

Biodata and Achievements of Anil K. Rajvanshi

Dr. [Anil K. Rajvanshi](#) is a thought leader and his achievements can be classified as follows:



1. **Development of pioneering renewable energy technologies and devices for rural areas.** In this he has tried to use the best tools of science and technology for rural development. This is a clear departure from the existing practice where rudimentary or so called “appropriate technology” is used for rural areas. His efforts have inspired the development of such devices world over.
2. **Development of national policies and philosophy of sustainable rural development.** This has been done through his extensive writings in journals, newspaper articles and on the net and being member of various government bodies.

Background information

[Anil K. Rajvanshi](#) has been the director of the [Nimbkar Agricultural Research Institute \(NARI\)](#) at Phaltan, Maharashtra since 1981. NARI is a private non-profit NGO working in rural India. It is a registered trust and does pioneering work in the areas of agriculture, renewable energy, animal husbandry and sustainable development. Dr. Rajvanshi is also the trustee and honorary secretary of NARI. He has concentrated his efforts for last 30 years on how to use high tech modern science and technology to achieve environmentally sound rural development. Dr. Rajvanshi’s research has therefore spanned a whole spectrum of areas affecting the lives of rural population. These have included among others renewable energy based cooking and lighting for rural households; power generation – both small scale and on Taluka level from agricultural residues; electric cycle rickshaws; water purification and effluent treatment through the use of renewable energy in environmentally sound way.

Dr. Rajvanshi was born and raised in Lucknow, India. After obtaining B.Tech. and M.Tech. degrees in Mechanical Engineering from **I.I.T. Kanpur** in early 1970’s, Dr. Rajvanshi went to USA to pursue a Ph.D. degree at **the University of Florida** in Gainesville, U.S.A. He received his Ph.D. in mechanical engineering in 1979 with specialization in solar energy and then taught at the University of Florida for two and half years before returning to India in 1981 to join NARI. He left a very [lucrative career in U.S.](#) to come and work for rural development in India. Dr. Rajvanshi established the energy and sustainable development work at NARI from scratch to make it nationally and internationally known. He has directed its activities in these areas since 1981.

Technology Development

Household cooking and lighting

With the help of his colleagues, Dr. Rajvanshi has carried out research in varied subject areas, which were selected based on perceived needs of local rural population in and around Phaltan.

For example, during his early stay in 1980s at Phaltan (a rural town) the electricity situation was not very good resulting in frequent blackouts. This made him start work on developing an improved and very efficient liquid fuel lantern. The designing of the lantern required very sophisticated tools of heat and mass transfer, combustion and fluid dynamics. This lantern christened **“NOORIE”** is a multifuel one and runs on kerosene, diesel and low concentration ethanol. According to knowledgeable experts in the area of liquid fuel lighting, development of NOORIE lantern was the first major advancement since early 1920s in lantern technology. It is much more efficient than the existing available designs and is much easier to light. Besides, it also doubles as a small cooking stove. There is a good demand for Noorie lanterns both internally and for exports.

Recently the concept of Noorie lantern has been expanded into **kerosene Lanstove**. This device simultaneously provides excellent light and cooks a complete meal for a family of five. Lanstove is being **extensively tested in rural huts** around Phaltan. Working with rural poor during lanstove testing also showed that rural poor eat nutritionally very poor diet. This led Dr. Rajvanshi to develop a concept of **rural restaurants** which is being actively pursued by various Government and International agencies as a viable way for improving the nutrition of rural poor.

In developing kerosene lanterns, Dr. Rajvanshi became acutely aware of the need for developing an alternative liquid fuel which should be renewable, environmentally sustainable and home-grown. Consequently, he and his team established the pioneering program for production of ethanol from **sweet sorghum** in middle 1980's.

