

Onion Transplanter

National Second
Farm Machinery and Food Processing Technologies

Pandharinath Sarjerao More
Ahmednagar, Maharashtra

Scout: G M Bhise/ Late Ramesh Mahajan



The task of transplanting onion seedlings manually is time consuming, labour intensive and toilsome process. PS More (66), a farmer and an innovator, has developed an affordable, semi-automatic transplanter for timely sowing of onion seedlings. He has also laid no restriction for anyone to copy and use his technology, and in fact wants the technology to diffuse widely for the betterment of the farmers.

Pandharinath has 33 acres of irrigated land in his village, Sangavi Bhusar where he grows sapodilla, guava, gooseberry, drumstick, sweet lime and mango. Few years back he grew sugarcane, soybean, wheat and onion but 2006 onwards, he switched over completely to horticulture. His village, with rich farmlands, is located on the banks of the river Godavari and is about 45 km from Shirdi. The area is rich in black soil and agriculture is the mainstay of the people.

His father, late Sarjerao More, was a trader of farm implements and had an agency in partnership dealing in Caterpillar farm machines. Pandharinath,

the youngest among five siblings, graduated in arts from Fergusson College in Pune. During this period, he developed a keen acumen in mathematics and physical sciences, which helped him later in his analytical approach leading to refined innovations.

He was keen to pursue his MA, but his father asked him to return and take charge of the farm. In 1967, he married Meeradevi. He has two sons and one daughter. Both his sons have completed their respective diplomas in Mechanical engineering and Printing technology, and now assist him in the farm. His daughter, a state hockey champion, discontinued her diploma in engineering and is married to a chemical engineer posted at Ahmednagar.

Over the last five decades, Pandharinath has donned hats in multiple areas. He has developed solutions in the field of farm implements, agricultural machinery, electrical systems, horticulture, low-cost housing, rainwater harvesting and water conditioning systems.

Genesis of innovation

In the year 2000, Pandharinath, on a pilgrimage to Pandharpur, was sitting devotedly and listening to *bhajans* (devotional songs). A line in a *bhajan* by Saint Tukaram *meant* "paras also cannot make gold without touching iron" struck in his mind. This line moved him a lot and he resolved to use his skills to improve the lives of fellow farmers.

Many of his subsequent innovations including the onion transplanter were born as a result of this resolution. Farmers in south Maharashtra cultivate onion as a cash crop during the Rabi season from October to January. This is done by transplanting 8 to 10 weeks old seedlings. Transplanting is one of the most labor intensive operations in onion cultivation. When pencil-thick, onion seedlings are transplanted as soon as possible in permanent, slightly raised, precision-leveled "panels" in the field, and watered regularly after bulbing.

Pandharinath observed the scarcity of skilled farm workers in the planting season. Even when adequate farm hands were found, lot of expense was

incurred in bringing them from their villages to the farm every day. As for quality harvest, accurate row and plant spacing and handling transplants without damage was required, he decided to build a device to mechanize the sowing of onions.

He failed in his initial attempts to make a fully automatic version. The problem lied in separating, picking up and dropping individual seedlings. However, on 14th January, an idea clicked his mind and everything else fell into place. He did not sleep for the next four days as he burnt the midnight oil, building and iterating the parts. Surviving a major mishap when a cutter wheel flew off while testing and struck his chest, he continued unabated. As the sun pierced the wintry dawn on 19th January 2005, Pandharinath stepped out of his workshop. He asked his wife to prepare *pakodas*...it was time to celebrate.

Spending a month on various configurations, he was finally able to build a semi-automatic working model in 43 days at a cost of Rs 18,000. About his experience he says, "*Chetanwadi dimaag mein jad bhi bolne lagti hai, pyaaz ka paudha bhi mere se bolne laga tha...*" (Even inert things communicate to aware minds, the onion plants were talking to me...).

Innovation

Pandharinath's onion transplanter is a tractor drawn semi-automatic unit. It can perform three functions at a time *viz.* transplanting the onion, applying the fertilizer and making the irrigation channels.

The unit assembly consists of a cultivator frame, fertilizer box, fertilizer conveying tubes, trays for keeping the seedlings, two ground wheels, furrow openers, chutes to deliver the seedlings and seating arrangement for up to four people.

