



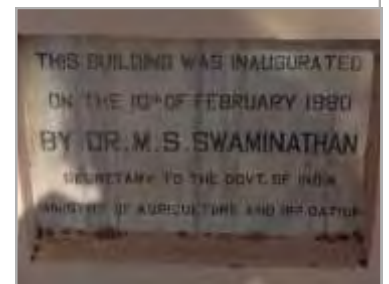
## NIMBKAR AGRICULTURAL RESEARCH INSTITUTE (NARI)

Sustainable Rural Development through the Application of Science and Technology

### The Institute

NARI is a private non-profit research and development institute. It was established in 1968 by Shri B.V. Nimbkar who remained in the role of its President until 1990. Since then Dr. Nandini Nimbkar has held the position of Permanent President. The institute is registered under the Societies Registration Act XII of 1860 and the Bombay Public Trust Act of 1950. It is situated in the rural town of Phaltan in Maharashtra state.

The institute undertakes research mainly in agriculture, renewable energy, animal husbandry and sustainable development.



### Infrastructure

The institute is housed in spacious buildings (total area is about 3500m<sup>2</sup>) and has about 40 hectares of farm with year-round irrigation facilities for research purposes. NARI also has well-equipped laboratories with sophisticated analytical instruments and computational facilities, a full-fledged workshop, and excellent semen-freezing, parasitology and chemistry as well as basic nutrition and molecular biology laboratories. Most of the hardware for research is fabricated in the workshop. The institute has a small, though well-stocked library with about 6000 books and subscribes to about 60 periodicals (both national and international) in the areas of agriculture, energy and animal husbandry.

The Institute is recognized by Shivaji University, Kolhapur for the purpose of Ph.D. in Energy Studies. The Institute actively collaborates or has collaborated with researchers in other organizations and institutes such as BAIF, BARC, BVC, NBAGR, NCL, TIFR (India), as also UF (USA) and CSIRO, UNE, University of Melbourne (Australia).

Most of the funding for NARI has come from sponsored research projects from Government of India agencies like CAPART, DBT, DST, ICAR, ICICI, KVIC, MNES etc. and from international agencies like ACIAR and AusAid (Australia), E&Co (New Jersey), EEC, Rockefeller Foundation (N.Y.) and USDA (Washington). NARI also undertakes sponsored research from private companies (in the recent past from NFCL, Bombay Oil Industries Pvt. Ltd., Marico etc.) and organizations in selected areas of agriculture, renewable energy and animal husbandry.

The institute has a Tax-exempt status under Section 35(1)(ii) of the Income Tax Act which results in contributions and donations to the Institute being 100-175% tax-deductible (100% for individuals and 175% for companies). NARI is also registered under Foreign Contribution Regulation Act and hence can accept foreign donations.



## The Research Programme

The basic philosophy of the Institute is to solve the age-old problems of rural India through the application of best tools of science and technology. Consequently, highly innovative research and development programs have been undertaken in the areas of agriculture, renewable energy, animal husbandry and sustainable development.

NARI has pioneered development of better varieties of safflower, sweet sorghum and technologies such as gasification, distillation, combined lighting and cooking stoves and many others, for rural development.

Project results are published as research papers in national and international scientific journals or in research reports periodically prepared by the Institute. Most of the work of NARI is available on its website ([www.nariphaltan.org](http://www.nariphaltan.org)). As of 2012, 106 projects have been undertaken at NARI with total funding of Rs. 100 million.

The Institute has staff of about 40 out of which 15 are research personnel including 5 Ph.Ds in the areas of agriculture and engineering.

NARI periodically gets interns (for 3-6 months) from around the world, mainly from US, Europe and Canada to undertake internships in agriculture and rural development. The Institute welcomes such [interns](#).

The major areas of R&D at NARI are as follows:



Madhura Sweet Sorghum Syrup



Safflower Petal Collector



A sweet sorghum field at NARI



Treatment of distillery waste

## Agriculture

## Renewable Energy

The focus of agricultural research at NARI has been on drought-tolerant crops. Research is therefore being conducted on safflower and sweet sorghum using whole plant approach. Thus the strategy is to use all the parts of the crop for human utilization to mitigate food vs. fuel issues. In both these crops NARI is an All India Coordinated research center under the aegis of the Indian Council of Agricultural Research (ICAR), Government of India.

**\*Safflower seed and petals:** NARI has developed various safflower varieties and hybrids bred to give high oil and petal yields.

**\*Sweet sorghum R&D:** Many varieties of sweet sorghum have been developed by NARI; This is a multipurpose crop which can be used for food, fuel, fodder and fertilizer.

**\*Agrochemical testing:** Agrochemical testing for various companies and research laboratories in India is carried out at NARI.



Sweet sorghum breeding plot



Safflower in bloom

Renewable energy is one of the main areas of NARI's research. The focus is on the use of the best tools of science and technology to solve the energy problems of rural areas. Consequently, innovative R&D has been done in the areas of **household energy, power generation, mobility issues, creation of renewable fuels, household water treatment** among others.



Solar-Powered Ethanol distillation Plant

**Household Energy:** Lanstove and improved kerosene lanterns.

Only 40% of India's rural population has electricity. Blackouts and brownouts are commonplace. As such, NARI has spent considerable time on the development of efficient, decentralised cooking and lighting devices. Liquid and gaseous fuels burn cleanly. Moreover due to their high energy density, transportability, easy



Kerosene lanstove and cooker

storage and availability, the liquid fuels are superior to other renewable alternatives.

