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## SOIL REJUVENATION





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# INSIDE

**T**he Agriculture sector accounts for nearly 70 per cent of the rural households and its growth is key to bringing prosperity to the rural population. However, there has been a steady decline in Gross Domestic Product (GDP) which topped out in the nineties. This coupled with declining productivity in the agriculture sector is a cause of worry for the policy planners.

The sudden increase in the service and the agriculture sector and a sharp decline in GDP in agricultural growth has given rise to income inequalities between the urban and the rural population, resulting in large-scale migration of people from villages to the cities and towns.

While the Indian government has devised several schemes to help increase the income levels of the rural poor, the need to give a major boost to the agriculture sector will help directly the farmer and thus the rural population.

In this issue, we discuss how the health of the soil needs to be improved to increase productivity. We also discuss how salinity is affecting the land under crops. Seven million hectares of agriculture land is currently affected due to salinity and these areas are likely to rise further. It is estimated that by 2025 the total agricultural land affected by salinity could be around 13 million hectares.

In this issue we discuss how the efforts of a state owned Fertilizer agency, has helped increase production and productivity of variety of crops.

Agricultural scientists say productivity can be improved by improving water resources, Improving access to land, Improving access to rural finance, Information and communication technology, Technological Prospective. However the need to adequately add fertilizers to the soil has been bogged down by the debate on the kind of fertilizers to be used.

Although agriculture's share of the economy of India has declined over the decades it still provides livelihood to the majority of the country's population. As such sustaining productivity growth in agriculture continues to be critical for achieving food security, poverty reduction, and broad-based economic growth. Rejuvenating soil health is thus an important issue while discussing how to increase agricultural growth.



# SOIL REJUVENATION

## - THE ROAD AHEAD FOR SECOND GREEN REVOLUTION

A. Roy, S.V.Kaore, K.N. Tiwari

*Let us not forget that in our quest for a rapid green revolution and food security, we have completely ignored the soil health. Nutrient removal by crops far exceeds nutrient additions through fertilizers. This situation is akin to mining the soils of their nutrient capital. Replenishing of the mined nutrients is not only essential but also should be made mandatory. A systematic and regulatory approach should be made to achieve this goal on a missionary basis. There is an urgent need to address this issue. Keeping these facts in view, Indian Farmers Fertilizer Cooperative launched a Pilot Project titled "Soil Rejuvenation to Enhance crop Productivity which is showing the path of Second Green Revolution of food, nutrition and environment security.*

**F**ood production has increased over four-fold from 51 million tones (mt) in 1950 to an estimated 234 mt in the year 2008-2009. India witnessed a significant increase in grain productivity and cropping intensity till the 1980s. Thereafter several factors have led to a slowdown in the growth rate of agriculture. One of the major reasons for this decline is the large scale nutrient depletion through crop harvests and low level of replenishments through inadequate nutrient use causing negative

nutrient balances in the system. Deterioration in the soil's physical and biological properties is further withholding crop yield. Although scientists are developing new germ plasms to raise current yield ceilings, future yield increases are likely to occur in smaller increments than in the past.

In a country such as India where population growth rate outstrips agricultural productivity, the need to produce more food on a sustained basis





is important to ensure food security. As Indian agriculture is faced with a major problem of declining factor productivity immediate remedial measures to ensure food security at present and in the coming years for a long time would be needed.

To achieve the goal of improving agricultural growth rate, a major step would be the streamlining of the nutrient management practices in the area under food production. These yield increases will require more knowledge – intensive forms of soil and crop management that increase the efficiency of production inputs and, at the same time, do not harm the environment. Soil health problems and stagnation/decline in crop yields is a great challenge for one and all associated with agriculture development in the country.

Keeping these facts in view IFFCO initiated a pilot project titled “ Soil Rejuvenation and Productivity Enhancement” in 15 villages of Bighapur block of district Unnao, Uttar Pradesh in April 2009 to address the vital issues of continuous deterioration in soil health which in turn is leading to stagnation in crop yields and decline in factor productivity and farmers profit. . In October 2009, one more village-Harishchand Pur was added. The project aims rejuvenate the soil and enhance the productivity of the crops for better livelihood of farmers is serving as a role model to break stagnation in growth rate of agriculture through improved soil health and thus meet future challenges of increasing food demand to feed its burgeoning population. The salient findings of the project for the year 2009-10 is presented in succeeding columns.

#### Basic survey

The basic survey indicated that the crop productivity is low due to inadequate and unbalanced use of fertilizers, poor awareness about nutrient mining and in consequence emerging problem of multi-nutrient deficiency and the yield loss due to indiscriminate use of NP fertilisers. Farmers knowledge about balanced fertilization is very poor. They do not know about changing pattern of soil fertility due to exhaustive cropping. Organic resources available with the farmers which can be utilized for preparation of compost are being wasted. There is no compost pit in the villages. Farmers are reluctant to prepare compost and green manuring. They do not know much about biofertilizers and as such not

using biofertilizers. They are using fertilizers on their own experience without consideration of soil fertility status. Farmers are not aware of importance of soil testing and fertilizer use based on soil-test results.

#### Soil Fertility Evaluation

As revealed by soil testing, widespread deficiencies of nitrogen, phosphorus, potassium, sulphur and zinc were observed in soils of the Project villages. To rejuvenate the impoverished soils, a system approach of integrated nutrient management was adopted. In the first phase, farmers were educated about changing pattern of nutrient deficiency leading to the problem of multinutrient deficiency, impoverishment of soil health, decline in nutrient use efficiency and factor productivity and finally stagnation in crop yields.

**Nitrogen and Phosphorus:** More than 90% soil samples were deficient  
**Potassium:** 42 to 90% samples were either in low or medium category  
**Sulphur:** 90% samples were either in low or medium category  
**Zinc:** 73% samples were either in low or medium category  
**Deficiencies of other micronutrients were of low magnitude**

#### Responsible Nutrient Management: A Need Indeed

Awareness about importance of responsible nutrient management through integrated nutrient supply was created and farmers were persuaded for balanced crop nutrition integrating all nutrient resources viz. Fertilizers, organic manures, green manure, crop residues, biofertilizers etc. They were encouraged for conservation and use of organic wastes to prepare quality composts, promote use of green manuring, biofertilizers and use of secondary (sulphur)and micronutrients (zinc and boron) along with NPK fertilizers.

#### System Approach for Soil Rejuvenation

A system approach was adopted for soil rejuvenation which is comprised of green manuring, preparation and use of organic manures, biofertilizers and need based use of fertilizers.

#### Green Manuring

Green manuring is an important resource for improving soil health by increasing soil fertility and



### Measures Adopted for Soil Rejuvenation

- Balanced and efficient use of fertilizers including gypsum and micronutrients (1350 t gypsum - 884 beneficiaries)
- Conservation of organic resources and preparation of PSNC (581) and Vermi - compost (21)
- Green Manuring (478 beneficiaries, 200ha)
- Use of Biofertilizers (41,250 packets)
- Pulse based cropping systems
- Water harvesting (deepening of 7 ponds)

These measures will help improving soil fertility, physical and microbiological properties

by improving physical and biological properties of soils. Training programs to educate farmers about importance of green manuring in improving soil health and crop productivity were organised. Farmers group meetings were the regular feature of the project activity.

To ensure adoption of green manuring eighty quintal seeds of *dhaincha* (*Sesbania aculeata*) was distributed to the farmers for green manuring in 200 ha (Table 1). This certainly helped enhancing not only soil fertility but helped improving total soil health with favorable effect on soil physical and microbial properties of the soil in consequence to improved biological activity in the soil.

*Dhaincha* crop showed very good nodulation thus helped fixing sufficient atmospheric N and improving soil fertility and enhancing soil productivity. Six to 7 week old crop was turned in the field for the purpose of green manuring as shown in Fig. 1. Paddy crop was transplanted in such fields after turning green manure crop of *dhaincha*.

### Quality Compost

Farmers are careless about preparation of organic manures and most of the dung is utilized as dung cake for fuel (Fig. 2). The agricultural wastes available with the farmers are kept in open as heap and partially decomposed organic material is applied in the field which in turn favor increasing problem of termites.

To achieve the goal of integrated nutrient management which is important for bridging the gap between nutrient additions through fertilizers and nutrient removals by the crops, farmers were educated through several group meetings/ training

### Green Manuring

A major component of Soil Rejuvenation Project



A bumper dhaincha crop grown for green manuring



Good nodulation and high N fixation go hand in hand

This will enhance not only soil fertility but help improving total soil health with favourable effect on soil physical and microbial properties of the soil in consequence biological activity in the soil.



Turning of green manure crop in a paddy demonstration field

FIG. 1 A VIEW OF DHAINCHA CROP, ROOT NODULES AND TURNING

Table 1. Details of dhaincha seed distribution

Village	Quantity (kg)	Beneficiaries	Area covered, ha
Adhurjpur	505	43	12.6
Narottampur	500	36	12.5
Sademaui	400	15	10
Pandeypur	470	26	12.0
Narmdakheda	470	24	11.8
Girjanagar	420	20	10.5
Chiloli	450	27	11.3
Tedha	700	42	17.5
Satni	1380	92	35.0
Karnaipur	400	20	10
Pali	400	24	10
Nayakheda	450	24	11.3
Kamarajanapur	420	20	11.0
bara	560	36	13.0
Jhagarpur	475	29	11.9
<b>Total</b>	<b>8000</b>	<b>478</b>	<b>200.0</b>

### GREEN MANURING

Distribution of seeds

80 quintals of dhaincha seed was distributed for green manuring of 200 ha.





Fig. 2 Dung is used as dung cake for fuel

programs to conserve the organic wastes and use them judiciously for preparation of nutrient enriched compost which in IFFCO is popularly known as Phospho - Sulpho – Nitro (PSN) compost. Needless to say, farmers were neglecting the precious organic materials available with them for the purpose of composting and as such these wastes were creating the problem of environmental hazards. *470 pits were dug and filled for PSN compost.* The details of the pits completed are given in **Table 2**. A view of PSNC and vermi-compost preparation is shown in **Fig. 3**.

**Table 2. PSN Compost for Improving Soil Health**

Village	Pits filled
Adhuripur	54
Narottampur	41
Sademaui	16
Pandeypur	50
Narmdakheda	22
Girjanagar	30
Chiloli	20
Tedha	56
Satni	50
Karnaipur	27
Pali	40
Nayakheda	19
Kamarajanapur	16
bara	16
Jhagarpur	32
<b>Total</b>	<b>489</b>

**489 pits were dug and 186 filled for PSN compost. 284 more compost pits will be completed by August, 09.**



Farmer filling compost pit

### Promotion of Biofertilizers

Importance of biofertilizers is being realised more and more now than ever before. This is perhaps due to deterioration in biological properties of the soils under cereal based mono cropping system. Promotion of biofertilizers is a very important component of integrated nutrient management in this project.



Fig. 3 A view of PSNC (left) and vermi-compost(right)

As low water requiring crops like urd (urdbean), arhar (pigeonpea), mung (mungbean) is preferred by the farmers of the project area, 3500 packets of Rhizobium cultures of specific pulse crops were distributed and group meetings were organised to educate the farmers about correct use of these cultures. Besides rhizobium culture 4000 packets of phosphate solubilising bacteria (PSB) were distributed to enhance phosphate solubility of indigenous phosphorus present in the soil and also to enhance phosphorus use efficiency of phosphatic fertilizers like DAP. 4000 packets of Azotobacter cultures were also distributed for use in cereal crops like maize, sorghum and wheat.

### Use of Gypsum for Correction of Sulphur deficiency and Amelioration of Alkali Soils

1350 tons of gypsum was distributed to correct sulphur deficiency prevailing in 70 per cent fields and also to ameliorate alkali soils. To energise soil health by impregnating beneficial microbes, use of biofertilizers was promoted by distributing 31500 packets of crop - specific biofertilizers packets.

### Training Programs for Educating Farmers about Soil Rejuvenation and Productivity Enhancement

To enhance crop productivity, crop-specific training programs were organised to educate farmers about responsible nutrient management and best management practices. To achieve the goal, 6000 critical input packages were distributed to the farmers which included improved high yielding/hybrid seeds of cereals (rice, maize, sorghum, wheat), pulses (urdbean, mung bean, chickpea), oilseeds (sesame, toria, mustard), vegetables, spices, flowers, fruits,



and chemical fertilizers and biofertilizers. A general view of Project activities is presented in Fig. 5.

