

THE POWER OF

SEEDS

The current world population of 7.6 billion is expected to reach 8.6 billion in 2030 and 9.8 billion in 2050 (UN), with much of this growth taking place in developing countries. Market demand for food will, as a result, continue to increase and place additional stress on agriculture-dependent developing countries. Dina Patel speaks to Venkatram Vasantavada, Managing Director and CEO at SeedWorks, and Rajasekaran Rajakumar, General Manager of Quality Assurance at SeedWorks, to find out how their organisation is helping to reduce this pressure by enhancing the productivity of farmers through its research and development efforts



rice is one of the most widely consumed grains in the world with more than 90 per cent produced and consumed in Asia. It is the basic staple for the majority of the population in this region, including the 783 million poor who live below the poverty line

(Ricepedia). Research by the US Department of Agriculture, released in 2019, showed India to be the second largest consumer of rice in the world – behind China (143,790 million metric tons) – with 100 million metric tons of rice consumed in 2018/2019 (Statista). It is therefore no surprise that seed is the basic and most critical input for sustainable agriculture (Seednet India Portal) and why the Indian government has introduced some programmes and quality specifications to support the seed sector.

India's Seeds Act, 1966, sought to regulate the production, distribution and sale of seeds and required every seller of seeds to meet minimum standards. To build on this, the government has, for the past few years, been working on a new Seed Bill that hopes to ensure the supply of modern, high-quality, cutting edge seed technologies to the farmers to enhance their efficiency and productivity.

Quality seeds

Seed manufacturer SeedWorks, has been producing genetically modified hybrid seeds of rice, cotton, pearl millet, mustard and vegetables since 1998 by harnessing technology, research and the latest innovations. Innovations include DNA fingerprinting, which identifies the genetic make-up of the genome of seed samples to maintain seed purity. Headquartered in Hyderabad, India, the organisation has been working on enhancing the potential of each seed to contribute sustainably to the world's growing demand for food.



Venkatram Vasantavada, Managing Director and CEO at SeedWorks, says the organisation's strong research and development capabilities provides its farmers with the chance to improve their farm productivity and income. Vasantavada is responsible for delivering profitability and ensuring high quality governance practices. "We leverage a lot of technology and innovation to create value for our stakeholders in a sustainable manner. Our mission is to provide superior seed solutions," he says. "We have 346 employees across the country working in agronomy, quality, supply chain, and in research and development (R&D). Our R&D is recognised by the Department of Scientific and Industrial Research (UK)."



Unlocking the potential of plants and leveraging it to tackle the major challenges facing sustainable farming is one of SeedWorks' tasks

Agriculture is becoming more and more challenging in India with increasing demands to feed a growing number of people. Climate change means that plants are becoming more important as a renewable resource for mankind. Vasantavada says unlocking the potential of plants and leveraging it to tackle the major challenges facing sustainable farming is one of SeedWorks' tasks. "SeedWorks creates diversity within a plant species by systematically selecting the plants with specific traits for agriculture cultivation. Our pathologists and entomologists support the breeding programmes with greenhouse and laboratory screening methods, designed for assessing the resistance to diseases and pests."



Rajasekaran Rajakumar, General Manager of Quality Assurance at SeedWorks, is responsible for high level planning for quality function considering present and



future business requirements. Rajakumar says: "Providing timely and accurate results is the prime responsibility of the quality function. We test around 50,000 hybrid seed samples a year and we are consistently increasing in our numbers. My team and I are responsible for the quality of seeds of all the crops that are handled by SeedWorks. We continuously work with our commercial team to understand the needs of the customers with respect to quality standards and to add value to the seeds through continuous improvement. We check the end-to-end process to improve and maintain the quality across the seed multiplication and handling stages, because the seed is handled so many times and passed through many different processing steps."

SeedWorks collaborates with national and international research institutes to strengthen its own research so that it can produce the right quantity of seeds on time, through a robust supply chain model, across different locations, and with a stringent quality control process. The organisation has quality procedures, policies and well-defined roles and responsibilities across the many different functions. Rajakumar says the company also continuously benchmarks the quality of its seeds with customer requirements through various surveys and trials. In addition to this, there is a complaint management system, which registers and tracks customer complaints through defined protocols and corrective actions.