The working width of the equipment is 4.5 ft with 8 furrow openers. The weight of empty machine is 3 ton. The additional fertilizer drilling arrangement weighs 0.5 tons. The machine needs rotavator operation prior to the planting operation.



It can be retrofitted to tractors in the 22-35 HP range using a three point linkage system. When the tractor moves forward, the star wheel type metering mechanism gets the drive to release the fertilizer in the tubes. On the field when starting, the speed of operation is kept at 1-1.5 kmph. The seedlings are delivered manually in the delivery chutes for planting. The inter-row and inter-plant spacing can be adjusted in the machine to a finer level. The row to row distance of 7 inches and plant to plant distance of 3.5 inches can be maintained using this machine, whereas conventional methods usually achieve a distance of 9 inches and 4-5 inches, respectively. Two depth controlling wheels fitted on either ends of the equipment maintain the uniform depth of onion planting, which is kept at 1 cm.

In the conventional method of planting, it is very difficult to maintain straight rows, which is a barrier in mechanical weeding. However, this machine facilitates the mechanical weeding thereby reducing the cost of weeding. It can cover one hectare per day (2.5 acre/day) using a driver and four workers.

This is superior to the coverage of 0.05 hectare per day achieved in conventional methods using the same number of people. At Rs 1000 per hectare, this machine achieves a cost savings of 80 per cent in transplantation cost in his region.

Also, in the conventional method of onion planting, roughly 1, 70,000 to 1, 90,000 seedlings per acre are transplanted using 40 people whereas 2, 25,000 seedlings per acre can be transplanted using this machine. Using this machine, owing to the uniform furrow and spacing, mechanical harvesting of onion becomes easier once transplanting has been done. This also results in uniform bulb size, which fetches a good price in market.


The machine eliminates the inaccuracy, drudgery, low yield and high labor costs of manual planting and can also be used to sow seeds of cereals and pulses.

There are various types of seed transplanters available viz. disc type furrow openers (US 4622906), mechanical planters with spot planting mechanism through spot holes (US 4807543), runner type furrow opener (US 3108551), mechanical seedling transplanter with electronic controlled system (US 5823126), mechanical transplanter with roto-till or mini-mulcher unit in dual row arrangements (US 060308) and a few others.

However it was found that most available semi-automatic or automatic transplanters are equipped with disc type press wheels and or wedge shaped runner type furrow openers, well suited for the raised bed cultivation. The advantage with this machine is its unique design of blunt nose furrow opener for planting with fertilizer dispensing arrangement. Moreover, it is a dedicated vegetable transplanter for onion seedlings, with controls on row, plant spacing and depth with 100 per cent utilization without damaging the onion bulb while planting.

The open source model

More made one transplanter for himself and thereafter declared the technology as open source for people/firms to manufacture/sell as per the



requirements. Though Pandhurinath did not want a patent for this machine, NIF filed a patent in More's name in 2008 to keep the legal rights with him. However, no restriction in the copy and use of the technology has ever been implied. Some manufacturers in nearby Pune and Nashik apart from some in Ahmednagar have been manufacturing and selling the transplanter to customers. On an average, the Onion transplanter costs Rs. 30,000 with a fertilizer drill and Rs 18,000 without it.

Users' feedbacks indicate that the machine has bettered their profit margins and improved their savings. Some users also give the transplanter on rent on per acre or per day basis. Onion is the most important crop among various alliums grown in India and occupies an area of 3, 20,000 hectares. The total production is 3.35 million tons with an average yield of 10.5 tons per hectare. There has been a steady increase in area and production of onions in the last decade. India exported 4, 16,000 tons of onion valued at Rs. 1630.6 million, which accounted for about 75 per cent of total foreign exchange earning among fresh vegetables. Thus, there appears to be a huge potential for this machine. While some customers do not use the fertilizer drilling feature, the performance of the machine has been appreciated by farmers as well as professionals from Directorate of Agriculture, Govt. of Maharashtra and National Research Centre for Onion and Garlic, Rajgurunagar, Pune.