### Achieving the Goal

**Salient findings of the Project are summarised below:**

- ♦ The cropping intensity has significantly improved from 150 to 200 per cent. Earlier to the project farmers use to grow mixed crops of Local urd/mung + pigeonpea (Arhar), sorghum + arhar or Fallow – Mustard, Fallow–Wheat, Fallow – potato – Vegetables which are gradually changing to Improved varieties of early pigeonpea – Wheat, Improved varieties of Urd/Mung /Sesame/ Hybrid Maize/Hybrid rice/ Hybrid sorghum – Toria – Wheat or Improved varieties of Urd/Mung/ Sesame/Hybrid maize/ Hybrid rice/ Hybrid sorghum – Toria/Potato – Onion or Urd/mung/ Hybrid Maize/Hybrid rice/ Sesame – Toria – Wheat - Mung. After harvest of rabi crops dhaincha will be sown for green manuring.
- ♦ Appreciable increase in area under pulses, oilseeds and green manure was observed, thus cropping intensity was doubled. Crop productivity enhancement was quite significant varying from 21 to 74 per cent in different crops.
- ♦ 248 field demonstrations on urd, sesame, early pigeonpea, hybrid rice, hybrid maize, hybrid sorghum during kharif and 159 demonstrations on toria, mustard, wheat, chickpea, potato,

vegetables, spices and sugarcane were conducted during rabi to enhance crops productivity through improved varieties, efficient nutrient management, plant protection measures etc. Increases in crop productivity varied between 39 to 76 per cent in different crops with improved fertilizer practices over farmers fertilizer practices in kharif crops viz. Hybrid rice, hybrid maize, early pigeonpea, urdbean and sesame. During rabi, productivity enhancement program was initiated with mustard, wheat, chickpea, potato, vegetables and sugarcane and significant increases were recorded in productivity of all the crops with best management practices.

- ♦ Distributed 6000 packets of vegetable seeds and increased production of quality vegetables.
- ♦ As a component of crop diversification 15,780 saplings of tissue culture banana covering an area of 6.5 hectare were distributed. Besides this, 7500 saplings of guava, ber, aonla and citrus were distributed.
- ♦ Veterinary camps were organised for treatments animals, vaccination and artificial insemination.
- ♦ Free health camps were also organised for check up and treatment.
- ♦ Incentives were provided to girl students to pursue higher education. 1500 school bags and 4500 books were distributed to school going children.
- ♦ Free eye camps were organized for operation by most competent eye surgeon.
- ♦ Self help groups were initiated to generate additional income.
- ♦ Literature related to soil rejuvenation and productivity enhancement were published and distributed to the farmers.

This Project is now expanded in 117 villages of Bighapur block of district Unnao from April 2010.

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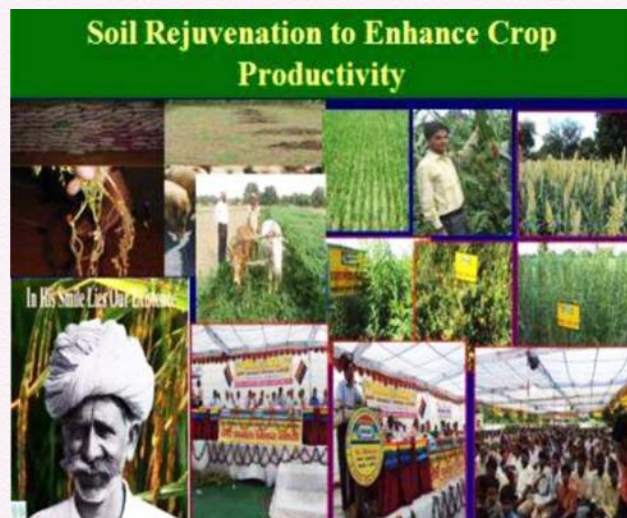


Fig. 5 Project activities at a Glance



# SALINE AND ALKALI SOILS AND THEIR MANAGEMENT FOR EFFECTIVE UTILIZATION

Yashbir Singh Shivay

*The estimates indicate that by 2025 the country may have about 13 million ha area under salt affected soils. There is, therefore, an urgent need to have comprehensive understanding and better contingency plans based on resource efficient, socio-economically viable and environmentally safe technologies to deal with salt degraded soils and to improve productivity of such marginal lands.*

**T**he salt affected soils are not alien to land; these have been associated with mankind since the inception of agriculture. Civilizations in Mesopotamia, Nile Valley, Mohanzodaro and several other places and their subsequent fall are the testimony to the occurrence of salinity in agriculture. Salinity afflicted the Indian landscape since time immemorial and the problem increased with the commissioning of a large number of

irrigation projects during the post-independence period. Presently approximately 7.0 million ha of agricultural land is affected by varying degrees of salt problems in the country, which has been shown in the Table 1. The affected area is likely to increase in the near future due to secondary salinization in irrigation commands and lift irrigated schemes, increase in dependence of agriculture on poor quality waters in semi-arid and arid regions, sea





water intrusion and brackish water aquaculture in coastal regions. **The estimates indicate that by 2025 the country may have about 13 million ha area under salt affected soils.** There is, therefore, an urgent need to have comprehensive understanding and better contingency plans based on resource efficient, socio-economically viable and environmentally safe technologies to deal with salt degraded soils and to improve productivity of such marginal lands.

Salt affected soils differ from normal soils in respect of soil reaction (pH) and soluble salt content. Visually, they are recognised by the presence of a white or greyish-white efflorescence of salts on the soil surface during dry months. Commonly they are devoid of good natural vegetation. Being poorly drained, water stagnates on the surface for long periods. Indicator plants of these soils include: *Prosopis juliflora*, *Acacia nilotica*, *Capparis aphylla*, *Salvadora persica*, *Butea monosperma*, *Sporobolus* spp., *Desmostachya* spp., *Suaeda maritima*, *Kochea indica*, *Leptochloa fusca*, *Cynodon dactylon* and *Bracharia mutica*.

Salt affected soils in India are broadly classified into groups of alkaline or saline soils. Soluble salts in alkali soils are mostly carbonates and bicarbonates of sodium. The exchangeable sodium percentage (ESP) of these soils often

exceeds 15%. In barren alkali soils the exchange complex may be largely occupied by sodium ions, and the presence of large amounts of exchangeable sodium dispersed in the soil resulting in their poor physical condition. The presence of sodium carbonate and hydrolysis of exchangeable sodium increases the soil pH, which in highly deteriorated soils may be as high as 10.5. Alkali soils are known as 'Usar' in Uttar Pradesh and 'Kallar' in Punjab and Haryana. The factors inhibiting crop / tree growth in alkali soils are:

- 1) A high pH throughout the profile which causes problems of nutrient availability
- 2) A highly deteriorated soil structure, with poor water transmission characteristics leading to water stagnation and reduced aeration of roots
- 3) A hard calcium carbonate layer at about one metre depth in the profile acting as a physical barrier for the vertical penetration of tree roots, although the location of this layer in the profile and its thickness varies in different soils. Often compact sub-surface horizons also restrict root penetration in alkali soils.

Saline soils contain an excess of neutral soluble salts, generally chlorides and sulphates of sodium, calcium and magnesium. Saline soils rich in such divalent cations have low ESP and

**Table 1. Extent of salt affected soils in different states of India**

States	Broad group of salt affected soils	Approximate area (million ha)
	<b>Costal salt-affected soils</b>	
Gujarat, West Bengal	Arid regions	0.714
Orissa, Andhra Pradesh	Humid region	1.394
Tamil Nadu, Kerala	Acid salt-affected	0.016
Karnataka, Madhya Pradesh, Andhra Pradesh, Maharashtra	Salt-affected soils of the medium and deep black soil regions	1.420
Gujarat, Rajasthan, Punjab, Haryana and Uttar Pradesh	Salt-affected soils of the arid and semi-arid regions	1.000
Haryana, Punjab, Uttar Pradesh, Bihar, Rajasthan, Madhya Pradesh	Alkali soils of the Indo-Gangetic Plains	2.500
		<b>7.044</b>



pH and a good physical condition. Owing to the flocculating effect of neutral salts, saline soils are very permeable and can be reclaimed by leaching with good quality water provided the ground water table is deep. The factors inhibiting crop / tree growth in saline soils include:

- 1) The salinity induced high osmotic pressure of soil water
- 2) The toxic effect of specific ions
- 3) Nutritional disorders occur due to competitive uptake of ions
- 4) A high water table and therefore regular and/or prolonged water logging is associated with such soils
- 5) The ground water found in saline areas is often of poor quality, while fresh water is scarce.

#### CAUSES OF FORMATION OF SALINE AND ALKALI SOILS

##### WEATHERING OF ROCKS AND MINERALS

Chemical weathering results in the release of neutral soluble salts including those of  $\text{Ca}^{++}$ ,  $\text{Mg}^{++}$  and  $\text{Na}^+$ . These salts move downwards and get deposited in the lower layer of soil with little amount of rainfall but again move upward due to high temperature. When water evaporates, these salts accumulate on the surface of the soil as white crust.

##### HYDROLYSIS OF SODIUM SATURATED SOIL COMPLEX

Sometimes soluble salts in the process of leaching of calcium ions are replaced by sodium ions. Soil micelle is then saturated with sodium resulting in the formation of sodium carbonate. Sodium carbonate so formed undergoes hydrolysis to form sodium hydroxide, which dissociates to increase concentration of hydroxyl ions in soil solution. Formation of  $\text{OH}^-$  ions results in an increase in pH.

##### ARID AND SEMI-ARID CLIMATE

Poor rainfall and high temperature of arid and semi-arid regions are very favourable conditions leading to formation of saline and alkali soils. The

low rainfall in these regions is not sufficient to leach down the soluble weathered products and hence the salts accumulate in the soil. In summary, salts move up with water due to evaporation. As water is evaporated in the atmosphere, the salts are left behind in the soil.

#### QUALITY OF IRRIGATION WATER

If water available for irrigation contains excessive amounts of  $\text{Ca}^{++}$ ,  $\text{Mg}^{++}$ ,  $\text{Na}^+$ ,  $\text{Cl}^-$ ,  $\text{SO}_4^{--}$ ,  $\text{HCO}_3^-$ ,  $\text{CO}_3^{--}$ ,  $\text{BO}_3^{--}$  and  $\text{NO}_3^-$ , their continuous application is reflected on the quality of soil. Water available in arid region usually contains excess amount of salts. Besides this: (i) A rise in the ground water level of salts and (ii) Erratic use of irrigation water, i.e. flooding at one time followed by drought so that salts may remain on the surface of soil leading to the development of saline and alkali soils.

##### USE OF BASIC FERTILIZERS

Use of basic fertilizers like sodium nitrate, basic slag may develop soil alkalinity

#### MANAGEMENT OF SALINE ALKALI SOILS

**Leaching of salts:** Leaching and draining away of salts by rain and irrigation water can be achieved effectively. The main objective in the reclamations of these soils is to leach the salts below the root zone. Hence, drainage system should be installed, if necessary. This is achieved by flooding and ensuring that water is drained away to lower depths in soil. To make it effective, bunds are raised around plots prepared according to their textural classes and water is applied depending on their water requirement to leach salts. Water needed to leach salts varies according to soil texture. The heavy soil need more water than sandy or light soils.

**Scraping:** Scraping off surface salts from highly saline patches can be done. However, this is very tedious job and required lot of labour and energy.



**Use of gypsum:** If saline soil contain a little amount of sodium, application of gypsum is necessary to displace sodium. This is followed by leaching. In these soils the exchangeable sodium is so great as to make the soil almost impervious to water. Large quantities of gypsum are applied to replace sodium and leached downward and out of reach of plant roots. Gypsum is applied on the soil surface and mixed by harrowing two to four weeks before sowing @ 2.5 to 5.0 tonnes per hectare depending on the density of the salts present in the salt affected soil.

**Artificial drainage and deep ploughing:** In saline soils, with high water table, artificial drainage should be practiced. If there is any hard pan in the sub-soil layer, that may prevent downward movement of water, deep ploughing or chiselling should be done to break such layers and open the soil for free downward movement of water.

**Use of mulches:** In areas where water resources are limited, application of surface organic mulch slows surface evaporation, salt movement by evaporative water is decreased and net downward movement of salt is increased.

**Use of sulphur:** In extreme cases sulphur is used to reduce alkalinity. Ground sulphur is incorporated into the soil several weeks before planting of the crop. The quantity of sulphur required is depending upon the intensity of salt affected soil and climatic conditions. The pH up to 8 the 1.25 to 2.5 tonnes of sulphur and 5 to 7.5 tonnes of organic matter per hectare will be required to reduce the pH to about 6.5.

**Application of pyrite:** Pyrite is a mineral containing iron and sulphur ( $\text{FeS}_2$ ). The pyrite should be grinded into small particles and broadcasted followed by a light irrigation. It takes about 4-6 weeks to oxidize on the surface of soil the soil after which it should be incorporated in to the soil. Pyrite is oxidized to sulphate. The oxidation is a chemical and microbiological process. Increasing

the ratio of application of pyrite increases the surface available for oxidation and results in an increase in the amount of pyrite oxidized. Top dressing of pyrite increases its oxidation and is more effective. The temperature range between 25 to 45°C is considered optimum for activity of *Thiobacilli*. *Thiobacilli* is usually aerobic and their activity decline under oxygen deficiency like waterlogging. *Thiobacilli* enhances the rate of oxidation of pyrites.

