

A HAND TO THE PLOUGH

We need an alternative approach to farming that builds on indigenous knowledge and resources

"Everything else can wait, but not agriculture"
—Jawaharlal Nehru, 1947

AV BALASUBRAMANIAN

PANDIT Jawaharlal Nehru made this famous remark in the context of the Bengal famine of 1942-43 and the acute food scarcity prevailing in the country in 1947. For Indians who grew up in the 1960s, a vivid image is one of perennial food shortages and a precarious political situation due to dependence on imports. The mood of the era was epitomised by a RK Laxman cartoon which showed a minister looking out of his window and remarking to his aide "...Good, good, the monsoons are on time. Once again this year, we can ask the Americans to mind their own business."

Thanks to the green revolution, that era is only a dim memory. While the green revolution led to an immediate increase in production and productivity of agriculture, it was achieved at a heavy cost to the environment and is not a sustainable long-term strategy. As noted agricultural scientist MS Swaminathan said, "The green revolution of the 1960s provided a breathing spell for achieving an adjustment between population growth and food production." However, it is a matter of concern that even today a large section of the scientific community tends to see the progress in the agriculture sector as a matter of more and more technological fixes, of the green revolution variety.

For several years now, agriculture in India is said to be in a state of crisis. This is tantamount to saying that India is in a crisis since about 70 per cent of our population is still in rural areas with agriculture as their main livelihood. This crisis manifests itself as increasing impoverishment of the farmers and lack of options for rural non-farming employment. There is an alarming degradation of the resource base of agriculture, especially of soil, increased pressure and demand on land from non-agricultural activities, erosion of biodiversity in terms of both species and varieties of cultivated crops and decline in cattle population. This has led to distress migration to the cities and caused scarcity of labour in rural areas for agricultural activities.

India has one of the largest networks of organisations and infrastructure for agriculture anywhere in the world. Nevertheless, traditional Indian agriculture has hardly any space in the research or extension and dissemination services of the central or state governments. The achievements of the modern chemical model of agriculture have been so dazzling that little attention has been paid to the relevance of indigenous agricultural knowledge and practices.

India is richly endowed with plentiful natural resources and tremendous density and diversity of bio-resources. Its cultivable area of 160 million hectares is about 60 per cent of the total land area against the world average of 10 per cent. The average rainfall throughout India is 105 cm per year, higher than what other large areas of the world receive.

Almost all parts of the country have had a rich traditional knowledge of agriculture and sustainable utilisation of natural resources with a history of continuous land cultivation over long periods with little decline in soil fertility. This knowledge tradition is both oral as well as supported by rich textual resources.

The unique feature of Indian knowledge in many areas is its social organisation into classical and folk traditions. Classical tradition connotes formally organised knowledge supported by a corpus of texts and manuscripts and a clear theoretical framework. Normally, there are formal procedures for training experts. In contrast, folk traditions do not necessarily have a textual basis. The training of practitioners is informal and propagated through a *guru-shishya parampara*. In the case of agriculture, also, we see two such streams. The