Quality structure

Quality is vital to minimising errors during the production process and detecting defects at SeedWorks. Rajakumar says the quality assurance activities are set up around the monitoring quality in the fields, processing surveillance, and the end-to-end process audit for adherence to the crop specific quality protocols. The quality team ensures that each crop follows its own specific standards and that the resulting seeds have the best physical, physiological and genetic quality. "We have a physiology lab that assesses the physical quality parameters, such as physical appearance, insect infestation, admixtures, moisture and physiological quality parameters, like germination and storage potential," Rajakumar explains.

Error-proofing is a huge part of Rajakumar's role at Seedworks. "It is not acceptable to have even a very small number of defects, and the only way to achieve this goal is to prevent them from happening in the first place. At each stage of the seed multiplication, field auditing is done to verify adherence to the set quality protocols to minimise the defects," he says.

Quality protocols at SeedWorks include removing disease-affected plants and fruits to maintain seed health, and avoiding unintentional cross pollination and contamination.

SeedWorks employees work with 2.3 million farmers, helping them to improve farm productivity and income with Seedworks' latest seed technologies. For example, Rajakumar says only the best combination of seed protection chemicals are used to treat the seeds. This provides early protection from pests and diseases and results in a higher yield.

The organisation also provides better crop management practices to help farmers obtain the highest yield and income. For every 75 to 100 farmers, there is one quality auditor that will cover 100 acres of land. They are responsible for helping farmers harvest the hybrid seeds. The quality is monitored through various digital tools that are linked to SeedWorks' enterprise resource planning (ERP) system.

The organisation created a Digital Transformation team in early 2018 to reinforce a focus on providing superior seed solutions to the farming community using emerging technologies, such as artificial intelligence (AI), augmented reality and mobility solutions. "Just to give you an example," Rajakumar says, "Every crop has got critical stages in the crop cycle. Take cotton for example. There are three stages when the crop must be monitored very closely – pre-pollination, pollination and boll harvesting. The growers are happy because we are providing a lot of real-time information to them, which helps to improve productivity and gain valuable analytics. This is possible through a mobile solution called Siddhi, which is used by the field technicians to capture the grower cultivation practices, where the real-time data is synched to the ERP system. For example, the data driven advice sent to seed production farmers has increased the seed productivity for our rice hybrid 'US 312' from 546 kg per acre in 2015 to 751 kg per acre in 2019. This has created a significant impact in farmers' income, which has increased from 53,000 rupees per acre (2015) to 67,600 rupees per acre (2019)."

Continuous improvement

SeedWorks says it aims to exceed the guidelines for seed standards set by the Indian government for the maintenance of each crop.

The quality policy at SeedWorks facilitates the development of its staff to use the standardised and documented internal protocols to assess the quality of the seeds adequately and appropriately in a timely manner to ensure the seeds supplied to farmers meets the internal quality standards. The quality of the seeds is tested in a lab according to the rules for seed testing set by the International Seed Testing Association (ISTA). In addition to ISTA protocols, SeedWorks has in-house standardised protocols to predict vigour and storability of the seeds so



that they retain the quality standards until they are sowed. "These protocols are standardised after conducting well-defined seed technology experiments," says Rajakumar. "Following the ISTA protocols and data-based decision-making helps us to do our work right first time, every time."

ISTA is an independent international organisation that develops and publishes internationally agreed standard procedures for the sampling and testing of seeds. ISTA accreditation verifies whether a laboratory is technically competent to carry out seed testing procedures in accordance with the ISTA International Rules for Seed Testing, through a series of proficiency testing, document verification and on-site audit. Rajakumar says SeedWorks has prepared employees at all levels for the relevant training and is restructuring the organisation's quality documentation according to ISTA guidelines. Rajakumar hopes to receive ISTA accreditation for the lab in Hyderabad by the end of 2020. "Being accredited by ISTA shows that our lab is competent, staff are competent, and the test results are reliable. It helps to increase customer trust on the quality of seeds. Orange certificates issued by ISTA accredited labs are also well-recognised in international trades."