**Application of manure:** Salt affected soils are deficient in organic matter and nutrients particularly nitrogen and zinc. Because of high pH, many plant nutrients are fixed up in unavailable forms. Application of farmyard manure results in increasing fertility and improving soil physical conditions. The maintenance of flooded condition for 15 - 30 days following incorporation of farmyard manure at the rate of 20 - 25 tonnes/ha reduced exchangeable sodium percentage to a great extent by minimizing the escape of  $\text{CO}_2$  released during fast initial decomposition besides facilitating the leaching of sodium replaced from the exchange complex.

**Use of acidifying fertilisers:** The use of some acidifying fertilizers can help to reduce the salts toxicity for growing of the crop plant and trees. For example single superphosphate or ammonium sulphate which increases acidity in soil and maintains fertility of soil impoverished by leaching and cropping are the best source of plant nutrients in salt affected soils.

**Green manuring:** In alkali soil green manuring of *dhaincha* has been found to be beneficial along with gypsum in resorting physical condition and enriching the soil in nitrogen and organic matter. In addition to *dhaincha*, *sunhemp* can also be grown for reclamation of salt affected soils.

**Use of molasses:** Molasses are used to reclaim alkali soils @ 5 tonnes/ha along with 2.5 to 5 tonnes of press mud. It provide source of energy for micro-organisms and on fermentation, produce



**Table 2. Comparative salt tolerance of different crops**

Highly tolerant	Moderate tolerant	Moderate tolerant	Highly sensitive
Barley	Spinach	Radish	Lentil
Rice (transplanted)	Sugarcane	Broadbean	Chickpea
Cotton	Raya	Cabbage	Beans
Sugarbeet	Rice (direct sown)	Cauliflower	Peas
Turnip	Wheat	Cucumber	Carrot
Tobacco	Pearlmillet	Gourds	Onion
Safflower	Alfa alfa	Tomato	Lemon
Taramira	Oats	Sweet potato	Orange
Karnal grass	Blue panic	Sorghum	Grape
Date palm	Para grass	Millets	Peach
Ber	Rhodes grass	Maize	Plum
Casuriana	Sudan grass	Berseem	Pear
Tararix	Guava		Apple
Salvadora	Pomegranate		

organic acids which reduce alkalinity while press mud help in reducing exchangeable sodium.

**Growing salt tolerance crops and varieties:**

Crops and their varieties vary a great deal in their tolerance to salinity and alkalinity conditions. *Sesbania aculeata* (dhainacha) is a tolerant legume in these soils; rice is tolerant to flooding conditions and has a shallow root system. A list of salt tolerant crops has been given in Table 2 and accordingly the selection of crops can be done based on the intensity of the salt affected soils for better utilization of the finite resource (land).

Central Soil Salinity Research Institute, Karnal, Haryana has developed for coastal salinity, CSR 1, CST 2 and CSR 3 as salt tolerant rice genotypes and CSR 4 and CSTR 6 were released at the zonal level and CST 7-1 by Central Variety Release Committee. Recently, new salt tolerant rice variety 'Sumati' has also been released for coastal saline soils. Salt tolerant varieties of rice (CSR 10, CSR 13, CSR 23, CSR 27, CSR 30 and CSR 36), wheat (KRL 1-4, KRL 19), Indian mustard (CS 52, CS 54) and gram (Karnal Chana 1) have been released for various parts of the country by the same institute.

**Bio-saline agriculture:** As highly saline Vertisols are difficult to reclaim especially under rain-fed situations, bio-saline agriculture forms an alternative to bring these lands under cultivation. Economic potential of some halophytes can be exploited for saline agriculture on salt affected black soils of Gujarat.

It may be concluded that the problems of soil sodicity, salinity and of poor quality water are likely to increase in the near future due to planned expansion in irrigated area and intensive use of natural resources to meet food, fodder, fibre and timber requirement of the burgeoning human and livestock populations. Tentative estimate indicates that the salt affected soils will constitute nearly 13 million ha area in the country by 2025. Therefore, there is an urgent need to reclaim the presently salt affected soils and also to avoid the further deterioration in the soil quality by appropriate management techniques.

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# Soil Health: Key factor for sustainable production and ecosystem function

Nintu Mandal and Sujit Sarkar

*The golden era in Indian agriculture began with the Green Revolution in the 1960's. Synergistic interaction among various factors of crop production i.e. improved high yielding dwarf varieties, fertilization, improved crop protection chemicals, water management practices and moreover efficient delivery of technology by extension functionaries enabled us to reach to that success point. Production increased and the country was able to feed the masses. But in the post-green revolution era, due to indiscriminate use of agrochemicals i.e. fertilizers, pesticides and over exploitation of natural resources there is declining trend in partial factor productivity.*

Soil performs key ecosystem functions like sustaining biological diversity and productivity; regulating and partitioning of solute and water flow; filtrating, buffering, degrading, immobilizing and detoxifying organic and inorganic materials; storing and cycling of nutrients and provides support for socioeconomic

structure. Soil performs multiple functions to support our ecosystem sustainability. Now, soil health is deteriorating due to multiple causes as mentioned hereunder:

## Causes of soil health deterioration

Deterioration of soil health occurs due to multiple causes





**i. Imbalanced fertilization:**

Fertilization is necessary for crop nourishment. Balanced N: P: K ration is 4:2:1. But most of the cases there is wide variability in that ration, particularly in the state of Punjab and Haryana. This should immediately need attention

**ii. Deletion in Soil Organic Matter (SOM):**

Soil organic matter is known to be the nucleus of soil fertility. It imparts improvement of various physical, chemical and biological properties of soils apart from supplying nutrients. Due to tropical and subtropical climate there is rapid mineralization of organic matter and loss of carbon. Indian soils are typically low in organic carbon (Walkley Black Carbon 0.1-1%).

**iii. Intensive cereal-cereal cropping system:**

There is more nutrient mining in cereal based cropping system (Table 1). Mismatch exists between nutrient removal from soil and nutrient addition to soil. Our Indian Agriculture, there is negative balance sheet of 8-10 mt of nutrients.

**iv. Use of land not following the Land suitability classification:**

Land should be used based on its potentiality and limitations as per suitability classification. But

in most of the cases, improper land selection and crop results in depletion of soil health.

**vi. Emergence of multinutrient deficiency:**

Now-a-days apart from N (62%), P (49%), K (20%) there is occurrence of deficiencies of secondary S (41%) and micronutrients (Zn, B, Fe, Mn, Mo and Cu) which results in lesser crop productivity as well as depletion of soil health. As per report of the All India Coordinated Research Project on Secondary, Micronutrients and Pollution elements in soils and plants Zn, B, Mo, Fe, Mn and Cu deficiencies are to the tune of 50, 33, 13, 12, 5 and 3% respectively.

**vii. Lack of Soil testing facilities:**

Soil testing services in our country not in a position so that it can reach to every farmer. There is need to strengthen this service and to cover more number of samples.

**viii. Soil Test Crop Response Correlation Approach (STCR):**

There is STCR based recommendation for major crop varieties developed in different agro-climatic condition but this recommendation in most of the cases does not reach to the farmer in appropriate time and place. So, information dissemination is a problem major problem in this aspect.

**Table 1. Estimated nutrient removal under rice - wheat cropping system in Indo-Gangetic Plain**

Sub-region	Removal of Nurients ('000 tonne)								
	N	P	K	S	Zn	Fe	Mn	Cu	B
Trans Gangetic Plain	682.0	186.2	982.2	141.6	1.23	3.92	2.87	1.65	0.32
Upper gangetic Plain	547.8	145.9	782.0	112.6	1.00	3.16	2.31	1.31	0.26
Middle Gangetic plain	334.8	92.6	499.6	69.8	0.60	1.92	1.40	0.80	0.16
Lower Gangetic Plain	33.5	9.2	49.8	7.0	0.06	0.19	0.14	0.08	0.02
Indo-Gangetic Plain (Total)	1598.1	433.8	2313.6	331.0	2.89	9.19	6.72	3.84	0.76

(Gill and Singh, 2009)



**ix. Improper method of compost preparation:**

Farmers may be trained for preparation of compost from their own farm waste, cattle dung, urine and vegetable waste. Some farmers prepare their own but during preparation and storage lot of nutrient loss occur due to improper handling of manures or composts.

**x. Dumping of industrial effluents:**

Dumping of industrial effluents without prior treatments causes soil pollution. Some times radionuclide is also dumped in soil, which causes health hazard. In coastal area, some oil spillages are there causing soil pollution.

**Soil test based fertilizer recommendation:**

Soil test based fertilizer recommendation is important for balanced nutrition. At present, there are 686 Soil Testing Laboratories (STLs) in India with analyzing capacity of 7.21 m soil samples. Out of these laboratories, 647 STLs run by State Governments, fertilizer industries 39 STLs and SAUs and ICAR run 20 STLs. But these numbers cannot cope growing demand. Now, question arises why soil testing is not yet successful in India? Possible reasons may be:

- i Error in sampling: Most important and critical part in total procedure is sampling. Farmers do not know exact procedure to draw representative sampling. If sampling error is there, then recommendation will not be proper.

- ii Difficulties in estimation: Lack of trained manpower is a major problem in most of the laboratories. Proper procedure of estimation with suitable precaution should be followed. There is chances of errors in each and every steps if not appropriately followed

- iii Improper interpretation of results: Interpretation of results is also critical. In this regard in most of the laboratories the procedure followed are

Above mentioned criteria was developed more than 50 years ago and after wards no revision has been made. Lot of changes is already there, so the range should immediately be revised. Further, division into five categories may be done i.e very low, low, medium, high and very high.

**Soil and Water testing Kits**

It is practically not possible to establish soil testing laboratories in every blocks and villages. Now-a-days soil testing kits are available which can analyze pH, EC, Organic Carbon, P, K, N, S along with some micronutrients. In some kits, lime requirements and gypsum requirement calculations provision are there. These kits are low cost (Rs. 2500-5000, depending on number of parameters) are already available in market. These kits are having enormous potentialities to reach each and every field of farmers.

**Table 2 Rating of soil test values currently followed in India**

Parameters	Range		
	Low	Medium	High
Organic Carbon (WBC) (%)	<0.5	0.5-0.75	>0.75
Available N (KMnO <sub>4</sub> -oxidisable) (Kg ha <sup>-1</sup> )	<280	280-560	>560
Available P (Olsen) (Kg ha <sup>-1</sup> )	<10	10-20	>20
Available K (NH <sub>4</sub> OAc extractable) (Kg ha <sup>-1</sup> )	<120	120-280	>280



### Digital soil testing kits

Digital soil testing kits has recently been developed which can analyze N, P, K, S, Zn and B and give fertilizer recommendation just by moving the knobs. It is very simple, easy to operate and low cost. Farmers need not to calculate, how much fertilizers has to be added, it will automatically give fertilizers recommendation. In situ testing in the field and recommendation is possible and can reach each and every corners of farmer's field.

### Soil suitability mapping and classification:

Intensive survey and mapping of lands depending on suitability and limitation is necessary. NBSSLUP has already covered some area, but at block levels generation of such maps is necessary for suitable land use planning and sustainable use of land for which it is actually suitable. This is very important in modern context where there is huge competition for use of lands for different purposes.

### Remote sensing, GIS and GPS based approaches

Identification of saline area, waterlogged area and alkaline area for larger scale remote sensing is very much useful. Now-a-days organic carbon status, N availability, crop health status can be monitored through remote sensing based approach. Using GPS, exact location of a particular place can be known. In GIS, environment soil fertility map for a particular area can be prepared and it is very useful for farmers, planners and policy

makers. So, coupling of modern technologies with traditional ones is very important.

- i From the year 2010, NBS (Nutrient Based Subsidy) has been implemented by the government instead of earlier product based subsidies. No doubt this will lead to balanced nutrition.
- ii Quality controls for biofertilizers should be strictly monitored as this contains living material and should have enhanced shelf life when applied in soil.

- iii Strengthening of soil testing facilities and services

- iv Through extension services for farmer's consciousness and education about soil health.

- v Issue of soil health score card and rapid access of test report through e- governance or using AADHAAR.

- vi Ensure availability of fertilizers in the market when farmers need it. Some cases fertilizer

products are not available in time.

- vii Some subsidy may be provided for purchase of soil testing kits to encourage farmer to use it.
- viii Strict government actions and monitoring is needed for reducing dumping of industrial effluents in soil without pretreatments.