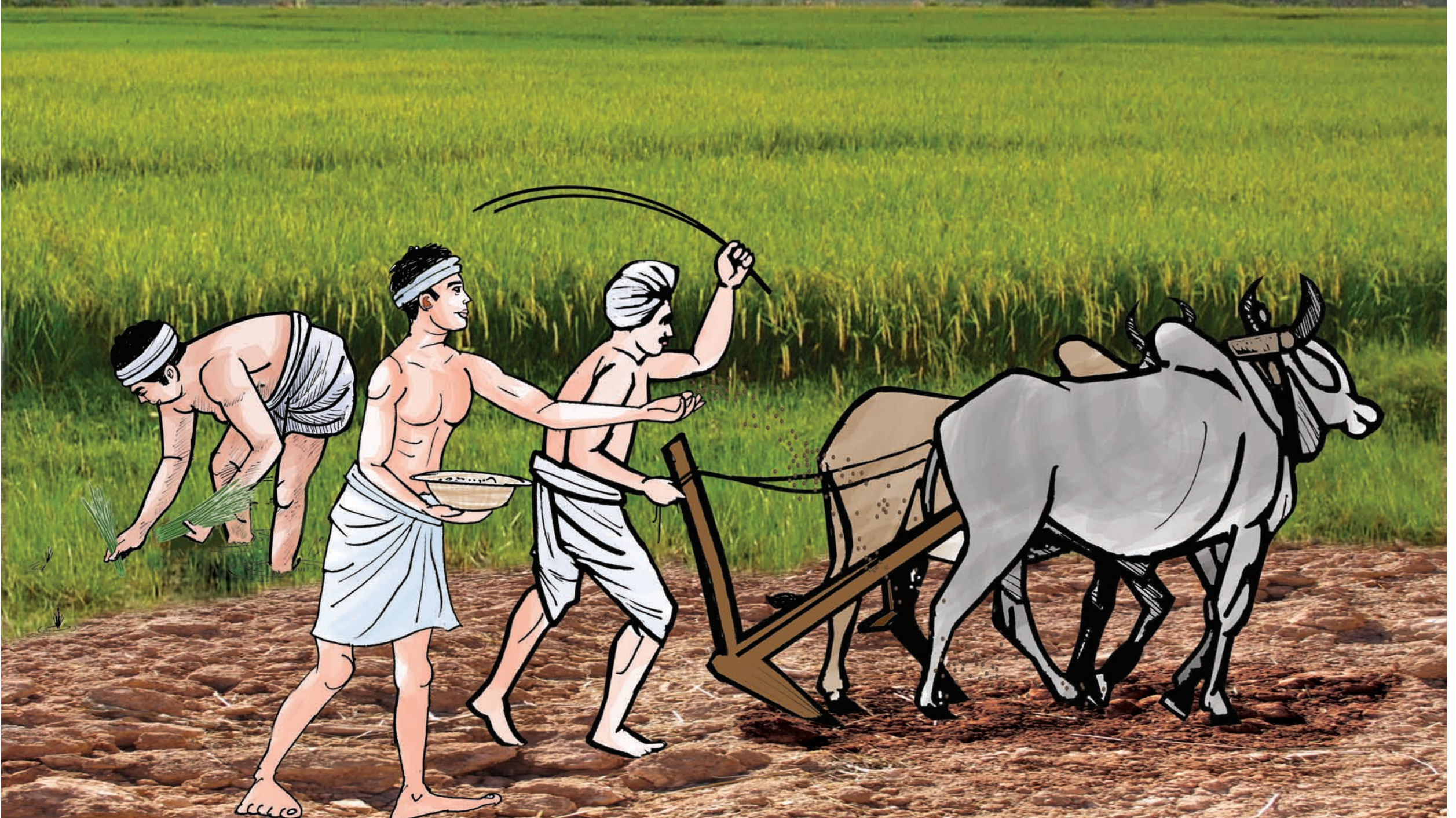
classical stream of knowledge is *vrikshayurveda*, literally meaning knowledge of the science of life of plants. There are a large number of scholarly texts of *vrikshayurveda* in various Indian languages, including Sanskrit, Tamil, Kannada and Malayalam. In recent years, the Asian Agri-History Foundation has brought out excellent editions of many of these texts which include translations and commentaries. There is also a robust folk tradition of agriculture.

Today's scepticism of traditional knowledge is based on the view that such knowledge cannot be trusted since it has not been subject to testing and validation as per modern scientific norms. In this connection, it is very interesting to see that a vast body of traditional knowledge of agriculture was indeed very recently put to scientific examination.

