

SATHI- An initiative for assuring quality seed supply to the farmers

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Seed is a critical determinant of the agricultural productivity which decides performance and efficiency of other agri-inputs. Supply of quality seed of high-yielding varieties/hybrids certainly enhances crop productivity. With the objective of ensuring quality seed production and distribution chain, Department of Agriculture and Farmers' Welfare has designed the digital platform 'SATHI-Seed Authentication, Traceability and Holistic Inventory'. SATHI provides information about every seed multiplication generation starting from nucleus seed production and lifting to multiplication in subsequent generation to the distribution of certified seed among farmers through registered dealers for the empowerment of the farmers. SATHI provides digital ecosystem to the seed sector that enhances the quality of the seed and provides single digital platform to all stakeholders like seed growers, seed processors, seed certification agencies and input dealers. Digital traceability of the seed through different modules of SATHI portal saves time significantly in seed growers' registration, field inspection, generating reports, field inspection, reports on seed testing in laboratories and seed certification.

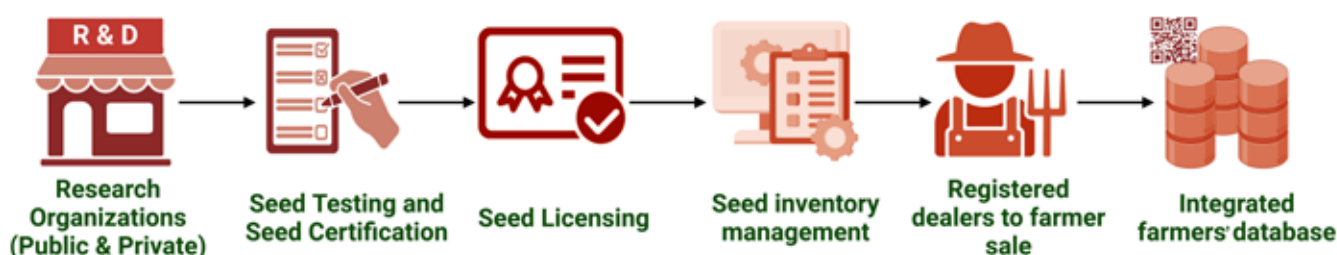
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A sustainable and healthy seed system provides quality assurance and access to high quality seed of high-yielding varieties/hybrids of wide range of crops, at the time needed with a fair price to all those who are in need of such information. Hence, a healthy system works well when all farmers have easy access to quality seed in accordance with diverse demands and preferences with sufficient quantity during sowing season. Therefore, seed system plays a crucial role in the ensuring food security which is not a mere priority but an existential necessity for ever-growing global population estimated to cross 8.5 billion in 2030. Under globalization, the people are becoming curious about the food they eat and they want to know everything about the food, from its origin (production site and management) to market from where

they purchase for consumption. Seed is the first and foremost origin of food products and the global seed market valued USD 63 billion in 2021 with a growing pace of CAGR 6.6%. Currently, the Indian seed industry is growing at higher pace than to global seed industry with the market value of USD 6.3 billion and rising with a pace of CAGR of 12.43 %. This tremendous growth in seed industry provides quality seeds of several varieties of a single crop. However, inadequate information in seed production, processing, availability of quality seed to the farmers, and maintenance of seed chain are still concern. Lack of digitization in seed ecosystem is the major drawback in ensuring availability of the quality seed, therefore, Digital Seed Traceability system is the need of an hour to solve seed related issues and curb the pilferage in seed business that results in poor productivity in

many crops.

Seed traceability is a way to track and record the journey of seeds from their origin to the farmers i.e. end user to ensure the authenticity, genetic purity, seed vigour, germination, and physiological quality of seed by bringing transparency related to quality, expiry, counterfeiting and accountability in the seed supply chain. The Department of Agriculture and Farmers Welfare, Govt. of India took initiative in collaboration with National Informatics Centre (NIC) to launch a digital platform named SATHI to provide digital ecosystem for seed sector and to empower farmers with assurance of quality seed. SATHI portal was launched on 19th April 2023 and it is digital approach to trace complete journey of seed during seed multiplication generations starting from nucleus seed to breeder seed, breeder seed to foundation seed, foundation