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***Soil test based fertilizer recommendation is important for balanced nutrition. At present, there are 686 Soil Testing Laboratories (STLs) in India with analyzing capacity of 7.21 m soil samples. Out of these laboratories, 647 STLs run by State Governments, fertilizer industries 39 STLs and SAUs and ICAR run 20 STLs. But these numbers cannot cope growing demand.***



## Bamboo Management – A Grass or Poor man's Timber

S. P. Vasudeva

*The first claim over bamboo growing in government / forest land should be of local right holders/ tribals for their bonafide domestic requirement. This be followed by distributing it to local organizations of youth and co-operatives for its value addition and sale. Exploitation for commerce and trade by Govt./ other agencies must follow these requirements.*

There had been discussions and deliberations in the recent past regarding whether bamboo be treated as grass because it belongs to the grass family Gramineae (Poaceae) or timber wood because it is classified as such under the Indian Forest Act, 1927. Bamboo in any case is an important plant species having vast socio-economic potential with capability to generate employment

and ability to ensure ecological and environmental stability. It also has carbon sequential properties thus aiding in abating climate change. It is one of the fastest growing plant and a quick renewable resource. Bamboos cover about nine million hectares of forest land in India and in many states cultivated on private lands also. About 23 genera and 130 species of bamboo both indigenous and





exotic are found making India the second largest place for bamboos in the World after China. This diversity can be made use of not only in utilizing it in raw form but also through its value addition in producing various products. Bamboo has capacity to replace wood products by manufacturing of new generation bamboo products such as mat board, mat veneer, composite mat, corrugated sheets etc. The introduction of such bamboo based products will help in conservation of forests by replacement of the wood products and with that taking the bamboo-based industry to an outlay of Rs 26000 crores by the end of 11th Plan (National Bamboo Mission). Bamboo sector generates more than 450 million workdays annually. This makes it an ideal plant species of utility for the rural and tribal areas.

#### **Bamboo - Forest Produce or Minor Forest Produce:**

Bamboo has been designated as Minor Forest Produce by including it in Rule 2 (i) under Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006. Rule 3 © of this Act entitles the individual local tribals or other traditional forest dwellers along with the communities the right of ownership, access to collect, use and dispose off bamboo and other Minor Forest Produce which traditionally has been collected within or outside village boundaries. However it still remains a forest produce under the principle Act the Indian Forest Act, 1927 as per Rule 2 (4) (a) and Rule 7 of this Act. It cannot be treated as Minor Forest Produce where Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 and Rules made is not applicable. The term Minor Forest Produce was coined for the management of forest produce mostly small in size (leaves, flowers, fruits, roots, tubers, extracts of plants etc.) found as undergrowth and has nothing to do with taxonomy or law. Since bamboo occupies large forest areas, is harvested like trees, transported like timber, its utility in raw form or through value addition can replace many timber and wood based products and having vast

environmental potential it is not appropriate to classify it as a Minor Forest Produce.

Grasses, herbs, shrubs, bamboos and trees growing in forest as per Indian Forest Act, 1927 is a Forest produce. This was and has rightly been done for the simple reason to conserve floral-diversity including tree growth and bamboos. It has come handy due to carbon sequential properties the tree growth, bamboos and other floral-diversity has, thus aiding in tackling the menace of climate change and other environmental challenges that have cropped up in the recent past. The criticism that conservation and management of plant growth and trees including bamboo through the above legal and policy perspective as contained in the Indian Forest Act, 1927 is anti poor and anti-tribal is unfounded and uncalled for. More so the forest rights to the people both in the tribal and other areas during the colonial period and thereafter has been bestowed under this Act by following the process of public consultation. Himachal Pradesh is a state where the erstwhile rulers and then the state governments after independence made it a point to give such rights through this process to the people including tribals in the forests. These forest rights are contained in various Forest Settlement Reports. This is true of many other states.

#### **Bamboo – Policy and Legal Issues for its Management:**

The country has got a written constitution which has to be taken into account while governing. Laws and Rules enacted under the constitution need to be followed by deriving powers from them. Based on these laws, policies have to be framed for implementation to be continuously reviewed for improvement. In doing so the welfare of the people and accountability of the Government to the people is of prime importance, democracy being the guiding principle. However in the present context the demands being raised regarding bamboo management, the laws in force are being challenged and the policies being proposed are in contravention of laws in force. The only guiding principle being



thought of is populism and immediate economic returns without taking into consideration the social-economic and environmental benefits this wonder plant had been giving and is required to give in future.

Basically, the primary role that the Plant Kingdom including Bamboos have in nature is to produce oxygen and absorb carbon-di-oxide through photosynthesis and with that regulate the conservation of water. The use of bamboo and its products for the benefit of communities individually and or collectively in any way is of importance but has to be secondary. The exploitation for commerce and trade comes thereafter. Hence while dealing with the exploitation of forest produce including bamboos we have to keep a balance between socio-economics and environment based on the principle of sustainability and there needs to be regulations in force to work on these principles. Deregulation of its exploitation and transit especially from the private land has been allowed in many states by taking it out of the Transit Rules made under section 41 and 42 of Indian Forest Act, 1927 to make its exploitation and transportation easy. This principle need to be followed where such a de-regulation has not been implemented.

The 73<sup>rd</sup> constitutional amendment gives ownership and management of Minor Forest Produce to the Gram Sabha within the jurisdiction of the Gram Panchyat. The classification of bamboo as Minor Forest Produce under the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 entitles besides community the individuals the right of ownership, access to collect, use, and even dispose it growing in forests. However this will apply only in areas where this Act is applicable. Further several initiatives have been started by the state and central Govt. for value addition of bamboos and marketing of its products. It has to be kept into consideration that although its collection for local domestic use without any restriction is

a step in right direction but when its exploitation for commerce and trade is involved no free will can be allowed and there has to be regulation and proper institutional mechanism for its exploitation and management so as to conserve it till posterity. Such a provision through Gram Sabha of Panchyat exists under PESA Act, 1996 and rules made in many states. Similar Management perspective need to be brought under Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 as per 73<sup>rd</sup> constitutional amendments rather than allowing free will and access to individuals to dispose of the bamboos for commerce and trade by taking recourse to it being Minor Forest Produce while ignoring that it is a common property resource.

#### **What Next – Sustainable Management:**

Bamboo is a fast growing plant species which needs to be propagated both on the Govt./ forest land and private land to utilize its socio-economic and environmental potential. National Bamboo Mission a Centrally Sponsored Scheme has been initiated by Govt. of India and is being implemented with such objectives and intention. Bamboo needs to be de-regulated from the process of demarcation of land and transit rules when growing on private land for its easy exploitation and transportation where it has not already been done. However, care has to be taken that because the exploitation of bamboo on the private land in most cases is contractor centered, local people and tribals need to be exposed and they have to come forward to take over the trade. The felling cycle in the private land under Land Preservation Acts of the state, however, needs to be followed to utilize the sustainable social, economic and environmental potential of bamboo.

The first claim over bamboo growing in government /forest land should be of local right holders/tribals for their bonafide domestic requirement. This be followed by distributing it to local organizations of youth and co-operatives



for its value addition and sale. Exploitation for commerce and trade by Govt./ other agencies must follow these requirements. The felling cycle contained under the working plans of the area need to be followed scrupulously where trade and commerce is involved for sustainable returns and for continuity of bamboo forests till posterity. Commercial exploitation of bamboo from the Govt./forest land at first be tried through Panchyat/Local Yuvak Mandals on usual payments if they have capacity and capability to do so to be followed by other agencies. The local people through their Gram Panchyat must have share in the amount earned from its exploitation (being a common resource) from forest land which may be used for the development of the area under the panchyat or given in cash to the people of that Gram Panchyat where the capital is not required for developmental needs. This percentage can be decided by the state governments. Local self help groups need to be constituted for the utilization and value addition of bamboo and where possible and feasible co-operatives with representation from the local people and tribals be set up for such a purpose. Bamboos need to be given to these organizations free or at a minimum price to be decided by the concerned Gram Panchyat and to have uniformity in consultation with the Forest Department. The bamboo in raw form and the value added products should be made mandatory to be purchased by Public Sector/ Private Sector enterprises from them through the process of competition after fixing the minimum support price for remunerative economic returns to the people.

Such a process of management of forest produce including bamboos extracted from forests exists under PESA Act, 1996 through the institution of Gram Sabha of Panchyat and need to be extended to areas not covered under the Act. Unlimited access to cut bamboos for commerce and trade to local individuals need to be avoided as it will not only result in elimination of bamboo

but lead to encroachments and degradation of forests in those areas as bamboo occupies vast forest area unlike other Minor Forest Produce which is collected from plants and trees or occur dispersed as undergrowth in the forests.

The management of bamboo growing on Govt./forest lands through Gram Sabha of Panchyat will have to remain with the Forest department for facilitation and regulation with full accountability for the sustainability of its growth and yield. If need be such a process can be brought under the purview of Public Service Delivery Act being promulgated for full accountability and responsibility. This is required as if the harvesting left to the people without any control and regulation as seen in case of other forest produce including Minor Forest Produce in the past has almost disappeared or on the verge of extinction. The communities including tribals can be benefited individually for their domestic requirement through rights recorded which if not already existing can be bestowed now under the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 where this Act is applicable and in other areas under the Indian Forest Act, 1927.

### **Conclusion:**

The management of bamboo in this way both on private holdings and forest land uniformly in the country will help in utilizing its socio-economic potential for rural and tribal people and giving ecological and environmental stability for posterity so essentially required. Bamboo can be designated as grass which it taxonomically is belonging to grass family Gramineae, but by using its vast socio-economic and environmental potential in a sustainable way as explained. However, it cannot be designated as Minor Forest Produce just for utilizing its economic potential immediately.

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## Increasing Forestry: Development Should Not Degrade Land

Dhurjati Mukherjee

**A**t a time when there is all round concern for the environment the world over, the United Nations declared this year as the 'International Year of Forests'. The UN obviously wishes to raise awareness how forests are to people all over the world, specially indigenous countries. There is need to check deforestation through an integrated programme and motivate people to plant more trees to ensure that air pollution is checked or curbed while these could act as carbon sinks to offset fossil-fuel driven emissions.

It is a well known fact that forests are intrinsic to human welfare. **In India about 100 million people are dependent on forests for fuel wood, fodder and non-timber forest produce, of which 54 million are adivasis that is, downtrodden and neglected people. The livelihood of these people is linked to**

**development of forests and their proper upkeep.**

But in recent times, there have been several controversies involving the coal and environment ministries over diverting forests for mining.

Roughly 21 per cent of India's geographical area is under forest cover. The theology since the early 50s has been that one-third of the country should be under forest cover. Though this has never become a reality there is a need to ensure that the present forest cover, due to mining and other industrial activities, is not further reduced. The development paradigm should be so designed that the country's forestry is not affected.

It is significant to note that, as per estimates of the environment ministry, forests could absorb 11 per cent of India's greenhouse gas emissions





that contribute to climate change. This is equivalent to 100 per cent emissions from energy in the household and transport sectors. A 'green bonus' has been announced for covering forests that act as carbon sinks.

As is well known, trees absorb atmospheric carbon dioxide through photosynthesis and the growing forest cover will increase the forest carbon stock from 8.8 billion tonnes of carbon in 2006 to 9.5 billion tonnes carbon by 2030, as per the study. Such projections of increased forest cover and increased carbon stock are indeed welcome as this would help Indian negotiators during various international conferences and negotiations on ways and means to curb global warming.

However, according to a research paper titled 'Cryptic Destruction of India Native Forests' prepared by two Indian scientists and another from Australia, India's forest cover has been decreasing. While the country's official document 'Status of Forest Report 2009' claims a 5 per cent growth in forest cover between 1997 and 2007, the research paper points out that large chunks of this cover were actually made up of exotic tree plantations such as eucalyptus and acacia. If the plantations are subtracted from the total forest cover, the figure showed 1.5 to 2.7 per cent shrinkage of India's natural forests every year.

The paper observed that "India has already lost 80 per cent of its natural forest cover". As is well known, natural forests support associated species. The clearing of forests and its replacement by plantations often results in the extinction of several species of flora and fauna.

Another recent study by the lead author Prof. N. H. Ravindranath of the Centre for Ecological Sciences, IISc observed that "India could cite its steady increase in forest cover as an achievement towards mitigating climate change". The IISc researchers found that India appears to have

stabilized its forest cover despite pressures from human and livestock population and low per capita forest cover. The country has only 66 million hectares of forest or wooded land per 1000 population compared with China's 215 million hectares or Brazil's 2673 million hectares. About 196,000 villages in India are located within or on the fringes of forests.

There is enough doubt about increase in forest cover in the country. Stabilization of forest cover amidst reports of deforestation may be attributed to the implementation of the Forest Conservation Act 1988 that was designed to reduce indiscriminate diversion of forest land for non-forestry activities and regulate land under forests. However, there are allegations that well over half the forest land for non-forest use has taken place since the promulgation of the Act. A lot more needs to be done in strict adherence to the Act so that forests are protected, the true sense of the term, and also taking up urban forestry in a big way to combat the growing environmental pollution in most of the urban centres.

Meanwhile another study, released at the 190-nation meet at Bonn, found that India's forest cover of 65-66 million hectares of forest and tree cover is enough to neutralize 11.25 per cent of the country's total emission of greenhouse gases at 1994 levels. This is equivalent to offsetting 100 emissions from all energy in residential and transport sectors or 40 per cent of total emissions from the agricultural sector. Should the country's forest cover increase at the current rate of 0.6 per cent per annum, then the total carbon stored in India's forest will increase to 6998 million tonnes by 2015.