Sweet sorghum is an excellent substitute to sugarcane for ethanol production. Besides it is a multi purpose crop and produces grain, sweet juice and excellent fodder simultaneously from the same piece of land. Per unit of water consumption it is also one of the most efficient sugar producers. Dr. Rajvanshi and his group established in late 1980's, probably **one of the largest multidisciplinary research programs in the world on sweet sorghum for ethanol production**. It included extensive breeding for higher yielding varieties, fermentation studies, **solar distillation plant** (a 50 l/day pilot plant running completely on solar energy was set up at NARI campus in 1987), and **development of stoves and lanterns to work on low concentration ethanol**. These efforts resulted in making **NARI the only Institute in India to be invited by European Economic Commission** in 1993 to be a part of European network in Sweet Sorghum Research and Development.

As a result, NARI's sweet sorghum hybrids have been tested and sown in about nine countries viz. Mexico, Zambia, Thailand, Pakistan, Zimbabwe, Portugal, Mauritius, France and Italy. Besides the production of ethanol, Dr. Rajvanshi and his team also embarked upon the development of complete technology for producing jaggery and syrup from sweet sorghum. The **MADHURA sweet sorghum syrup** has been successfully test-marketed. Till

today about 4 tons of it has been sold. It is a natural plant product and has been found to be an excellent source of calcium. Presently it is being used as a base for Ayurvedic medicines and as a natural sweetener in many food products.

Because of the efforts of Dr. Rajvanshi and his team members Government of India has recently set up a National project on sweet sorghum where about a dozen agricultural universities are involved in research and development. Also large numbers of private corporations have become interested in the use of sweet sorghum for ethanol production. This shows the foresight of NARI's effort in early 1980s. The whole idea behind sweet sorghum development was to give farmers value-addition so that they could earn extra remuneration. Besides, sweet sorghum can provide clean and environmentally sound ethanol fuel to the rural areas.

Dr. Rajvanshi's pioneering work on lighting and cooking technologies using ethanol as household fuel has **been replicated all over the world**. Also his seminal [paper on cooking and lighting strategy](#) (published in 2003 in Current Science Journal) set the tone for research worldwide in high tech rural cooking technology such as the use of electricity from thermoelectric elements for running a small fan; small scale biogas plants for cooking; and use of alternative fuels like vegetable oils and alcohol for cooking. A direct outcome of this paper was the development of Philip's stove running on fan powered by thermoelectric element. Similar inventions are being developed for rural biomass stoves.

This paper on cooking and lighting strategy incidentally was also the first paper anywhere which showed how nanotechnology can be used for rural development. The paper, which was widely covered in [newspapers](#) and mass media, prominently figured in a white paper on Nanotechnology for Rural Poor by Meridian Institute in Washington D.C. and later on led to the efforts by Government of India (through DST) to set up a small national program on Nanotechnology for Rural Development.

For rural household Dr. Rajvanshi and his team have therefore pioneered the development of ethanol lanterns and stoves, and his recent invention has been to combine the lantern and stove. This device **christened [lanstove](#)** produces very bright light and simultaneously cooks a complete meal for a family of four or five. Besides it also produces clean drinking water. Thus for the first time in the world an innovative design has been developed which provides light, cooking and clean drinking water for rural areas using low grade ethanol-a locally available and environmentally sound fuel. This innovation was given the [Globe Forum Award](#) in 2009 by Crown princess Victoria in Stockholm, Sweden. This invention has also elicited worldwide interest on the use of ethanol fuel for cooking and lighting in rural areas.

The work on sweet sorghum ethanol production also led to the development of technology for cleaning the distillery waste. In rural areas of Maharashtra there is a widespread network of sugar factories. These factories produce molasses as a byproduct, which is used for producing ethanol in distilleries. The effluent produced in this process is dark-colored and has an obnoxious smell. It also has a very high chemical oxygen demand (COD). Most of the times this effluent is discharged without any treatment and pollutes surrounding water bodies. This affects the health of the people and animals living in these areas. Even if this effluent is treated for producing methane, it is only partially purified and its black color still remains. Dr. Rajvanshi and his group have developed and patented a method to clean this effluent completely with the help of a photo catalyst and solar energy. Thus the black color is removed and the COD is drastically reduced. This was probably one of the first such

innovations regarding the [solar detoxification of distillery effluent](#). This method has been successfully tested in a pilot plant set up at NARI campus to treat 100 l effluent per day. Many distilleries have expressed interest in this technology.