Turn to Page 6

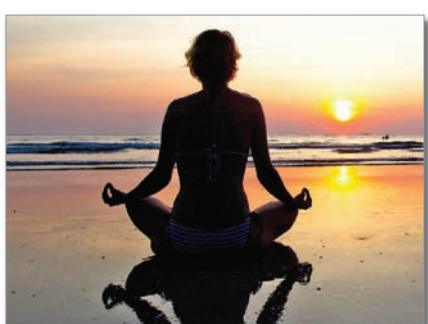


THE
SandHI
SERIES



Budha Chandra

Tech know ||| MEDITATE AWAY



Meditation may alleviate the symptoms of two hard-to-treat gut disorders by altering certain genetic signals, according to scientists, including one of Indian-origin. Researchers looked at people who had either irritable bowel syndrome (IBS) or irritable bowel disease (IBD) and found that doing yoga and meditating regularly for two months eased the symptoms.

||| SHIFT WATCH



Employees who work shifts outside of a 9-to-5 schedule are more likely to be overweight, experience sleep problems, and are also at higher risk of developing metabolic disorders, such as diabetes, scientists have found. Investigators used cross-sectional data from the Survey of the Health of Wisconsin (SHOW) collected from 2008-2012.

||| SKIP THE SALT



High salt diets may delay puberty, which in turn can lead to behavioural problems, stress and reduced fertility, a new study has found. These findings could have significant consequences for the reproductive health of future generations, researchers said. The University of Wyoming investigated the effect of varying levels of dietary salt on the onset of puberty in rats.

Inside story

Tuck in!

Make sure your first meal of the day is a well loaded with the essentials page C

Fight of the big guys

Is it time to look beyond your default browser and see the rest? page D

Dark tales

Take a look at *Limbo* and explore stories darker than Grimm's page D

Local practices are more sustainable

From P1

The Indian Council of Agricultural Research (ICAR) launched a nationwide mission mode project on collection, documentation and validation of indigenous technical knowledge under the national agriculture technology project (NATP) in 2000. Information on indigenous technical knowledge was collected from primary sources through voluntary disclosure and collection and compilation of the *Indigenous Technical Knowledge* (ITK) volume was made from available literature, books, journals and theses.

The compilation has five documents in seven volumes (published between 2002 and 2004). The first two documents consisting of four volumes listed 4,879 indigenous practices. The third and fourth documents describe efforts at validating and cross-validating these practices. Of the 4,879 practices documented, a set of 111 practices were selected and subjected to experimental testing in efforts that were conducted by ICAR institutes and state agricultural departments and universities.

In fact, the existence of this voluminous body of information is hardly known, much less publicised widely. Information about the series could be procured only after filing a petition under the RTI Act!

A whole range of solutions and technologies drawn from indigenous knowledge, however, are now available from various sources, including various volumes of *vrikshayurveda* and the journal published by the Asian Agri-History Foundation (<http://asianagrihistory.org>); various issues of the journal *Honey Bee* published from the Centre for Management of Agriculture in the Indian Institute of Management, Ahmedabad (<http://www.sristi.org>).

A large number of efforts undertaken by non-government organisations across the country to document and field test these practices have also pro-

Proof in the pudding...

Efficacy of local methods practiced over centuries in India

Theme	Total number of experiments	Proved valid	Analysis of results of experiments			
			Partially valid	To Be repeated	Not valid	Results not declared
1 Rain water management	3	3				
2 Soil and water conservation	2	1	1			
3 Tillage practices	1	1				
4 Crops and cropping systems	5	4	1			
5 Pest and disease management	13	9		1	2	1
6 Farm implements	4	3	1			
7 Grain/ seed storage	8	8				
8 Horticultural drops	18	16	1		1	
9 Veterinary science and animal husbandry	34	23	3	1	7	
10 Fisheries	3	2				1
11 Food product development	5	5				
12 Natural yarns and dyes	2	2				
13 Ethnic food	7	7				
14 Thermal efficiency	1	1				
15 Weather forecasting	4	3		1		
16 Low-cost housing materials	1	1				
Total	111	89	7	3	10	2
Percentage	100	80	6	3	9	2

duced a significant body of credible experience and evidence.