Efforts to reverse deforestation have meant that between 1995 and 2003, the carbon stock in the country's forests increased from 6245 million tonnes to 6662 million tonnes. Over the next few years till 2015, the government proposes to

*Contd. Page 26*



# The Mahatma

**“The highest form of freedom  
carries with it the greatest measure  
of discipline and humility”**

*M.K. Gandhi*

**2 October, 2011  
The International Day of Non-Violence**







*from Page 23*

bring 6 million hectares of degraded forest land under forest cover. Considering the impact of the initiatives undertaken, the study projected that if India's forest and tree cover increases at a higher rate than 0.6 per cent, then the total carbon stored could increase to 7283 million tonnes by 2015. This is expected to add a value of Rs 6000 crores per year.

Obviously what is needed at this juncture is sustainable forest management and incentives for afforestation and reforestation. In spite of efforts, the Tenth Plan stipulation to increase "forest and tree cover to 25 per cent by 2007 (end of the Plan period) and 33 per cent by 2012 (end of Eleventh Plan) as against the baseline cover of 2003 per cent in 2001" has not been achieved. The mid-term appraisal of the Ministry of Environment & Forests (MoEF) found the progress rather disappointing as total forest cover does not appear to have increased despite 1.1 million hectares covered under annual afforestation programmes.

It is necessary to mention here that though the Scheduled Tribes & Other Traditional Forest Dwellers (Recognition of Forest Rights) Act was passed in 2006, a committee of the Ministry of Tribal Affairs, MoEF submitted a report (on December 15, 2010) which found "implementation of the FRA has been poor and therefore its potential to achieve livelihood security and changes in forest governance along with forest conservation has hardly been achieved". In fact, the Act has hardly been implemented in Bihar, Uttarkhand, Jharkhand, Himachal Pradesh, Arunachal Pradesh and other North Eastern states.

However, though conserving forests and increasing the green cover has received some priority for some time now, more efforts are needed in this direction. In colonial times and after, the State appropriated resources from local

communities. Things changed after the Forest Act which centralized decision-making over forests with only the Central government having the power to sanction the diversion of forest land for non-forest purposes. The hitherto rampant diversion of land stopped to a very limited extent but deforestation couldn't be adequately controlled. Even now around 100,000 hectares of forest land has been allowed for mining.

Since the 1990s and even later, the Supreme Court stepped in, imposing checks on how forests were to be worked and the country also started giving a lot of emphasis on forest development. The action plan adopted by the government a few years back has been to improve the forest cover by rehabilitating 31 million forest land at an investment of around Rs 1860 crores per annum.

The strategy in India has not been all that successful because of lack of secure rights to land or even to forest produce. Moreover the incentives to people, tied just to forest produce, were too small to make it sustainable. The JFM (joint forest management) strategy was that local communities would manage forests if they were compensated with resultant forest produce; many states talked of "benefit sharing". In reality, either the highly degraded forests provided little by way of tangible benefits or the 1996 ban on felling came in the way of gaining from harvesting timber. And various rules in different states that keep changing restrict access to non-timber forest produce.

A World Bank study titled Unlocking Opportunities for Forest-Dependent People a few years back found that though the JFM model has been successful, most communities still fail to utilize the full potential of forests to improve local livelihood. For communities to benefit from the untapped potential of forests, the study stressed, wide ranging and carefully phased reforms are required at both the national and state level, addressing the following:



- (i) stronger forest rights and responsibilities for forest communities;
- (ii) more effective management systems targeted at communities involved with forestry;
- (iii) improved access to more efficient market systems for major and minor products; and
- (iv) more effective and flexible institutions and capacity building.

The economic benefits from forestry have been envisaged to be immense. As is generally agreed maintenance of forests keep a wider variety diversity of livelihood options, protects biodiversity and buffers against extreme events such as floods and landslides.

The total forest income from commercial timber, bamboo and non-timber products on improved forests is expected to rise from an estimated \$ 222 million in 2004 to approximately \$ 2 billion by the year 2020. Further, with modest value addition and quality enhancements, annual commercial incomes could also increase significantly. Ecological and eco-tourism values from current JFM forests could be as high as \$ 1.7 billion as formerly degraded forests mature and begin to generate important conservation benefits, the study concluded.

Keeping in view the fact that the annual loss of land-based natural capital – in terms of human welfare benefits from forests alone – pegged between \$ 2 trillion to \$ 4.5 trillion, as estimated by researchers of The Economics of Ecosystems & Biodiversity (TEEB), it is necessary at this juncture to give serious thinking to regenerate our forests and evolve new ways and means of managing its wealth in a way that can straddle conservation as well as productivity.

Meanwhile it may be mentioned here that the government has recently decided to assess vulnerability of forests and take remedial measures under the Rs 46,000 crores Green India Mission. Parts of forests as also wildlife corridors, critical wild life habitats etc. that are vulnerable to climate

change will be identified using satellite mapping and on ground research. The Mission plans to increase forest cover by 5 million hectares and improve another five million hectares of degraded forests. Seven vulnerable criteria for identification of forests based on forest diversity and density has been identified by the Indian Institute of Sciences. From the next financial year (2012-13), the fund disbursement of approximately Rs 4100 crores will start and these will be given to the state governments for specific jobs of the Mission.

One is reminded of the fact that India has the world's third largest 'ecological footprint' (overall impact) and is using twice what its natural resource base can sustain. Keeping in view the fact that forests are among the world's largest carbon sinks and the government's Green India Mission, which is no doubt a very positive step, the following measures need to be seriously considered:

- (i) determining forests which needs to be protected only for conservation;
- (ii) strict adherence to the Forest Rights Act (FRA) and resisting pressures for indiscriminate mining, specially in 'no-go' zones;
- (iii) implementation of the FRA and changes in forest governance along with strengthening of forest conservation;
- (iv) paying the communities who live in and around forest lands for protecting resources, the costs of which have to be paid by users for water, recreation or other services;
- (v) revamping the conservation policies for forests by planting trees in a big way but also cutting those to utilize our forest wealth without destroying forests; and
- (vi) encouraging through incentives and other ways afforestation and reforestation programmes, both in urban and rural areas.

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## Agro-met Advisory Services for the Farmers

Sarita Brara

**W**eather Forecasting Service was introduced by the India Meteorological Department for the benefit of farmers even before independence in 1945. It was broadcast over All India Radio in the form of Farmer's Weather Bulletin (FWB). For a very long time programmes like Krishi Darshan aired by All India radio were the only source of information for farmers across the country. The programme had become so popular that that one of the varieties of rice was in fact named as Radio Rice. But times have since changed. The profile of the farmers is fast changing and with the revolution in the IT sector the dissemination of information to farmers too is taking multi-channel routes. SMS and voice messages on Mobiles are the latest techniques to reach out to the farmers. According to the Agromet scientist K.K Singh, over 25 lakh farmers are benefiting from this service.

Vikas, a farmer in village Nizampur near Delhi says that he was about to sow the seeds for carrots when he received the SMS that there would be heavy rains and he postponed the sowing. Had he gone ahead with his plan and not received the message he would have lost 25000 rupees worth of money in addition to the effort that would have gone waste.

In Palla village, also near Delhi, farmer Surendra had decided to irrigate his paddy crop but he received the SMS that it would rain in a day or two and he postponed the irrigation. The message helped him save cost inputs for irrigation including electricity.

One of the farmers in Nekpur village of Bulandshah told us that he was planning to spray fertilizer in September but as he received an SMS that there will be rains within next two days, he knew the time was not right for the idea and





concentrated on other issues on the farm. Had he ignored the message, the rain would have washed away all the fertilizer.

### **What is Agromet SMS?**

The Agromet SMS are brief notes not more than 160 letters providing information on weather forecast and other agriculture related issues to the farmers. The content is suitable for local conditions and needs. These advisories are sent twice a week and the farmers receive them in their local language.

Various stake holders such as Ministry of Earth Sciences, Ministry of Agriculture and Telecom companies came together to start this new and innovative venture. The IFFCO Kisan Sanchar Ltd (IKSL) was launched in 2009 to empower Farmers by providing agricultural information to farmers via mobile phone using innovative voice based technology in their local language including a local support Help Line.

The source material is prepared by 130 field units that are located across the country. These field units comprise experts in various agriculture related subjects. 50 to 100 contact farmers are under each of these units who give their feed back.

### **A five-tier system**

It is a five-tier system in place for dissemination of Agromet information.

- 1 The Ministry of Earth Sciences which is the nodal ministry.
- 2 IMD Headquarter which is the main source for weather forecast. IMD started Agro Meteorological agricultural Advisory Service (AAS) from its State Meteorological Centers, in collaboration with Agriculture Departments of the respective State Governments in 1976. Later an Integrated Agromet Service was introduced in the country from 2007 in collaboration with different organisations/institutes. At present

bulletins are being issued from the national, state and district level.

IMD maintains a network of agro meteorological observatories across the country with the cooperation of agricultural universities and research institutions. The Division provides technical assistance to the cooperating institutions for site selection, training of personnel, calibration of instruments and their maintenance, scrutiny of data, etc. Besides this, observations of evaporation, evapotranspiration, soil moisture and dewfall are made at IMD's own observatories. The Central Agromet Observatory at Pune and the agromet observatories at Bangalore, Anand and Rahuri have many special instruments and facilities for research.

The Agricultural Meteorology Division prepares crop weather calendars, which depict the state and stage of the crop under normal weather conditions and the weather elements detrimental to the crops in various growth stages. The crop weather calendars are periodically revised as new crop varieties are introduced and cropping patterns undergo changes.

3. The third link in the five tier system is regional Met centres. They add value to the forecast taking into consideration the local inputs and conditions.
4. The Agromet Field Units They are an indeed the most important link. For it is at this level that brief notes to be sent to the farmers are prepared. Apart from the location specific weather forecast, short advisories are prepared on irrigation, sowing, pesticides, fertilizers, plantation early or late variety of seeds and other inputs and harvesting as well. These advisories are specific to local conditions and requirement.



## 5. Telecom companies

A number of telecom companies have arrangements for disseminating information to the registered farmers in the local language. It may be, however pointed out that only 10 to 15 percent of the farmers are benefitting from the SMS services. There is a long way to go before a majority of farmers will be able to get information from this service. But these farmers can get information from nearly 600 Krishi Vigyan Kendras set up in eight zones across the length and breadth of the country. The Ministry of Agriculture, GOI, has set up these KVKs throughout the country to serve as an easy knowledge access point for the farmers. KVK disseminates latest technological information on agriculture, animal husbandry and allied field using AIR and Doordarshan by organizing farm schools, phone in programme etc. for farming community.

- ♦ Farmers can solve their queries by writing letters to KVK SMS on specific problems to get timely reply.
- ♦ Farmers can also avail the phone facilities of Kisan Call Center – 1800-180-1551, Help-line Services- 0581-230111111, at KVK landline phone 0581-2301181.
- ♦ Farmers can interact with the scientists at the Krishi Vigyan Kendra & get consultancy on issues related to agriculture, animal husbandry and allied fields to get information on advanced technological options.
- ♦ Farmers can have demonstrations & trials on their fields on latest scientific technologies.

### Impact of Agromet Services:

The agromet advisory services through various channels have resulted in significant increases in

farm productivity, resulting in increased availability of food and higher income generation.

They have helped the farmers not only in increasing their productions but also reducing their losses due to changing weather patterns and others problems.

The economic benefit of the agromet services runs in crores. The Ministry of Earth Sciences had engaged National Council of Applied Economic Research (NCAER) to carry out a comprehensive study on “Impact Assessment and Economic benefits of Weather & Marine Services.” This study was carried out during September & October 2010 and restricted to main end users i.e. Farmers for Agrometeorological Advisory Services. The

field study was carried out in 12 states and 1 Union territory. It was revealed that economic profit estimates can vary between Rs. 50,000 Crore (where 24% farmers receive weather information) to 211,000 Crore (where all farmers receive weather information). This shows that its economic returns depend on the proportion of farmers receiving information.

That is why there is need to ensure that all farmers, small, marginal and big, are able to benefit from the Agromet Advisory Services. This will no doubt go a long way in not only increasing production but raising the income of farmers and reducing their losses and ultimately distress. But for this infrastructure to match the demand will have to be created and that will indeed be a big challenge for the government as well as other stakeholders.