Rural power generation

Another example of need-based research was the development of loose biomass gasifier. In Phaltan taluka there are two sugar factories with a lot of farmers growing sugarcane. After cutting the sugarcane, farmers burn the dried leaves on ground. There are estimates that India produces about 800-1200 million tons of agriculture residues every year and most of them are burned in the fields. This is not only a loss of a valuable natural resource, but also leads to tremendous air pollution and production of greenhouse gases. Recently it has been shown that burning of agricultural residues in the subcontinent is the cause of the huge brown cloud over the area.

Dr. Rajvanshi has through his [writings](#) and speeches brought out the fact that agricultural residues can produce almost half of the electric power of India. Besides they will also give extra income to the farmers. Recently this strategy is being promoted by the Govt. of India. In order to produce power on small scale from agricultural residues, Dr. Rajvanshi and his team developed and setup at NARI campus a 500 KW_{th} loose [sugarcane leaves gasifier](#) for which they have received a patent. The gasifier which is totally automatic and is a PLC-based system can be very useful for providing heat for rural businesses. This gasifier set up in 1997 was the first such invention anywhere in the world which produced gas from loose leafy biomass material for heating purposes and also produced biochar-an excellent soil conditioner, as a byproduct.

The development of a gasifier running on loose agricultural residues led Dr. Rajvanshi to develop a [concept of providing electric power to a taluka](#) (equivalent to a county in U.S.A.) from the agricultural residues produced within its geographical boundary. He is the principal author of [national policy on Energy Self-Sufficient Talukas](#). This policy was implemented by the Ministry of Non-conventional Energy Sources, Government of India. As a part of this policy all the talukas of the country were surveyed and a biomass map of India was produced for power generation. Also as a part of this policy Government of India, through Indian Renewable Energy Development Agency (IREDA), has provided soft loans to more than 100 biomass-based power stations (each of 6-10 MW capacity) in the country. This is a prime example of Dr. Rajvanshi's efforts in creating a national program for producing environmentally sound power from renewable biomass source. He has also extended this concept to a [village-level micro-utility](#).

Rural transport

As a part of providing sustainable transport system in rural areas where distances are small, Dr. Rajvanshi has concentrated his [efforts since 1995 on improving the cycle rickshaw](#) so that the hardships being borne by the rickshaw pullers are reduced.

The existing cycle rickshaw has been totally reengineered for the comfort of passengers and rickshaw puller. He and his team have therefore developed three types of rickshaws. In the improved cycle rickshaw (**IMPRA**), the length of chain has been reduced; it has back-wheel braking, three-speed gears and it is lightweight. All these improvements enable the rickshaw puller to take two passengers on a 6-10% slope quite effortlessly without alighting from his

seat. In addition, by attaching a small battery-driven motor to IMPRA, a [motor-assisted pedal rickshaw \(MAPRA\)](#) has been developed. This enables the rickshaw puller to take two passengers on a 10% slope at a speed of 10-15 km/hr without getting down from his seat. Recently about two dozen IMPRAs and MAPRAs have been **exported to Europe, Canada and US**.

NARI's pioneering program on improved and electric rickshaws which started in 1995 has inspired world-wide interest and effort in the area of human-powered transport. This is attested to by the fact that material from NARI's website on rickshaws is copied by a large number of rickshaw and cycle enthusiasts on to their websites and discussed on various web groups. Besides this a large number of requests for cycle rickshaw supply regularly come from European and American cities.

Finally, Dr. Rajvanshi and his team have developed [ELECSHA](#)-an electric rickshaw, which runs at 30-35 km/hr and can travel 60 km with two passengers in one battery charge. Not only will these improved rickshaws prove to be a good alternative to the cycle rickshaws in use presently, but also to the 3 and 6-seater auto rickshaws which cause tremendous noise and air pollution in various cities of India.

Dr. Rajvanshi is also trying to set up rickshaw pullers' cooperative societies in different cities so that the rickshaw pullers can get loans from the banks to buy the rickshaws. He believes that electric cycle rickshaws can provide an environmentally sound rural and urban transport system for India. This work on rickshaws has been extensively covered both in print and mass media including BBC, Star News, Doordarshan etc.

