNest Smart Warehouse in reducing storage losses & prolonging the storage life of Onions	Dr. Bhu-shan Bib-we	10,54,153	2022-23
29.	Godaam Innovation Pvt. Ltd., Nashik	Evaluation of IOT based device	Dr. Bhu-shan Bib-we	6,33,400	2022-23
30.	RCF, Mumbai	Evaluation of RCFs Nano Urea on Crop Growth, Yield and Quality of Onion	Dr.Than-gasamy A.	17,66,460	2022-23
31.	Smartchem Technologies Limited, Pune	Response of Onion to application of Croptek 8:21:21 on crop growth, yield, quality and nutrient use efficiency	Dr.Than-gasamy A.	7,69,950	2022-23
32.	Coroman-del Inter-national, Secundera-bad	Evaluation of Foliar Application of Coroman-del Nano-Urea in Onion Crop	Dr. Than-gasamy A.	8,05,527	2023-24
Total amount				Rs. 2,31,94,108	

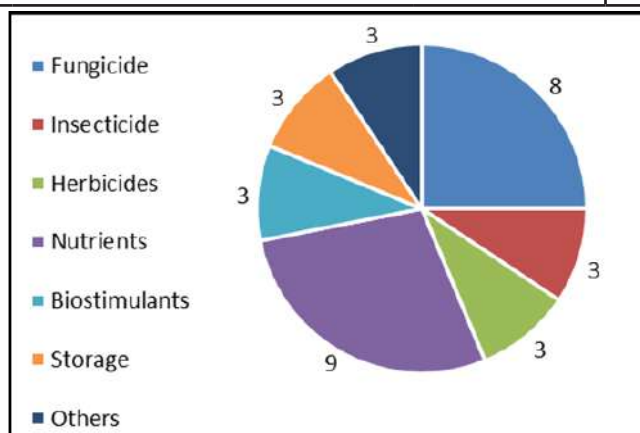


Fig 8: Sector wise contract research trials executed at ICAR-DOGR

8. Consultancy Services

Consultancy services play a pivotal role in facilitating the efficient transfer of knowledge, skills, and technologies to end users. They serve as a valuable avenue for scientists, generating revenue both for individuals and the institute. Moreover, consultancy services aid in the practical application of scientists' and institutes' expertise at the user level. These services encompass professional guidance extended to external agencies, offering scientific, technical, engineering, or other professional advice based on the expertise of scientists and the mandate of the institute.

Scope for consultancy services

There are several issues where ICAR-DOGR has expertise and can provide consultancy services for farmers as well as industries:

- Disease and pest management
- Package of practice for cultivation of onion and garlic
- Nutrient management
- Storage structure construction for onion and garlic
- Processing of onion and garlic
- Scientific seed production
- Export of onion and garlic

Table 5: List of consultancy services given by ICAR-DOGR

Sr. No.	Client	Title	Year
1	Lean Crop Technology Solution Pvt. Ltd., Baner Pune, Maharashtra	Forecasting of pest and disease incidence in onion using various climatological factors and also with hyper-spectral camera for earlier prediction of disease	2019
2	NED SPICE dehydration LLP, Gujarat	ICAR-DOGR technology and white onion varieties for processing and dehydration	2019
3	M/S Khemanand Dudh and Krishi company Ltd. Mumbai	Use and evaluation of onion production technology for processing purpose	2019

9.Public-Private Partnership

On realizing the importance of the Public Private Partnership (PPP) in the research and development, ICAR-DOGR has also initiated collaboration with the several private players for research area within mandate of institute. Areas of collaborations are storage, export, IoT, IT and UAVs etc.

Table 6: Collaborations by ICAR-DOGR with different stakeholders

S. No.	Collaborating Party	Purpose of Collaboration	Year
1.	Idea Forge Technology Pvt. Ltd.	To Understand and use of UAV base technology solution for Onion and Garlic	2017
2.	Devleela Lifescience Pvt Ltd., Raipur	Development of on-site diagnostic kits for the detection of onion and garlic viruses	2017
3.	Devleela Lifescience Pvt Ltd., Raipur	Generation of virus free garlic varieties	2017
4.	Kala Biotech Pvt. Ltd., Pune	Development of onion storage structure	2018
5.	Water shade Organization Trust (WTOR), Pune, Maharashtra	Dissemination of ICAR-DOGR technologies and development of GIS	2019
6.	Sanghar export, Pune, Maharashtra	Performance of ICAR-DOGR onion varieties during export to different countries will be studied	2019
7.	Godaam Innovation Pvt. Ltd., Nashik, Maharashtra	Internet of Things (IOT) based Onion Storage Study	2019
8.	Centre for Technology Alternatives for Rural Areas, Indian Institute of Technology, Powai, Mumbai, Maharashtra	Development of Storage Model/ System for enhance shelf life of onion	2020