*(The author is a freelance journalist.)*

**In Palla village, also near Delhi, farmer Surendra had decided to irrigate his paddy crop but he received the SMS that it would rain in a day or two and he postponed the irrigation. The message helped him save cost inputs for irrigation including electricity.**



## Traditional Knowledge Digital Library (TKDL)

Samir K. Brahmachari

**T**KDL is a collaborative venture between Council of Scientific and Industrial Research, Ministry of Science and Technology and Earth Sciences, and Department of AYUSH, Ministry of Health and Family Welfare, and a maiden Indian effort to prevent misappropriation of traditional knowledge belonging to India at International Patent Offices. TKDL has overcome the language and format barriers by scientifically converting and structuring the traditional medical knowledge of Ayurveda, Unani, Siddha and Yoga in 34 million A4 size pages of the ancient texts in languages such as Sanskrit, Hindi, Arabic, Persian, Urdu and Tamil into five international languages, namely, English, Japanese, French, German and Spanish, with the help of information technology tools and a novel classification system - Traditional Knowledge Resource Classification (TKRC). Today, India through TKDL is capable of

protecting about 2.45 lakh medicinal formulations similar to those of neem and turmeric. TKDL access has been given to eight International Patent Offices which are European Patent Office (EPO), Indian Patent Office, German Patent Office (GPO), United Kingdom Intellectual Property Office (UKPTO), United States Patent & Trademark Office (USPTO), Canadian Intellectual Property Office (CIPO), IP Australia and Japan Patent Office (JPO) under Access (non-disclosure) agreement. Based on the third party observations submitted by the TKDL team so far 53 patent applications of the pharma companies of United States, Great Britain, Spain, Italy, China, etc. have been either set aside or withdrawn/cancelled or declared as dead patent applications based on the information present in the TKDL database at no cost and in few weeks time after filing of the third party observations whereas cancellations of patents





have been known to take 4-13 years of legal battle. Considering the novelty, utility and its effectiveness in preventing the grant of wrong patents several countries and organizations have expressed their keenness in replicating the TKDL model for their own countries. World Intellectual Property Organization including the global community has recognized India's leadership in the area of Intellectual Property Rights and Traditional Knowledge.

### **Genesis of TKDL Initiative**

TKDL genesis dates back to the Indian effort on revocation of patent on wound healing properties of turmeric at the USPTO and anti-fungal properties of neem at EPO. Besides, in 2005, the TKDL expert group estimated that about 2000 wrong patents concerning Indian systems of medicine were being granted every year at international level, mainly due to the fact that India's traditional medicinal knowledge existed in languages such as Sanskrit, Hindi, Arabic, Persian, Urdu, Tamil, etc. which was neither accessible nor comprehensible for patent examiners at the international patent offices.

The grant of these patents in United States and Europe were the cause of great national distress, since, every Indian felt that the knowledge that belonged to India was wrongfully taken away. Further, the patents would have conferred exclusive rights on the use of technology to the applicant of the patent in the country in which it was granted.

### **TKDL for Breaking Language and Access barriers on Traditional Knowledge**

TKDL has overcome the language and format barriers by scientifically converting and structuring the available traditional medical knowledge in 34 million A4 size pages of the ancient texts into five international languages, namely, English, Japanese, French, German and Spanish, with the help of information technology tools and a novel classification system-Traditional Knowledge Resource Classification (TKRC). Today, India through TKDL is capable of protecting about 2.45 lakh medicinal formulations similar to those of neem and turmeric. On an average, it takes five to seven

years for opposing a granted patent at international level which may cost Rs. 1-3 crore. One could only imagine the cost of protecting 2.45 lakh medicinal formulations in the absence of TKDL.

### **Traditional Knowledge Resource Classification- An innovative mechanism for structuring Traditional Knowledge**

For classifying the Traditional Knowledge related subject matter under TKDL Project, a classification system i.e. Traditional Knowledge Resource Classification (TKRC) based on the structure of International Patent Classification (IPC) was created by India which consists of approx. 27,000 sub groups for Ayurveda, Unani, Siddha and Yoga. The objective of creation of TKRC is not only to give a structured classification to Indian Traditional Medicine but also to use it as an abstracting and retrieval tool.

### **Impact of TKRC on International Patent Classification**

TKDL has been responsible for the reform of International Patent Classification (IPC) by enhancing the IPC on Traditional Knowledge from one subgroup to 207 subgroups which enables effective search and examination process on the patent applications related to traditional knowledge subject matter. IPC reforms in the context of TK are fundamental reforms in the International Patent System which would have long term implications.

### **TKDL breaks distance, format and language barriers between TK holder(s) Knowledge and International Patent Examiners**

TKDL is a proprietary and original database. TKDL is based on 148 books of Indian Systems of Medicine, which are available at a cost of Rs. 50,000. These books are the prior art and can be sourced by any individual/organisation at national/international level. TKDL acts as a bridge between these books and international patent examiners. It is the TKDL technology which has created a unique mechanism for a Sanskrit sloka to be read in languages like German, Japanese, English, Spanish and French



by an examiner at EPO or any other International Patent Offices on his computer screen.

#### **Access to TKDL under TKDL (non-disclosure) Access Agreement**

Access of TKDL to International Patent Offices is available under TKDL Access (Non-disclosure) Agreement. Under the agreement, examiners of patent office can utilise TKDL for search and examination purposes only and can not reveal the contents of TKDL to any third party unless it is necessary for the purposes of citation. TKDL Access Agreement is unique in nature and has in-built safeguards on non-disclosure to protect India's interest against any possible misuse.

India has signed TKDL Access Agreements with: (i) European Patent Office (Feb 2009) (ii) United State Patent & Trademark Office (Nov 2009) (with the sideline of the state visit of the Prime Minister to United States) (iii) Indian patent Office (July 2009), (iv) Canadian Intellectual Property Office (Sep 2010) (v) German Patent Office (Oct 2009) (vi) United Kingdom Patent Office (Feb 2010) (vii) Intellectual Property Australia (Jan 2011) and (viii) Japan Patent Office (April 2011).

#### **TKDL search and retrieval capabilities for protection of Traditional knowledge**

TKDL is one such database that has proven its efficacy and has succeeded in opposing hundreds of patent applications at various International patent offices through the route of filing of third party observations which exists in most of the National Patent Laws of the countries, wherein a submission may be filed by any member of the public on state of art / prior art at the patent office questioning the novelty and non-obviousness of a patent application after the publication of the patent application and before the grant of patent. Challenging the patents at International Patent Offices is a long drawn process and is expensive. For example, Mexico, only after more than 10 years of legal battle, was able to get the patent on Enola bean at USPTO cancelled in July 2009. Similarly, cancellation on Monsanto Soybean patent happened in July

2007 at EPO after 13 years of legal battle. India is the only country in the world which has set up an institutional mechanism (TKDL) to protect its Traditional Knowledge and is able to prevent grant of wrong patents. TKDL enables cancellation / withdrawal of wrong patent applications concerning India's Traditional Knowledge at zero cost and in time period of few weeks. In sharp contrast, in the absence of TKDL it took 10 years (1995-2005) to get Neem patent invalidated for antifungal properties at EPO

#### **Impact of TKDL against bio-piracy**

Significant impact has already been realised during the last two years. Beginning July 2009, TKDL team has submitted 571 third party observations out of which so far 53 patent applications of the pharma companies of United States, Great Britain, Spain, Italy, China, etc. have been either set aside or withdrawn/cancelled or declared as dead patent applications based on the information present in the TKDL database.

#### **TKDL: A model for other Countries**

Considering the novelty, utility and its effectiveness in preventing the grant of wrong patents several countries and organizations such as South Africa, Mongolia, Thailand, Malaysia, ARIPO, Nigeria, Indonesia, etc. have expressed their keenness in replicating the TKDL model for their own countries. World Intellectual Property Organization including the global community has recognized India's leadership in the area of Intellectual Property Rights and Traditional Knowledge. WIPO in collaboration with CSIR organized an international conference on utilizing TKDL established by India as a model for protection of traditional knowledge was held in New Delhi in March 2011 where 35 countries rich in traditional knowledge participated to understand the methodology for creation of TKDL and to apply such model for protection of TK in their own country.

*(The author is Director General, Council of Scientific and Industrial Research and Secretary, Department of Scientific and Industrial Research, New Delhi.)*



# Census of India 2011 – A Story of Innovations

*Dr. C Chandramouli*

Indian Census is the single largest source of a variety of statistical information on different characteristics of the people of India. It is the most credible source of information on demography, economic activity, literacy and education, housing & household amenities, urbanisation, fertility and mortality, scheduled castes and scheduled tribes, language, religion, migration, disability and many other socio-cultural and demographic data.

With a history of more than 130 years, this reliable, time tested exercise has been bringing out a veritable wealth of statistics every 10 years, beginning from 1872 when the first census was conducted in India non-synchronously in different parts.

The recently concluded Census 2011 is the 15th National Census of the Country in the unbroken series since 1872 and the seventh after Independence. It is remarkable that the great historical tradition of conducting a Census has been maintained in spite of several adversities like wars, epidemics, natural calamities, political unrest etc. Very few countries in the world can boast of such a glorious tradition.

The responsibility of conducting the decennial Census rests with the Office of the Registrar General and Census Commissioner, India (ORGI) under the Ministry of Home Affairs, Government of India, which includes conceptualization, planning and implementation of the Census operation in





the country. The organization has field offices in all the States and Union Territories (except the Union Territory of Dadra and Nagar Haveli and the Union Territory of Daman and Diu, which are attached to the office at Gujarat). The field officers are headed by the Directors of Census Operations, who are responsible for the conduct of Census in their respective jurisdictions.

### Methodology

The Census of India is conducted once in a decade, following an extended *de facto* canvasser method. Under this approach, data is collected on every individual by visiting the household and canvassing a single questionnaire over a period of three weeks. The count is then updated to the reference date and time by conducting a Revision Round. In the Revision Round, any changes in the entries that arise on account of births, deaths and migration between the time of the enumerators visit and the reference date/time are noted down and the record updated.

Census 2011 has been conducted in two phases. In the first phase, known as House listing and Housing Census, each building, house and other structures were systematically listed and numbered. Besides, useful information on use of the house, amenities available to the households, if residential, and assets owned by them was collected. This exercise, held between April to September, 2010 in different States/Union territories was used to draw up a frame for the second phase of Census 2011, known as Population Enumeration held in February 2011.

In the second phase, the Population Enumeration exercise was held throughout the country from 9<sup>th</sup> to 28<sup>th</sup> February 2011. During this period, about 2.7 million Enumerators visited about 240 million households collecting information on every person living in these households. On the night of 28<sup>th</sup> February, 2011 the Houseless population was enumerated. Thereafter, a Revision Round was conducted to update the population with reference to the Census Moment, i.e., 00:00 hours of 1<sup>st</sup> March, 2011 by updating information on births and deaths occurring in the households.

### Innovations Adopted

India had witnessed unparalleled change in terms of growth in population, economic development and adoption of new technology, particularly in the field of Information Technology in comparison to the previous decades. This offered an opportunity to reassess each stage of census taking and modify the procedures taking into account the availability of resources and their optimum utilization. From planning to execution of the Census Operation, innovation was the key word. The objective was to ensure full coverage of the area and the population without omission or overlapping, collection of quality data without any prejudice and bias and to quickly process the data to make it available in the public domain for use before it becomes obsolete.

#### Following are some of the steps taken in this direction:

*Complete and Unduplicated Coverage of Population*-While undertaking census operation, a key aspect is to ensure complete coverage of the geographic area of the country without any omission or duplication. This requires the updating of jurisdictional boundaries of all the administrative units from States to the Villages/Towns. Towards this end for use in Census 2011, information on changes in the jurisdiction of the administrative boundaries of 35 States/Union Territories, 640 districts, 5,924 sub-districts, 7,935 towns and 6,40,867 villages were meticulously collected along with official notifications and maps. Each of these changes was recorded in the digitized maps using latest GIS software. In addition, the Census Organization has completed preparation of detailed digital maps of 33 capital cities of the country based on satellite imagery. These maps show detailed layout of buildings, houses, other structures, road network and important landmarks and were used in Census 2011.

### Quality of Content

*Designing the Census Schedules*- Two types of Questionnaire, known in Census as Schedules,



are canvassed for the two phases of Census. In Census 2011, the work of designing the Schedules was entrusted to the National Institute of Design, Ahmedabad which came up with brilliant designs, which were easy to use, aesthetically developed, easy to scan and comparable to the best in the world. The Schedules had several unique features like Bar Code, Unique Form Number and drop-out color from a standard palette. All these helped in collecting quality information and better inventory management, a nightmare in the past. These features have greatly enhanced the processing of data.

*Training-* One of the most critical elements in Census is the training of the field Enumerators who collect information. Unless the 2.7 million functionaries are clear about the concepts and methodology, the quality of data collected will suffer. For the first time support of the NGOs was taken in imparting training in local languages. In Census 2011, a three-tier training hierarchy was put in place with National Trainers (90 in number) at the country level, Master Trainers Facilitators (725) at the State level and Master Trainers (54,000) at the District level. It was the responsibility of the Master Trainers to train 2.7 million Enumerators/ Supervisors at the grass-root level, a ratio of just 50 Enumerators per Master Trainer. The Instruction Manual was substantially improved by incorporating suitable illustrations and examples. In addition, Training Guides showing minute to minute agenda was prepared for use by the trainers at each stage of training. The Guide not only focused on elaborating concepts and methodology in Census but also covered such aspects as communication, rapport building etc. One important addition to the basket of training aids was the introduction of e-Learning modules on important census concepts, where animation characters representing Enumerators and Respondent(s) were shown actually delivering the dialogues and asking questions.

*Publicity Campaign in Census 2011-* For any large scale operations like Census Operations to succeed, undertaking adequate publicity campaign

is an important element. Adequate sensitization of the people is a pre-requisite, as Census aims to collect personal information on each individual residing in the country at the time of Census. It is also important to focus on proper enumeration of such critical aspects as gender and disability in the population. In absence of adequate in-house expertise, the work of devising the entire campaign was assigned to reputed advertising agencies in the country with support from the UN Agencies. Elaborate campaign was planned and executed by using mass media, public outreach and digital media to achieve the objectives. The basic modules in Hindi were translated in 12 languages for use in different parts of the country. The media plan was prepared using the latest reports available on reach of media in different parts of the country using different modes on a scientific basis.