The work on motor-assisted rickshaw has also led to the development of a motor-assisted hand operated wheel chair for **physically handicapped**. The vehicle christened [MANHARA](#) (motor assisted NARI handicapped rickshaw) is really a great boon to disabled people as it increases their mobility. Efforts are on to commercialize these vehicles. Recently a completely automatic **electric tricycle for handicapped persons** has been designed and successfully used by a few physically challenged persons.

Other technologies

In addition to these projects, Dr. Rajvanshi has also concentrated his attention on how farmers can derive maximum benefit from crops such as **safflower**. He has developed the whole plant approach such that all parts of plants are useful to humans and that the farmers can earn extra income. Thus the safflower crop, besides producing seed for oil, will also be used to harvest its petals. He has been instrumental in popularizing safflower petal as herbal tea and has developed a [solar powered battery-operated machine to collect petals from spiny safflower plants](#). The batteries are charged by solar energy. The remuneration to farmers is increased several fold due to these petals. He is also starting a program on sustainability at NARI whereby from the same piece of land food, fuel, feed and fertilizer production can be optimized.

Dr. Rajvanshi and his team have also pioneered a technique to **provide potable water** to rural areas with minimal heating. Thus by filtering the dirty water through four layers of cotton sari and then heating to 55-60⁰ Celsius all the coliforms are eliminated and the water is fit for drinking. Heating the water to sub boiling temperatures greatly reduces the energy

requirements of making water potable. A [paper \(published in Current Science\) is on this site](#) and a syndicated [story appeared in various news](#) channels.

All the technology development and dissemination of the knowledge has been greatly facilitated by the use of internet. Thus Dr. Rajvanshi has tried to use this modern tool for rural applications such as e-commerce and technology transfer. NARI was probably one of the few rural-based organizations in India to **get e-mail connectivity in 1995!** Since then NARI has used internet and social media extensively for spreading its message. [NARI's website](#) has very high hit rates on Google and other search engines. Thus NARI has been able to share its expertise and technology with the rest of the world. This has resulted in worldwide use of its technologies and has also attracted large number of [interns from all over the world](#) who come for short term internship at NARI.

Holistic and Sustainable Development

Besides the technology work, Dr. Rajvanshi is also interested in the issues of spirituality. He writes occasional editorial [articles on this subject in Times of India](#) and has published a book entitled “[Nature of Human Thought – Essays on Mind, Matter, Spirituality and Technology](#)”. His work on spirituality has focused mostly on the issues of interlinking spirituality with technology and sustainability. In his own life he has shown that with the use of high technology like internet, renewable energy, modern communication network, and practicing spirituality to curb the greed for resources, [one can live a sustainable and emotionally satisfying life](#). On this issue of sustainable living he gives inspirational lectures all over the world and has tried to inspire and guide young engineering and management students from some of the prestigious Schools in India like IITs and IIMs.

Dr. Rajvanshi's [writings](#) on the issue of technology and spirituality have been widely read, are copied on various blogs and websites and occupy a very high position in Google search engine. Recently he has been given a [blog space as a master on Speaking Tree](#) (Times of India) website.

His work on spirituality and holistic development has led him to set up a [Center of Sustainable Development \(CSD\)](#) at NARI campus. This training and research center will try to bring corporate, NGOs and local people together for sustainable development of rural areas. Dr. Rajvanshi believes that corporations can become very active players in rural development once they are sensitized to the plight of rural poor. Besides, the exposure to combination of spirituality and technology will allow them to curb their greed and participate wholeheartedly in corporate social responsibility (CSR) activities. He has [written and lectured extensively](#) on this subject of corporate/NGO partnership.