This is a glimpse of the great richness and robustness of traditional agricultural knowledge systems. That they have survived down to this day despite total neglect by the official establishment or any kind of support from trained scholars or the scientific community is a testimony to their inherent strength and vitality.

The three essential elements of the material resource base required for agriculture are — soil (fertility), water and sunshine, as well as seeds. The Indian subcontinent is a region of extremely high biodiversity of plants and in fact, two of the 12 global “biodiversity hotspots” are situated in India. It has been estimated by the government’s National Bureau of Plant Genetic Resources (NBPGR) that currently there are 75,000 to 100,000 landraces of paddy available in India. Similarly, there are about 2,700 varieties of commonly used vegetables that are being preserved in the

Indian Institute of Vegetable Research (IIVR) at Varanasi. In addition, there are a significant number of varieties of paddy and vegetables still available with farmers which are not noted or captured by the formal systems.

Along with this, there is also extensive literature and knowledge regarding the agronomic properties as well as the therapeutic and nutritional properties of paddy and vegetables. Such knowledge is rich, varied and nuanced. Let us, for now, illustrate this rich knowledge through indigenous paddy varieties.

According to the late RH Richharia, who was one of our outstanding rice scientists, about 400,000 rice varieties existed in India during the Vedic period. He estimated that even today about 200,000 rice varieties exist in India — a truly phenomenal number. This means that if a person were to eat a new rice variety every day of the year he could live for over 500 years without reusing a variety!

In every nook and corner of India, farmers have nurtured and cultivated varieties suitable to those areas.

These conservation practices are often interwoven and linked with cultural, social and religious practices in an organic way. For example, it was observed by Richharia that at the Puri temple in Orissa, Lord Jagannath is worshipped with food prepared from freshly harvested rice every day of the year. This means that there was an intimate knowledge of the varieties of the rice that could be grown and harvested through all the seasons and a ritual linkage with a temple which ensure that these varieties continue to be cultivated and propagated. Throughout India, many varieties of paddy (and for that matter other crops such as millets, fruits and vegetables), are utilised and linked with specific festivals and celebrations, which, but for these linkages would have been extinct.

There are two broad categories of reasons why such diversity is important — agronomical as well as nutritional/therapeutic. In different parts of India, paddy shows variation with respect to crop age (short, medium and long duration), resistance to pests and diseases, requirement of water, suitability to various seasons, capacity to grow in different attitudes (ranging from the Himalayan heights to lands below sea level) and in different kinds of soil (sandy, clayey and so on).



TILLING SOIL: [L to R] aerial view of CIKS farm; chart showing the efficacy of local methods

This has ensured that a rice crop be harvested in almost every part of India through various times of the year.

A few indigenous rice varieties with interesting agronomic properties from Tamil Nadu illustrate this: *Sigappukuruvikar* (pest- and disease-resistant), *Koomvazhai* (flood-resistant), *JilJilVaigunda* (drought-resistant), *Kullakar* (provides excellent straw for thatched roofs), *Paman-gattu Kudaivazhai* (good fodder).

The value of indigenous varieties to act as insurance during times of distress and calamities was dramatically illustrated during the 2004 tsunami in Tamil Nadu, when thousands of hectares of land under paddy were under sea water for a brief period along the coast of Nagapattinam district. This rendered the soil saline and no high-yielding or modern paddy varieties could be cultivated. However, an excellent solution was provided by the use of an indigenous paddy variety called *Kalarpalai* (literally meaning a variety that grows in *kalar* – salty soil). This variety cannot only withstand soil salinity, it is also resistant to pests and diseases and provided an excellent solution to tsunami-affected farmers. During this period, it was found that even *Kalanamak*, an indigenous variety from northern India known to perform well in saline soil, could also be cultivated in these areas.