*Census in School Programme-* To sensitize school students about the Census 2011, an innovative programme was introduced throughout the country, where specially prepared and attractively designed School Kits were sent to about 60 to 80 schools in each of the 593 districts in the country. Each School Kit contained a letter from the Census Commissioner, India to the Principals of these schools requesting them to sensitize the students about the ensuing Census 2011 and also about the importance and utility of Census. Special attention was paid to the students of Class VI, VII and VIII for whom special lessons were sent on different subjects. The Census Commissioner, India also requested the Principals to designate one week in January 2011 as Census Week to develop awareness about Census 2011.

*Gender Sensitization-* Even though gender had been a prominent cross-cutting priority in 2001 Census, data related to female count, marital status, female headed households, female disability and female work-participation has continued to suffer from undercount or under-reporting. The 2001 census enumerated several villages/ districts that had reported very few women, very low female literacy and no female worker. To ensure



collection of accurate information, an attempt was made to integrate gender issues into various stages of census taking by identifying gender critical districts, which had low sex ratio (less than 900); low female literacy (less than 30%) or low female work participation rate (less than 20%) on the basis of 2001 Census. In this way 262 Critical Districts were identified for focused attention and training. Special steps were taken to appoint additional Master Trainer Facilitators to sensitize the Enumerators on gender issues and train them in collecting authentic information. Special Data Sheets and Posters were prepared and displayed at each training class to sensitize the Enumerators on the poor status of women with reference to these three critical indicators. Extra effort was also made during the publicity campaign to sensitize the people to provide correct information about women and the girl child at the time of enumeration.

*Using Social Networking Websites*-With the overwhelming popularity of the social networking sites among the youth today, for the first time, in Census 2011, a conscious effort was made to reach them directly. Census 2011 Group was created on Facebook and Twitter in the first week of February 2011 and regular posts were made initially informing the visitors about different facets of Census in general and Census 2011 in particular inviting their support in spreading the message on Census. Within a short time, a large number of persons, mostly from the younger sections of the population, became members and actively posted views on the wall. The experience was quite satisfactory as most of the posts complimented the efforts while a few pointing out about not being covered in Census 2011. Immediate action was taken to redress their grievances. The site was also used for disseminating information on Census 2011 extensively. At present, there are more than 20,000 members on this Group. Similarly on Twitter as well, the members welcomed the new initiative. The Census Commissioner, India was awarded Exceptional Achievement for innovative

use of social media in the country's biggest governance exercise.

*Community Volunteers*- This was a unique initiative in some North Eastern States where Civil Society Organisations joined hands with the Directorates to not only spread awareness but actually take part in the conduct of the Census. This has had a significant impact in these States and has greatly enhanced the participation of the general people in the Census.

**Time bound completion of field operations and timely release of data.**

*Using State of the Art data recognition technology in data capture and data processing*- The Census Office has always been in the forefront in the adoption of the latest data processing technology in the processing of census data. At 2001 Census, for the first time, a major technology change in the vital activity of data extraction recorded on the Census Schedule and creating associated computer data files was introduced, so as to fully computerize the subsequent data processing activities in generating output tables for use. India was the only large country in the world to have used this technology in 2001 Census. In the new technology used, the Census Schedules were scanned using high speed duplex scanners and information read using ICR technology. When the Census Office adopted this technology in India, it was considered a risk by many as the technology had been used only by a few small countries and not tested for a large country. This innovation by the Indian Census not only saved time and money but allowed accurate capture of data as well. Another major benefit in adopting this technology was that it allowed the Census to tabulate the entire data on a 100% basis rather than on a sample basis as was the case till 1991 Census. Using the ICR technology not only saved time for data capture and data tabulation thus ultimately making it available to the users early, but also was very cost effective saving public money.



*Despatch and delivery of Census material*-In Census 2011, approximately 340 million Census Schedules, 6 million Instruction Manuals, and other printed materials in 18 languages were used. The despatch and delivery of these Census materials weighing about 2000 metric tons, printed in the right language(s) from about twenty printing presses located in different parts of the country and delivering them to about 17,000 locations in each tehsil in the country was a logistic nightmare. After the operations, the filled-in Schedules were to be collected and delivered to the 17 Data Scanning Centres and the 33 Census Offices. This job of collection, delivery and return collection was given to Indian Posts which used their Logistic Post Service to deliver the material in each tehsil in the country, safely and securely and in time. With their expert services, the India Posts were able to complete the work in timesatisfactorily.

*Public Grievances and Monitoring*-A Call Centre was set up to receive complaints from the public on various issues relating to Population Enumeration. Located inPune, the facility was extended in 14 languages throughout the country. The complaints on non-coverage and other issues were quickly resolved with support from the local Census Offices. The Call Centers facility was also used to monitor the progress of enumeration work by directly contacting the Supervisions. At the conclusion of the Population Enumeration exercise, they have been assigned the job of Post Enumeration Survey (PES) in four metro cities.

*Outsourcing of non-critical activities*-Undertaking the Census Operation requires planning and execution of a wide array of activities, some demanding serious application of mind and some simply involving logistics and infrastructure. The scale of operations in all cases, however, was gigantic, due to the geographic spread and absence of adequate infrastructure in the country. It was decided at the planning stage itself to outsource non-critical activities in Census 2011 to allow Census Officials to focus more on Census related activities than managing logistics.

### **Adoption of Green Technology.**

Registrar General & Census Commissioner, India supervised and monitored the progress of the Census Operations through video conferences with all the 640 District Collectors every week. The video conferencing technology saved huge amount of money which otherwise would have been necessary if the supervision team practically travelled to all the places or issued instructions through letters or correspondences.

Availing Call Centre facility to address public grievances during census helped in spreading green technology.

### **Cost**

The cost of Census taking in such a large country as India is enormous. In Census 2011, about Rs 2200 crore was spent from the Central Budget during the two phases of Census, i.e., Houselisting and Housing Census held from April to September 2010 and the Population Enumeration held in February 2011. The amount spent was quite low as compared to the world average. According to the 25th Population Conference organized by the UN Statistical Division held in Seoul this year, the average cost of Census taking in the world is estimated as \$ 4.6 per person. In India, the cost was less than \$ 0.5 per person in Census 2011.

The heroines and heroes of Census 2011 have undoubtedly been the 2.7 million enumerators and supervisors who have spared no efforts to complete the arduous task in time. Three weeks to cover a vast and diverse country like India – a task looked at with awe by the world, but accomplished by these humble women and men with sincerity and devotion to duty. The Nation is proud of them and we salute each one of them for their hard work, perseverance and patience. (PIB Features)

**(The author is Registrar General and Census Commissioner, India)**



# Regulating Micro-Finance Institutions

Atonu Chatterjee

**R**eserve Bank of India (RBI) has done it. In an effort to rein in the Micro Finance Institutions (MFI) the upper limit of chargeable rate of interest have been specified (Circular no-RBI/2010-11/505 RPCD.CO.Plan BC. 66/04.09.01/2010-11 May 3, 2011). The apex bank, it seems, thus have tackled the allegation that usurious interest rates of MFIs were driving the poor in an endless abyss of debt. Yet confusion lurk deep somewhere that whether this will cure the sector from the deep seated disease.

## *The Backdrop*

An effort to structure and regularize the post-independence credit scenario, especially for the income-poor households was made through the principle of 'Social and Development Banking'

where nationalization of banks (1969) was a major tool. The underlying concept was that these banks will pump in appropriate quantum of timely credit to the deserving households. They however developed feet of clay over this. Astronomical costs involved in extending small loans along with the problems of repayment gagged the efforts. Post 1991 liberalisation of the economy provided an escape hatch from this imbroglio. The 'Report of the Committee on Financial System'(1991) headed by M.Narasimham held that "a vibrant and competitive financial system..." will take care of the redistributive objectives through "the instrumentality of the fiscal rather than the credit system..." Deregulation of interest rates, enlarged playing fields for foreign banks and a "market-driven..." profitability based institutional





structure came to the forefront. Microfinance and micro-credit in this milieu was the trump-card!

Culling from international literature empirical features of Micro-credit are:

- ♦ Quantum of loans is small,
- ♦ No collaterals are required,
- ♦ Rural and urban poor are the major borrowers.
- ♦ Ideally loans are used for income-generation through market-based self-employment, however their usage in consumption is found in abundance
- ♦ Loans are administered through borrower groups.
- ♦ Owing to NGOs' controlling disbursement as well the basic terms and conditions for sanction, they sometimes become private transaction.

'Task Force on Supportive and Regulatory Framework for Micro-Finance in India'(1999) came up with the definition of microfinance as the "provision of thrift, credit and other financial services and products of very small amounts to the poor in rural, semi-urban or urban areas enabling them to raise their income levels and improve living standards"...

### *The Problem*

So far so good. Microfinance thrived in India both as NGO led activity as well through government scheme of bank-linking of Self-Help-Groups (SHG). After initial euphoria Gordian knots appeared in the NGO led MFI sector. Basic problems consisted of imposition of exorbitant interest rates, harsh methods of collection coupled with zero tolerance to default and certain issues of governance viz camouflaging terms and conditions of loan, going in for multi-lending and client-poaching, utter lack of provision for delinquent loans and shunning of proper accounting procedures. Discontent were simmering against these deviant demeanour of the MFIs which took a nasty turn in the form of ransacking of the office of MFIs in Kolar district in 2006, stoppage of repayment (from 99% it came down to 15-20% 'Frontline' vol 27,issue24) and to cap it all around 200 suicides of the borrowers unable to cope with the

repayment pressure in 2006 and 60 in 2010. Efforts to arrest delinquencies through 'self-regulations' propounded by associations of MFIs fell squarely flat. It was bound to; self-restraint without an official imprimatur scarcely succeeds in India. Consequently some knee-jerk reactions from government evolved. Government of Andhra Pradesh came up with an ordinance and apex bank with a committee to probe deep into the situation.

### *The Committee*

Waking up to the slants of the issue, RBI in October 2010 constituted a 'Sub -Committee of the Central Board of Directors of Reserve Bank of India' to study issues and concerns in the MFI Sector under the chairmanship of Y.H. Malegam. The committee was entrusted to evolve a stringent regulatory mechanism for the NBFCs functioning as micro finance institutions after exploring the obverse-and-reverse of the issue.

The committee submitted its report in January 2011 which was posted in public domain. Their recommendations in a nutshell were-

- 1) Creation of a separate category of NBFC-MFI observing a specified 'Code of Corporate Governance' aimed to provide short-term, unsecured small amount loans pre-dominantly to low-income borrowers (75% of the loans should be for income generating), with comparatively more frequent repayment schedules.
- 2) Subject to fulfillment of certain clauses lending to these MFIs will qualify for priority sector lending.
- 3) A "margin cap" of 10 per cent for MFIs having a loan portfolio of Rs. 100 crore and of 12 per cent for smaller MFIs and a cap of 24% for interest on individual loans was suggested. It also proposed that, in the interest of transparency, a MFI can only levy three charges, namely, (a) processing fee (b) interest and (c) insurance charge after declaring the rates in a proper and transparent manner.



- 4) Members only of Self-Help Group (SHG) or Joint Liability Group (JLG) are entitled to borrow and that too from any two MFIs .
- 5) A minimum period of moratorium will hyphen disbursement of loan and the commencement of its recovery. The tenure of the loan must be amount specific.
- 6) Coercive methods of recovery should be avoided; 'Customer Protection Code' prepared by RBI, Grievance Redressal procedure, Credit Information Bureau, and a system of Ombudsman should be in place. MFIs, industry associations, banks and the Reserve Bank will monitor the performance of the sector.

Hinging on these recommendations RBI on May 3, 2011 released its circular on regulation after deciding to consider microfinance sector as a separate category.

1. Most significant is the cap on interest rate. MFIs are not allowed to charge interest rate beyond 26% on reducing balance basis with a perk-up of not more than 12%. Malegam committee recommended for a 24% interest cap with 10% perk up.
2. Lending in this sector will qualify for 'Priority Sector Lending' (Loan extended on or after 1/4/2011) provided Chartered Accountant certifies that the loans were extended to families with specified household annual income (Rs 60,000 for rural household and Rs 1.20 lakhs for urban families) and 75% of the total loan portfolio is in the income-generating sector.
3. Loan does not exceed Rs.35,000/- in the first cycle and Rs.50,000/- in subsequent cycles with total indebtedness remaining below Rs 50,000. Malegam committee recommended a ceiling of Rs 25000/- for individual loan.
4. Borrower determines the mode of installment payments (weekly, fortnightly or monthly) with provisions of prepayment or delayed payment without penalty.
5. The loan is without collateral and is routed preferably through SHG/JLG so that social and peer pressure for repayment replaces arm-twisting tactics which is again strictly no-no.