Honors

In 2001, Dr. Rajvanshi received the prestigious [Jammalal Bajaj Award](#) for the use of science and technology in rural development from Dr. Manmohan Singh (presently the Prime Minister of India). This is one of the most well known awards in India for rural development and in the past has been given to Nelson Mandela and Desmond Tutu (International Award

Category). In 1998 Dr. Rajvanshi was inducted in the U.S.-based [Solar Hall of Fame](#). He is the second Indian to be so inducted. He and his team's efforts have resulted in NARI getting the Federation of Indian Chambers of Commerce and Industries ([FICCI Platinum Jubilee Annual Award \(2001-2002\)](#)) for rural development at the hands of the then Prime Minister Shri. Atal Behari Vajpayee. In 2004 his work on MAPRAs was given the **Energy Globe Award** (in the AIR category). In May 2009 he delivered the prestigious [B.D. Tilak Memorial Lecture](#) at National Chemical Laboratory (NCL), Pune. His work on ethanol lantern/stove was given the [Globe Forum Award](#) for sustainability research in Stockholm. He received this award from HRH Crown Princess Victoria in June 2009. In 2014 Dr. Rajvanshi was honored with the [Distinguished Alumnus Award of University of Florida, USA](#).

The Central Government and Government of Maharashtra has appointed Dr. Rajvanshi on many prestigious committees. Therefore he is serving, or has served on central Government committees like Core group on rural technology in the **Office of the Principal Scientific Advisor to the Government of India, Advisory Board of Energy, Planning Commission and Ministry of Non-conventional Energy Sources** among others. At state level he has been nominated as member **State Planning Commission** (Energy and Environment Advisory Committee) and advisory board of **Maharashtra Electricity Regulatory Commission**. In the past he has been advisor and consultant to International Foundation of Science (Sweden), Winrock International (USA), E & Co (USA) etc.

Dr. Rajvanshi's achievements have been widely covered in mass media both nationally and internationally. Major stories on him have come in [Harmony Magazine](#), [India Today](#), [Sakal](#) and other publications. These stories and others are also available [at this site](#). Similarly he has been featured in NDTV, Doordarshan, AIR, SAM TV, among others.

Lectures/Publications

Dr. Rajvanshi has lectured at many universities in U.S.A. and India. He regularly gives inspirational lectures to a large number of students of prestigious institutes like IITs, Regional Engineering Colleges, various Institutes of Management etc. and has inspired them to take up rural development as a vocation (details are [at this site](#)).

In July 2002 he was honored by the Department of Mechanical Engineering at **University of Florida**, Gainesville by inviting him to give the inaugural lecture of the Charles V and Bertha C Perill Lecture Series on Sustainable Development. In September 2003 he was invited by the Principal Scientific Advisor to Government of India, Dr. R. Chidambaram to [address BARC scientists](#) on rural development. In 2004 he gave a **distinguished lecture** in the College of Engineering at University of Florida on his work at NARI. He has also been invited to give lectures at MIT, Boston and to address the prestigious IDEAS competition. In 2006 he was invited to give an [Institute lecture at IIT](#) Bombay and in March 2007 he delivered a **public lecture at the Patel Center of Sustainable Solutions** in USF, Tampa. Also in 2007 Cornell University made a half an hour [video e-clips](#) on his views on sustainable rural development, simple living and R&D for rural areas. In November 2007 he was invited by the UNDP and the **Chinese Government** to advise them on the rural energy program. Out of the five experts from all over the world he was the only Indian invited. In 2012 he was invited to [give a keynote address](#) at the Silver Jubilee celebration conference of

Indian National Academy of Engineering. Recently he gave an [invited lecture](#) at Stanford University – Reliance Industries workshop in Mumbai. The [video of the lecture is here](#).

He has more than 160 [publications](#), some of them in prestigious national and international journals, [seven patents](#), [three chapters in books](#) and two books (one on [spirituality](#) and other on his [experiences as a student in 1970s in US](#)) to his credit. Recently he has written a [human interest history of renewable energy work at NARI](#).

He writes regular blog on spirituality in [Speaking Tree website](#) of Times of India. He has chaired many sessions at national and international conferences and has given keynote addresses in many of them. His work has been carried extensively both in print and electronic media.

Dr. Rajvanshi's [biodata in pdf](#).

Dr. Rajvanshi's [short biodata](#)

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