Only certified seed can be sold by registered dealers to registered farmers

Six pillars of seed supply chain

to certified seed and distributing the seeds to end user through licensed traders. SATHI available at <https://seedtrace.gov.in>, brings all seed actors of nation [Breeder Seed Production Centres (BSPC) like Indian Council of Agricultural Research (ICAR) institutes, Agricultural Universities, National Seed Corporation (NSC), State Seed Development Corporations, breeder seed producers, seed growers, seed producing agencies (SPAs), seed processing plants (SPPs), seed certification agencies (SCAs), state and central seed testing labs (STLs), seed sellers - wholesalers and retailers, state governments and farmers, etc.] on a single window for maintaining transparency, and ensuring the timely and accurate distribution of high-quality seeds besides eliminating the potential spurious seeds from the seed chain.

Challenges addressed by SATHI

SATHI is a digital innovation that offers the robust solution to various challenges of agriculture and seed sector by filtering the spurious seeds and fostering effective linkages among seed actors of seed system with compliance to regulatory standards of seed business. Some of the following challenges will be addressed by SATHI.

Quality assurance and empowerment of farmers: Traceability of complete journey of seed from origin (production site) to end user use, will ensure availability of authenticated quality seed to the farmers that will certainly lead to higher crop productivity with less loss due to abiotic and biotic stresses and genetic impurities. High quality seed will ensure higher crop

productivity which ultimately helps in empowerment and upliftment of economic status of the farmers. SATHI strengthens the linkage between seed producers, farmers and seed providers (traders) that will help farmers to get first-hand knowledge of variety and farming practices directly by seed providers.

Productivity enhancement: Transparency, visibility and accountability of seed actors in the seed supply chain will ensure that farmers receive quality seed which will ultimately lead to higher agricultural production, productivity and better economic returns from unit area of cultivation.

Effective and sustainable seed supply chain: Bringing automation in seed production, seed certification, licensing and inventory management enables live monitoring of seed in supply chain. Digital seed ecosystem reduces time in registration, inspection, certification and generation of testing reports etc. by reducing manual intervention for timely distribution of quality seed.

Food security: Need for food is continuously, rising to feed the growing population and seed is the basic foundation for crop production and productivity enhancement. Therefore, seed quality and health is inextricably linked to sustainable food security. Digital ecosystem of seed supply strengthens the seed supply chain and farmers will gain comprehensive story of purchased seed bags that will prevent any deceptive practices within the seed supply chain.

Economic growth: Higher crop productivity will enhance economic prospects of farmers as well as of

nation. Digitized supply chain will strengthen seed export business by assuring enhanced quality and productivity, and also saves time to reach export compliance.

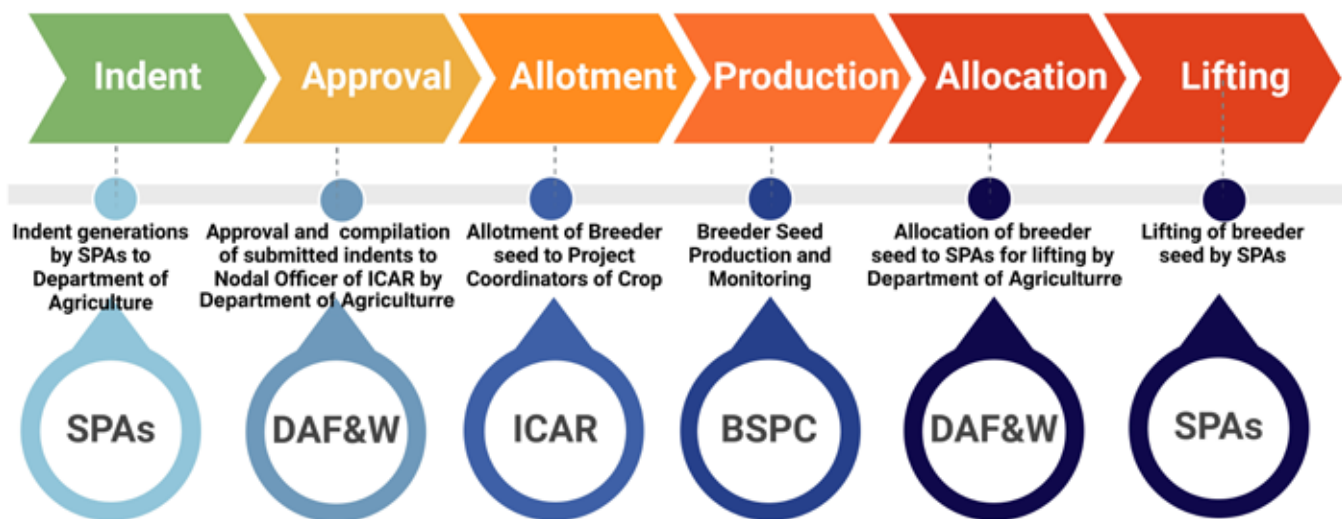
The SATHI portal will be implemented in two phases. Phase 1 of the project will cover only seed production and certification activities (traceability of seed multiplication generations from nucleus seed to breeder seed production, breeder to foundation seed and foundation to certified seed process). In Phase 1, seed growers, seed processing plants and state seed certification agencies will be involved. While, Phase 2 of the project will include the seed distribution and seed trade by covering seed dealer licensing, seed supply chain and inventory management, etc.