There are also refer-

ences to the nutritional and therapeutic properties of indigenous varieties of paddy (and for that matter various other grains, vegetables, fruits and spices in the literature of ayurveda, siddha as well as the texts of *pakashastra* (traditional science of cooking). Knowledge and understanding of food and its properties has always formed an essential part of the traditional medical understanding, as the ancient Sanskrit saying illustrates:

Amantramaksharamna sthi, nashimoolamanoushadham/Ayogyapurushonasthi, yojakastathradurlabha (There is no letter that is without the power of mantra and there is no plant (root) without medicinal value).

India has over 4,000 ethnic communities with a deep knowledge and understanding of the properties of natural products, particularly plants with which they live in close communion. The all-India coordinated research project on ethnobiology (AICRPE) produced a midterm report in 1994 which stated that the ethnic communities in India alone (who constitute only about 7 per cent of our population) had knowledge of around 9,500 species of plants used for varied purposes, the major ones being for medicine (7,500 species) and food (3,900 species).

Here are some examples of indigenous paddy varieties that have traditionally been accepted as containing varied nutritional and therapeutic properties. Modern laboratory studies carried out recently indicate that the traditional understanding may be consistent with these findings.

There are varieties that are suited for making particular preparations such as *Sempalai* (for puffed rice), *Pitchavari* (for puttu) and *Samba Mosanam* (for aval – pounded rice). The scented variety, *Seeraga samba*, as well as another variety, *Kitchili samba*, are preferred for biryani.

In terms of nutrients, *Mappillai samba* is considered an excellent source of strength and is found to be high in carbohydrates and crude fibre. Two traditional paddy varieties of Tamil Nadu, *Neelam samba* and *Kuzhichichan*, are said to be galactogogues, that is, good for lactating mothers. Laboratory studies show that *Neelam samba* is rich in calcium. *Karunkuruvai* is used in the treatment of filariasis. It is actively in use by *siddha* physicians of Tamil Nadu and mentioned in ancient Tamil *siddha* medical texts. Laboratory studies show that *Karunkuruvai* is rich in iron and has a low glycemic index. The glycemic

index of *Karunkuruvai*, *Kullakar*, *Kovuni*, *Mapillai Samba*, *Neelam samba* and *Kudaivazhai* are low compared to market varieties such as white *Ponni* — which is consistent with the traditional view that these are good for diabetics.

Mind you, this is just the tip of the iceberg, numerous other examples can be cited from all parts of India.

In today’s agriculture, there is very little presence or use of indigenous varieties of paddy. Several of them have not even been characterised rigorously through modern scientific efforts. They suffer a fate similar to the indigenous breeds of cattle which still continue to be described in official records as “non-descript (ND).”

Today, in Europe or North America, traditional agriculture is referred to as chemical agriculture since it has been in vogue already for a few centuries. Much of what goes by the name of organic farming or ecological agriculture is an afterthought or a corrective because of centuries of chemical agriculture and consequent environmental damage.

However, in India, sustainability and eco-friendliness are inherent to our knowledge systems.

The current policy on agriculture continues the green revolution strategy heavily dependent on external inputs ranging from seeds and including fertilisers, pesticides, and most importantly, knowledge of cultivation practices. This has led to declining yields and soil fertility and an increasing realisation of the limitation of chemical farming.

We need an alternative approach that builds on indigenous knowledge, wisdom and resources. We have outlined and shown that there is a tremendous potential for this.

Equally importantly, we are endowed with a tremendous resource base consisting of land, water, sunshine and biodiversity. This can provide a strong and unique starting point for alternative strategy for the development of Indian agriculture.

(AV Balasubramanian is with the Centre for Indian Knowledge Systems (www.ciks.org), Chennai, an institution working on sustainable agriculture building on traditional knowledge and practices ciksbalu@gmail.com)

NEXT WEEK
Dr MD Srinivas on the algorithmic approach to Indian mathematics



LOCAL SOLUTIONS: 1. Kudaivazhai ; 2. Kullakar; 3. Kowni nel; 4. Mapillai samba; 5. fumigation with herbs; 6. grains of Kalarpalai; 7. neem cake along the irrigation channel; 8. Perunkar