S. No.	Collaborating Party	Purpose of Collaboration	Year
9.	Savitribai Phule Pune University, Pune, Maharashtra	Management of diseases and pest in Alliums	2022
10.	KissanKonnnect Farmers Producer Company, Ahmednagar	To popularize and develop value chain model of the underutilized alliums (<i>Allium tuberosum</i> and others species.	2022
11.	ESDS Software Solution Pvt. Ltd., Nashik Maharashtra	Development of Decision Support System and ICT based online platforms on various aspects Alliums cultivation	2022
12.	SAGE University, Indoor	Research on underutilised alliums	2022
13.	TIH Foundation for IoT and IoE, IIT Bombay	Collaborative research involving IoT and IoE	2022
14.	Vasantdada Sugar Institute, Pune	Evaluation of chitosan and other nano particles in onion and garlic	2023
15.	aIDEA, NAARM	Co-operation in incubation programmes of NAARM to promote entrepreneurship in Agri and allied sectors	2023

10. IP protection at ICAR-DOGR

ICAR-DOGR safeguards its technologies through various means such as patents, PPVFRA (Protection of Plant Varieties and Farmers' Rights Authority) registration, and Trademarks. These various forms of intellectual property protection ensure the preservation and legal recognition of ICAR-DOGR's technologies, preventing unauthorized use or reproduction by others while enabling the institute to benefit from its innovations.

Here are the details of the technologies protected under these different forms of intellectual property:

i. Patents

ICAR-DOGR secures certain technologies through patents, ensuring exclusive rights for the inventions. The patented technologies are listed below

- Patent granted for the invention titled “A storage structure for storing onion bulbs and a method thereof” (Patent No: 469459). Technology developed under Public Private Partnership with Kala Biotech Pvt. Ltd.
- Patent application submitted for the invention titled “Methods and systems for pest and disease management of onion crop(s)” (Application No. 202321081043) filed on 29-11-2023.

ii. PPVFRA Registration

Under the Protection of Plant Varieties and Farmers' Rights Act, ICAR-DOGR registers and protects plant varieties. The varieties registered under PPVFRA are as follows

Table 7: ICAR-DOGR Varieties protected under PPVFRA

Sr. No.	Variety	Registration No.	Certificate No.	Filing date	Certificate issue date	Protection up to
1	Bhima Dark Red	REG/2014/985	4621	25-4-2014	13-7-2021	16-10-2030
2	Bhima Shakti	REG/2014/984	4367	25-4-2014	6-1-2021	5-1-2036

3	Bhima Raj	262 of 2015	1946	1-7-2014	19-10-2015	25-12-2023
4	Bhima Shubhra	120 of 2019	3660	15-9-2014	10-10-2019	16-8-2030
5	Bhima Red	342 of 2016	2411	26-11-2015	22-10-2016	16-10-2030
6	Bhima Super	REG/2015/2018	4917	26-11-2015	17-1-2022	5-12-2031
7	Bhima Kiran	341 of 2016	2410	19-11-2015	22-10-2016	16-8-2030
8	Bhima Light Red	261 of 2020	4217	22-8-2017	4-8-2020	15-1-2033
9	Bhima Safed	115 of 2019	3655	25-10-2018	10-10-2019	15-1-2033
10	Bhima Omkar	427 of 2016	2496	6-6-2016	29-12-2016	16-8-2030

iii.Trademarks

ICAR-DOGR employs trademarks to safeguard distinctive aspects of its technologies. The protected trademarks include



- ICAR-DOGR logo registered for Trade Mark in year 2014 (application No. 2701085) and protection is valid up to June 2024.
- Application made for the registration of trademark of logo of ABI of ICAR-DOGR.

For technology licensing and research collaboration, please contact:

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