Features of SATHI portal

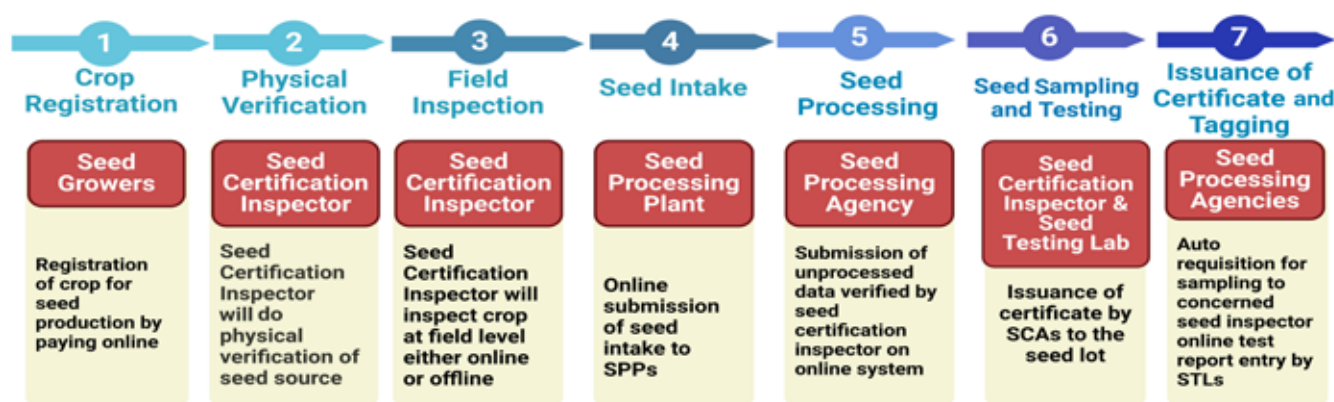
End-to-end seed traceability: Every seed bag will speak its own story from inception to end of their lifecycle. It enables the identification of seed sources, varieties and quality since from nucleus seed to the distribution to the farmer.

Automation of breeder seed processes: Automation of breeder seed production will ease the cumbersome process and make it user-friendly. Automation and digitalization of breeder seed will avoid the manual processes like indent submission and compilation, allocation, allotment and breeder seed lifting that will enhance efficiency.

Digitalization of seed certification process: Digitalization of seed certification process (registration, field inspection, sampling, testing and issuance of



Nucleus to breeder seed production, monitoring and distribution



Seed certification procedure

certificates and tags) will make process transparent, easy and convenient to save time and reduce manual paper work and make seed certification system more efficient.

Real time monitoring of seed demand and supply: The portal will provide real time picture of demand of breeder seeds and complete supply chain for timely response to fill the gap.