### **Power Generation:**

NARI's research into power generation can be divided into two main categories: small scale and large scale. Small scale projects are aimed at the development of specific devices and technologies that can produce clean, abundant energy. Large scale projects take the broader socio-economic context into account and focus on designing human settlements in such a way that they are self-sufficient and sustainable.

### **Water Treatment:**

Technology for solar detoxification of distillery waste using a suitable photocatalyst has been developed. The obnoxious distillery waste is made totally odorless and colorless. The chemical oxygen demand (COD) is also reduced drastically.

Technology has also been developed to collect fresh water through dew condensation.

A study was carried out to show that water can be made potable by filtering it through four layers of cotton sari and heating it to 55-60°C for a short duration.

### **Mobility:**

Improved Pedal Rickshaw (IMPRA)

NARI was possibly the first Institute anywhere to start working on reengineering the humble cycle rickshaw. It began working on modifying the rickshaws in 1995 and continued this work until 2002. During this time an extremely efficient pedal rickshaw named IMPRA was developed. This rickshaw has been successfully tested in Europe, USA, Canada and India.

Motor-Assisted Pedal Rickshaw (MAPRA)

After discussions with rickshaw pullers in many cities it was decided that a small battery-driven motor attached to the improved rickshaw will enable the puller to go uphill with ease. Besides carrying his burden this will make it possible for him to pull the rickshaw to a greater distance thereby increasing his income.



Motor-Assisted Pedal Rickshaw (MAPRA)



Low concentration alcohol stove



Weather Station at NARI



Biomass Gasifier



Improved Pedal Rickshaw (IMPRA)

### **Fuel Production:**

Ethanol distillation from sweet sorghum.

Work was carried out on the development of a solar-powered ethanol distillation plant between 1985 and 1987.

The distillation plant was set up on the Institute campus and was capable of distilling 50 l/day of 94% (v/v) ethanol from MADHURA sweet sorghum hybrid developed at NARI. The solar collector area was 38 sq. m. About 70% of the energy for distillation came from solar energy.

### **Weather Station:**

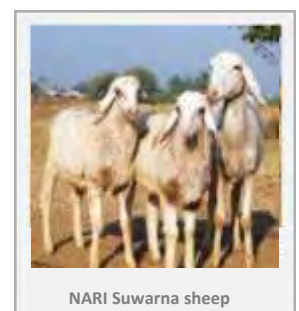
In undertaking agricultural, solar and biomass energy research, the collection and compilation of accurate weather data is essential. For this reason NARI established a class 'A' weather station on its campus in the early 1980s. On a daily basis the station records maximum and minimum temperatures, wind direction and velocity, relative humidity, pan-water evaporation, rainfall, and global total solar radiation.

## Animal Husbandry

The Animal Husbandry Division (AHD) of NARI was started in 1990. The chief aim of the AHD is to genetically improve local goats and sheep, and to improve the management of these animals on which the livelihoods of many rural people are dependent. AHD conducts scientific research and implements programmes aimed at increasing the income and wellbeing of people dependent on sheep and goat herding.



Animal Husbandry Dept



NARI Suwarna sheep



# Centre for Sustainable Development

Planning for the construction of Bajaj Centre for Sustainable Development (BCSD) began in 2006. The centre was completed in 2011 and has been a very positive addition to NARI. The Center is the venue for educational seminars on sustainable development, spirituality and various areas of research in which NARI is involved.

The center has features to minimize its environmental running costs. Thus very innovative features like rainwater harvesting, use of 0.75 kW PV-powered solar system to pump the water from the rainwater harvesting tank to overhead 5000 liters tank; use of 1750 liters solar water heating system for the guest accommodation (back-up is provided by a wood-fired boiler), evaporative roof cooling for summer months (powered by solar pump) and natural lighting and ventilation have been incorporated in the building. The centre has a pleasant ambiance due to the covered veranda together with an open courtyard of 350m<sup>2</sup> area.



BCSD courtyard

All this information and more: <http://nariphaltan.org/ncsd>

## Agriculture

- High yielding varieties of cotton, sunflower, safflower and sweet sorghum.
- The world's first non-spiny hybrid of safflower, NARINH-1.
- Introduced sweet sorghum in India in the early 1970s.
- The complete technology for producing syrup and jaggery from the Madhura sweet sorghum hybrid.

## Renewable energy

- The program of Energy Self-sufficient Talukas, which was the basis for the National policy implemented by the Ministry of Non-conventional Energy Sources (MNES), Govt. of India, New Delhi.
- Pioneered the production of ethanol from sweet sorghum.
- A lanstove (lantern combined with stove) running either on kerosene or low grade ethanol concentration (50% w/w and above ethanol-water mixture) for rural households.
- Technology of solar detoxification of distillery waste using a suitable photo-catalyst.
- The development of a loose leafy biomass gasifier.
- An improved pedal rickshaw with five speed gears, back wheel breaking and better suspension.
- A motor-assisted pedal rickshaw where one small PMDC motor powered by batteries helps the rickshaw driver easily pull the load over slopes.

## Animal husbandry

- A new strain of Deccani sheep, called Nari Suwarna, has been developed. The sheep produced twins, compared to one lamb per litter produced presently. This enables shepherds to increase their flock size much faster.

## NARI's Achievements



Renewable energy workshop at NARI

*Research at NARI is always undertaken with the intention of improving the lives of rural Indians in a sustainable manner. We appreciate your donations to our cause. Your donations help us carry forward the work on rural development. Donations can be made by directly depositing the money in our FCRA account or by **cheque in the name of the institute** and addressed to the President :*

*President; Nimbkar Agricultural Research Institute; Tambmal, Lonand Road; P.O. Box 44, Phaltan—415523; Maharashtra.*

*For more information contact us.*

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