Journey of innovations spanning decades

More started early. Once, while in third standard, he spent hours observing a craftsman make a duplicate key at his home. When he went out for lunch, he quickly took up the tools and fashioned a duplicate key of his room. This incident not only generated confidence in him but also incited him to look around and learn.

Learning by experience in his farm, by 1968, he had mastered many trades. He was an expert in motor winding, modifying tractor and bullock operated implements, and delivering engines and threshers with enhanced performance. He also started developing metallic farm implements that were more durable than wooden implements prone to wear and tear.

The next year, in 1969, he developed an improved bullock operated seed drill. It was an automatic model with a dedicated orifice type metering system and 4 furrow openers. It was also 40 kg lighter than the then existing conventional machine developed by Rauri Vidyapeeth. The seed drill changed Pandharinath's life in many ways. The Chairman of the local sugar factory saw the efficacy of this drill and asked his father to open a workshop for him. On 10th Feb 1970, his father opened a workshop for him so that he could continue his research and development.

In the next five years, he made and sold over 1000 seed drills in Maharashtra. But the very success and dispersion of the seed drill caused a few issues. By the year 1975, he faced the twin threats of product saturation and a spate of copycats who did a poor job of even copying his designs. He also lost his workshop in a family separation case. As a result of which the production and sale of the seed drill stopped after its successful golden run.

In 1990's he worked on the rain water harvesting concept and improvised it. In 2003, he made a biomass digestion plant. Same year he also developed an automatic water pump controller and a water conditioner. The water pump controller is based on the principle of float and can automatically switch on/off a pump. It is a very simple design and can be made by any one having preliminary knowledge of electrical. It took him three years to develop the water conditioner, which can treat the highly alkaline water in a village. This technology is customized as per the soil and water type. It integrates three facets of water conditioning. This includes a venturi like geometry combined with magnetic and catalytic methods. He used a mix of 16 ingredients (powder of semi-precious components) to condition the water. Educated farmers who could measure and monitor the soil chemistry were given access to this technology by him. He has sold a few hundred pieces in Maharashtra and some even in Chennai, Kanpur, Hyderabad, Goa and a few places in Gujarat. This water conditioner can be used for domestic as well as agricultural purposes.

He also developed an improved biogas stove, having a new nozzle design fabricated in copper instead of CI and fitted with a modified burner. The unit



manages to separate hydrogen sulphide and moisture from the gas. It has been claimed to have increased the efficiency by over 50 per cent.

His trail of innovations over four decades has resulted in receiving many awards. The then Speaker of Lok Sabha and Kulpati

Dhyaneshwar University of Pune felicitated him in May, 2003 for his contribution to agriculture. He also won the *Baliraja Jagrit Vachak Patra Puraskar* in 2005 and awards during Sevar Falotsav from 2004 to 2007. He was awarded the *Pragatisheel Krishak Samman* by the Indian Society of Agriculture in 2007 and *Lekhan Puraskar* by Baliraja Marathi Vaigyanik Parishad for Krishi Sansodhan in the same year. Recently, he was awarded the '*Krishi Bhushan Samman*' by Maharashtra Government in July 2009 for the water conditioner, onion transplanter and other innovations. He has also been well covered by local and national print and electronic media. ETV, ZEE Maharashtra and DD National and news papers such as Sakal and Times of India have have featured his innovations.

“Ye to bhagwan ki di huvi bhent hai, aur bhagwan to kabhi apni vastu par patent leta nahi, to fir unki gift par patent kyun? Ye to sabki pahunch main hona chahiye”

(The knowledge I have is a gift from God. God never get his knowledge patented. Why should I get patent over his gift, let this knowledge be accessible to all)

While many villagers do not share his altruistic approaches, they have great regards for the quality and relevance of his innovations. At the age of sixty-six, Pandharinath leads a pious, active and disciplined life. Waking up much before dawn at 3.30 am, he absorbs himself for three hours in *puja* before walking six kilometers to work. He, in his own way, has imbibed the hoary *Bhakti* traditions of Maharashtra. He is an ardent devotee of Saint Gyaneswar Maharaj and this has shaped his values and social approaches. Using an open source model, he has allowed free access to the general public and manufacturers to build and sell his innovations. He mentions the following to answer skeptics who find it hard to believe his open source approach.