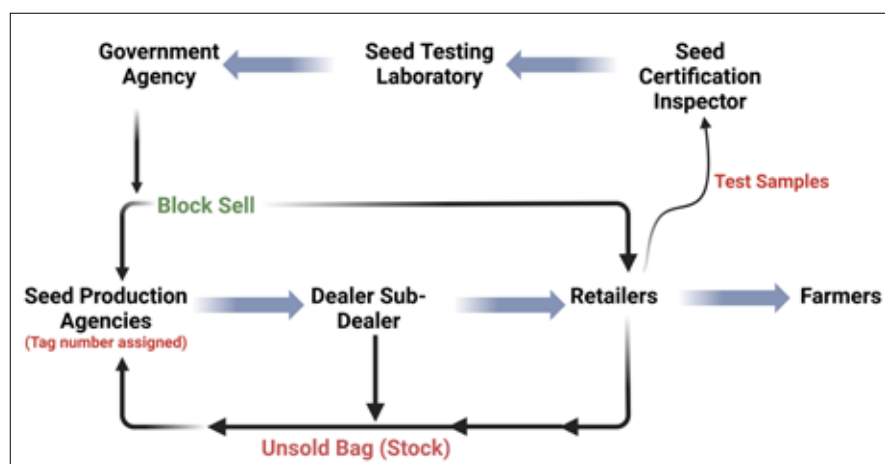
Reduced paper work and GIS enabled online field inspection: The digitalization is an ecofriendly system and reduces paperwork. Field inspection is more efficient as it is done using mobile/tablet application with live location information.

Digitalized seed dealer process: Digitalization in registration and licensing process facilitates dealers for tracking their applications and on administrative side easy to streamline the process.

Real time monitoring of inventory and sales: Ease of doing business at dealer and retailer level by keeping all the records of inventory and seed sales to farmers with generating online slip enables system more efficient to track demand and supply.

SATHI portal is a kind of block chain technology and it is pivotal

to set up 'Seed Block Chain' for developing more trust and authentication. To address the complex challenges associated with end-to-end visibility and monitoring of seed, SATHI portal is designed to resolve the issues associated at different stages of seed sector by developing different modules.



Seed bag movement

Table 1. Modules developed under SATHI portal

Module	Actions
Breeder seed management	• Registration of breeder seed indents, indenters and compilation of indents • Breeder seed indent generation to breeder seed producing centres (ICAR, SAU's/CAU's, NSC, etc.) • Registration of breeder seed production centres • Allocation and lifting of breeder seeds • Issuance of breeder seed labels
Breeder to foundation and foundation to certified seed production and seed certification	• Registration of seed growers, seed production agencies (SPA), seed processing plants (SPP) and state seed certification agency (SSCA) • Verification of seed sources and seed classes required for seed production • Field inspection and generation of inspection reports • Seed processing schedule, seed sampling, seed testing and generation of reports • Issuance of certificates and seed tags from Tag register
Seed dealership	• Ease of doing business by online application, licensing, and renewal of licensing • Coordination between state and district level dealer with the help of dealership application module • Geotagging of sale points
Seed inventory and seed sale	• Stock management to maintain inventory accurately and efficiently • One integrated system for inventory along with accounting • Generation of sale slips

SUMMARY

SATHI portal has been developed with the objective of ensuring good seed supply for good fields to ensure higher yields of seed being multiplied with assurance to ensure the availability of quality seed to all farmers preventing spurious seed from the seed ecosystem. SATHI is a multitenant application portal that brings all national seed stakeholders on a single platform to make monitor the journey of every seed bag to tells its own story. This system prevents the malicious mixing of substandard, spurious or duplicate seed tags/bags into the seed ecosystem and permitting the sale of seed bags exclusively sourced through authorized channels. The ultimate goal is to create healthy and sustainable seed ecosystem to empower farmers and ensuring food security of nation.

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HANDBOOK OF INTEGRATED PEST MANAGEMENT

To reverse the loss of environmental resources and also to reduce biodiversity loss, the Government of India has Integrated Pest Management (IPM) as part of the National Agricultural Policy. Integrated Pest Management emphasizes the growth of a health crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms. IPM is not new – mechanical, cultural and biological tactics were used by farmers for hundreds of years before chemical pesticides became available. Besides, there are IPM techniques that have been developed more recently and are effective in suppressing pests without adversely affecting the environment.



The task of spreading the message of IPM across is tough due to poor awareness about the subject among people in line-departments as also among the farmers. The information on integrated pest management as a whole is scattered. This *Handbook* comprehensively deals with all the aspects of integrated pest management in field crops, horticultural crops under traditional, protected systems. Information on basic strategies and tactics of different methods of management including mass production of biocontrol agents, IPM policy and pesticide registration is provided in comprehensive form.

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TECHNICAL SPECIFICATIONS

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