Safety is also an integral part of SeedWorks' operations. The layout at the centralised quality control laboratory at Hyderabad, for example, allows the testing of samples to be carried out in a safe way. Rajakumar says the flow of samples through the different workstations are charted and the lab is divided into two areas – sample preparation and sample analysis. The areas have been created to avoid contamination and unnecessary movement of samples. "The lab possesses the best equipment (hot air oven, moisture meters, vacuum seed planters, germinators and walk-in chambers) that help assess the quality of seeds," Rajakumar adds.

Continuous improvement is encouraged by top management at SeedWorks to maintain the quality of the seeds. Rajakumar says there is a lot of support and guidance that cascades down from the CEO. "Increased quality is a result of systematic analysis and improvement of work processes at SeedWorks," he says. "The quality team tries to involve employees across the organisation to review their current processes, to challenge themselves and ask what can be done differently or better. Continuous improvement isn't just about cost savings or efficiency, it's about adding value for our customers. For example, we have begun an efficiency improvement project with regards to cotton germination testing. We have increased the number of cotton seeds tested from 200 to 400 seeds before a batch goes out to the market, which increases the accuracy of data collected. This project began after three years of collecting data and speaking to key stakeholders.

"We also implemented a quality assurance dashboard system where the quality assurance is measured against KPIs for safety, lead time, test errors and customer complaints. Quality assurance managers are tasked with reviewing the performance at monthly intervals with their team and implement any corrective measures.

Future plans

The digital transformation team at SeedWorks, led by Vasantavada, has undertaken disruptive measures by adopting analytics, algorithms and artificial intelligence to automate various processes and decisions in the seed supply chain. The initiatives included advising farmers using Internet of Things technology, making more data-driven decisions through visual dashboards at operational levels, adopting digital tools for the purity testing of hybrid rice seeds, and advanced statistical modelling for the

yield forecast. AI has also been implemented for the analysis of physical purity in the paddy seeds, which Rajakumar says is five times faster than the conventional method (the manual observation of seeds under magnifiers to identify impurities).

SeedWorks is currently managing its manual and automated systems together as the company moves to process and decision automation using digital technologies. To manage the workload, every employee is required to undergo training and stringent proficiency tests before they can test the 50,000 hybrid seed samples that the organisation receives annually. Rajakumar says this, along with the manual supervision of existing processes, will carry on as the organisation looks at reducing manual intervention for monotonous work that can be completed by technology.

SeedWorks hopes that incorporating AI will help to reduce errors, particularly with testing the quality of the seeds. Genetic purity is one of the key quality parameters assessed before the seeds are released to the market. Rajakumar says the tests currently occur in the fields during the off season and take around 60 to 140 days. This poses challenges with regards to efficiency, speed and error reduction, all of which can be improved with testing in a controlled setting. Testing during the off season means that the data is not 100 per cent accurate. This is because of variances in weather, for example hot weather will affect whether the crops will grow.

"To combat this, we are in the process of developing a polyhouse (a specially developed structure where plants grow and develop under controlled climatic conditions)," says Rajakumar. "With a polyhouse, we can control the climate and make more accurate observations. We are also planning to expand our automated processes by adopting more machine learning tools for the various preparation and testing processes, for example, automated sample retrieval and automated germination and seedling evaluations."

A 2018 report published by the International Market Analysis Research and Consulting Group (a provider of market analysis and business intelligence), *Seed Industry in India: Market Trends, Structure, Growth, Key Players and Forecast 2018-2023*, claims India has emerged as the fifth largest seed market supplier across the globe. This is largely due to the work carried out by organisations such as SeedWorks and a result of the implementation of progressive policies by the Indian government (Seed Development 1988 and National Seed Policy 2002). The seed market in India is now occupying a pivotal place in Indian agriculture and is well-poised for continued growth in the years to come. ■