6. Only three components are to be included in pricing of loans namely, 1% of the gross loan amount as processing fee, the interest charge and actual insurance premium. Administrative charges for insurance should adhere to IRDA guidelines.

RBI is yet to publish a detailed and elaborate guideline in this regard but promises to do so quickly.

### The Pros

The circular sounds positive on three specific strata. The circular conceived of the MFIs as a separate sector and has identified a unique whistle blower in the form of RBI for the first time in India, in regard to them. This will definitely 'rein in' the delinquent MFIs who are in the habit of playing truant. Secondly 'priority sector lending' status have been returned to the sector. Post April 2011 loan advances secure this status once these loans abide by certain specifications as indicated in the circular.

At the level of internal governance of the sector also, RBI has come out with a number of measures, namely- transparency and proactive disclosures of interest rate and methods of calculation as well terms and conditions of loan. It also suggests a cap on upfront fees. The pricing criterion of the loan too is clearly spelt out so the MFIs have scarcely any chance to deviate. The circular in an ingenuous move also tries to take the lending institutions (i.e. the banks which lend to MFIs) in the loop. Recognising the pivotal role of lending banks in this effort, the circular delineates their tasks also. The banks need to build up immediately necessary criterion of 'due diligence' while processing loan applications of MFIs. This process should be initiated immediately to make sure that MFIs availing finance from the banks are capable enough to operate in terms of Corporate Governance, Human Resource Management, Customer Protection and other aspects as indicated in the regulatory framework, thereby ensuring smooth operations by MFIs.



### And the Cons

The dilemma lies elsewhere. RBI in February 2011 indicated that "The interest rate applicable to loans given by banks to micro-credit organisations or by the micro-credit organisations to Self Help Groups/member beneficiaries would be left to their discretion" (RPCD. FID. BC.No. 53 / 12.01.001/ 2010-11 February 14, 2011- Master Circular on Micro-Credit). The present capping of the interest rate by RBI is starkly opposed to what they held only four months back! In fact this capping of the interest rate, it is argued, may act as a negative incentive for the sector as MFIs will then scarcely venture in difficult terrain. In this era of hardening of interest rate the sector may very well suffer due to this, especially so, as MFIs are denied of accepting deposits or provide further financial services which could have given them an opportunity of cross-subsidising. This may import us to the same square one, forcing us to depend once again on public sector efforts for financial inclusion that have largely been unsuccessful.

Given this obvious tradeoff, famous

economist Pranab Bardhan along with others (Help Microfinance, Don't Kill It - Indian Express, 26/11 2010) argued, albeit in a different context, that regulation should be less focused on fixing interest rates or limiting profits, and concentrate on institutional reform. This allows MFIs to screen borrowers, lower the cost of their products and charge reasonable rates. RBI regulations, may be in the long run, falters on this count!

The basic focus, the "Greater Common Good" however is, financial inclusion of all segments of the population through an extension of financial services both in rural and urban areas. Micro-finance in this regard, is, no doubt an important tool. Consequently well-crafted balance between the regulation and growth objectives is necessary in formulating the approach to a regulatory regime, keeping in view the big challenge of financial inclusion of hitherto excluded segment of the Indian population.

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## Bhili Fm Radio - India's First In Tribal Dialect

Awanish Somkuwar

India's first FM community radio in tribal dialect – Bhili has come up in Bhabra – the birth place of great martyr Chandrashekhar Azad in Alirajpur district of western Madhya Pradesh.

Populated densely by Bhili, Bhilala and Patlya tribal communities, Alirajpur is nearly 400 km from the state capital Bhopal. Thousands of patriots visit Bhabra every year on 23rd of July to pay tribute to Martyr Chandra Shekhar Azad. Launch of Bhili FM Radio from this remote tribal region assumes significance in many ways.

*“.....Radio Thi Aawaz Nikal He Te Tamari Khud Nee Awaj Nikal He. Jal, Jangal, Jamin Nee Aawaj Nikal He”.* This was the first address in Bhili that means “the voice coming from this radio is in fact your own voice. This voice is expressive of your

waters, forests and lands”. These words on 90.4 Megahertz overwhelmed me eight km. away from Bhabra, says Karan Singh Bhanvar - 36 – a teacher by profession. He lives in Chhoti Pol village having 2000 plus population of Bhili community. Karan Singh teaches at Government Primary School Chhoti Pol, which has a total of 77 students. Of them 16 are in class - V and 20 in class I. “Though I occasionally speak to children in Bhili. I shared with them my first experience of listening to radio messages in Bhili dialect. I am keen to design some educative programmes for them in Bhili, he says enthusiastically. “We have television set and we enjoy serials, but listening to radio in Bhili gives me a sense of pride, he says.

The Bhili Radio is a venture of Vanya an undertaking of State Government's Tribal Welfare





Department. The Bhili Radio Station is housed in additional two rooms of Boys Higher Secondary School, Bhabra. It is heard in a radius of 20 km. that cover at least 115 villages in 35 Gram Panchayats. Each village is composed of three or four hamlets and distance between two hamlets varies from 4 to 6 kms. Information travels on a rough path and fails to reach the needy population.

“The sole purpose of starting FM Radio in tribal dialect is to empower tribal population by keeping them update about their rights and entitlements, says Kunwar Vijay Shah, who heads the Tribal Welfare Ministry. Besides, Bhabra, nine more FM radios are coming up in remote tribal pockets that include Chada in Dindori district, Baihar in Balaghat, Khalwa in Khadwa, Chichli in Betul, Nalcha in Dhar, Meghnagar in Jhabua, Umri in Guna, Sesaipura in Sheopur and Bijauri in Chhindwara district. These, he says will cater to information needs of Baiga, Gond, Seharua, Korku and Bharia tribes.

When asked how radio in Bhili dialect will help the tribal families when they are using mobiles and enjoying television, Anita -32, a resource person working with Madhya Pradesh Rural Livelihoods Project gives reasons that it is a question of linguistic identity. She says that television and mobile have their own limitation. They do not bring useful information to a particular tribal group. Long interaction on mobile is not possible, she says. “This is a beginning and response is enthusiastic, says Sriram Tiwari, managing director of Vanya Bhili Radio. It is not only limited to overcoming of the obstacle geographical remoteness in information dissemination. It is more about preservation of dialect and uniqueness of ethnic culture. It is like creating a space for the concerning tribal communities to think, act and learn using their own dialect.”

“Bhili radio a major step towards protection

of tribal dialects observes Laxminarayan Payodi a senior researcher with Tribal Research Institute, Bhopal, who has compiled a dictionary of disappearing Bhili words. According to him, attempts for survival of tribal dialects across the country through such a venture receive a new dimension. Accuracy in assessment of information needs of an ethnic group requires sincere efforts. Tribal people have wisdom to share but lack adequate medium to express their views. Bhili Radio brings hopes, he says.

“I want to know more and more about how my two and half acre land can give me enough yield, says Vijay Singh Bhamania - 32 a farmer living in Kodia Paan village, which is three km. from Bhabra. “I take my transistor with me to fields. I am very happy to hear programmes in Bhili. First I heard a Bhili folk song broadcast on the Bhili Radio. Now some more programmes are coming up, what I hear from its announcer Sanjay.

About the broadcast schedule, Sanjay a local announcer informs that in the morning from 8 to 10 and in the evening from 6 to 8. Raju -32, a twelfth standard pass local youth translates Hindi texts into Bhili. Another local youth Pravin writes scripts. Sanjay also goes to fields and collecting comments and messages from community members and design suitable programmes. It is a challenging job to keep on maintaining novelty in programme presentation. Recording the views of community members is also a tough job says Pravin. “We are concentrating on dissemination of information relating to agriculture, health and welfare schemes and important announcements from the district administration, he further adds.

***(The author is Assistant Director, Public Relations, Directorate of Public Relations, Government of Madhya Pradesh, Bhopal, e-mail :awanishsomkuwar@gmail.com***



# A spark of learning in the conflict zone

By Sujata Raghavan

**T**he drive between Kanker district headquarters and Bhanupratappur is through lush greenery, the pride of Bastar, known for its verdant forests, its bio-diversity and of course the tribal culture that supports and in turn is nurtured by forest wealth.

It is difficult to imagine, that a place of such infinite natural beauty, where human beings down the generations have lived in harmony with nature, celebrating its cycles, its various forms and seasons, can be a battle-ground, spawn a culture of strife, of growing violence. This is the Naxal affected region in Chhattisgarh where the government is determined to establishing the rule of law above all but equally to bring peace and development to the embattled region.

What does this ongoing conflict do to the minds of the young; a generation that has grown up in the darkness of violence yet as the young everywhere have a hope for the future? This generation has better access to news and developments beyond their immediate village or region. Television and newspapers are now part of village communities even in remote areas. What is the picture, these young people are forming and what is the road ahead? For it is squarely in their hands that the future will unfold.

**V.Arun Kumar, Principal, Shaskiya Mahavidyalaya, Bhanupratappur, Kanker district,** has lived amidst this conflict zone for over two decades. It has been a challenge but also a journey of courage and hope. Excerpts from a conversation:

**Q: What is the profile of your students?**

**A:** This is completely a rural area with majority of the local communities being tribals, mostly poor. Many of the students who take admission are first generation students in their families. They have seen the traditional way of life and have very little exposure to the developments

in the outside world.

**Q: What motivates them to join a Bachelors degree course in any of the various disciplines?**

**A:** There is a desire amongst rural youth to be educated and seek further avenues. Chhattisgarh being a tribal dominated state, there is a lot of support to tribal students from the government and other state agencies for their education. The Tribal Welfare Department gives scholarship to SC/ST students. There are scholarships by the Government of India, the University Grants Commission (UGC) National Mineral Development Corporation (NMDC) has a scheme of Rs.500/- to these students of Bastar region, now divided into five districts, Narayanpur, Bijapur, Bastar, Kanker and Dantewada. Even at the school level, there are several incentives. BPL students are provided with full stationary items. Students of Class XI and Class XII are given Rs.250/- per month.

**Q: What is your understanding of the students in your college, their mind-sets and aspirations?**

**A:** They are shy and do not form friendships immediately. They are also very sensitive and once they open up, have a lot of insights. Given an exposure to individuals from different fields, new activities, they take interest and are keen





to absorb these. They need patience, hand-holding and someone who can listen to them.

**Q: How do you build up this self-confidence and awareness?**

**A:** I talk to each student who applies here, to know his or her mind and have an understanding of the person. This helps me to guide them during the course of their study period here. We are an academic institution and have to follow the syllabus. But we also have extra-curricular activities like NSS which gives them exposure to social issues in villages and involves them in welfare activities like health camps.

**Q: Have there been any new courses you offer? To keep in step with the changing times?**

**A:** Yes as a matter of fact. In 2007, we introduced a 3 year Bachelors Degree in Journalism (BJ). Mass Communication and Media Studies are today an established field and a powerful tool in the democratic process. Yet the exposure to media in this region has been minimal. Kushabhau Thakre Patrakarita Evam Jan Sanchar Vishwavidyalaya based in Raipur has given the affiliation for the BJ course. The present Vice-Chancellor, Mr. Sachidananda Joshi has been very supportive of this maiden course.

**Q: How do you see the scope of such a course growing in a remote rural area this?**

**A:** This is a self-financing course. The salary of the faculty does not come from the University's coffers but from the student's fees. It has to stand the test of scrutiny, of being relevant and the student community decides that. In



the first year, it was difficult to get students to enrol. Neither they nor their families could see the point of a journalism course. We had to go house to house to promote this concept. But after the first batch has passed out, it has caught on. Awareness of the world outside has also grown, and the role of the media in linking this is now being understood. Several of our students have got admission in the Master of Journalism (MJ) course in Raipur. That is a big achievement.

**Q: What about the syllabus, the field exposure, internships? Who decides that?**

**A:** The syllabus has been designed by the University in Raipur—we follow that. We have one faculty member, Niranjan Kumar, and visiting faculty like senior journalist Ms. Asha Shukla. We have links with Charkha Development Communication Network, an NGO which transfers communication skills and knowledge of grassroots reporting to these students. Through its Trilingual Feature Service which places such writings in the mainstream media, several of their articles have been published in Hindi, English and Urdu media. Students form an editorial team and bring out a local publication "Bhanuday" on social issues of the region. This is all remarkable progress.

We also arrange to send these students for exposure visits in villages. Recently, they participated in a consultation by Rajendra Singh, the noted social activist in water conservation from Rajasthan. Niranjan Kumar takes the initiative to take them out to local fairs and melas to pick out stories.

**Q: What do you see as the future of youth in Naxal affected areas as this?**

**A:** I am not the one to comment on these matters. But what I have seen over the last 30 years and even today is that given a chance, an exposure to knowledge both within the college curriculum and beyond, rural youth in this tribal area have the potential to grow and create new spaces for themselves in the world both within the region and outside. This is what we are committed to providing.

**(Charkha Features)**



## WILD APRICOT: A potential source of vegetable oil

Dr. Virendra Kumar and Dr. Surinder Bhan

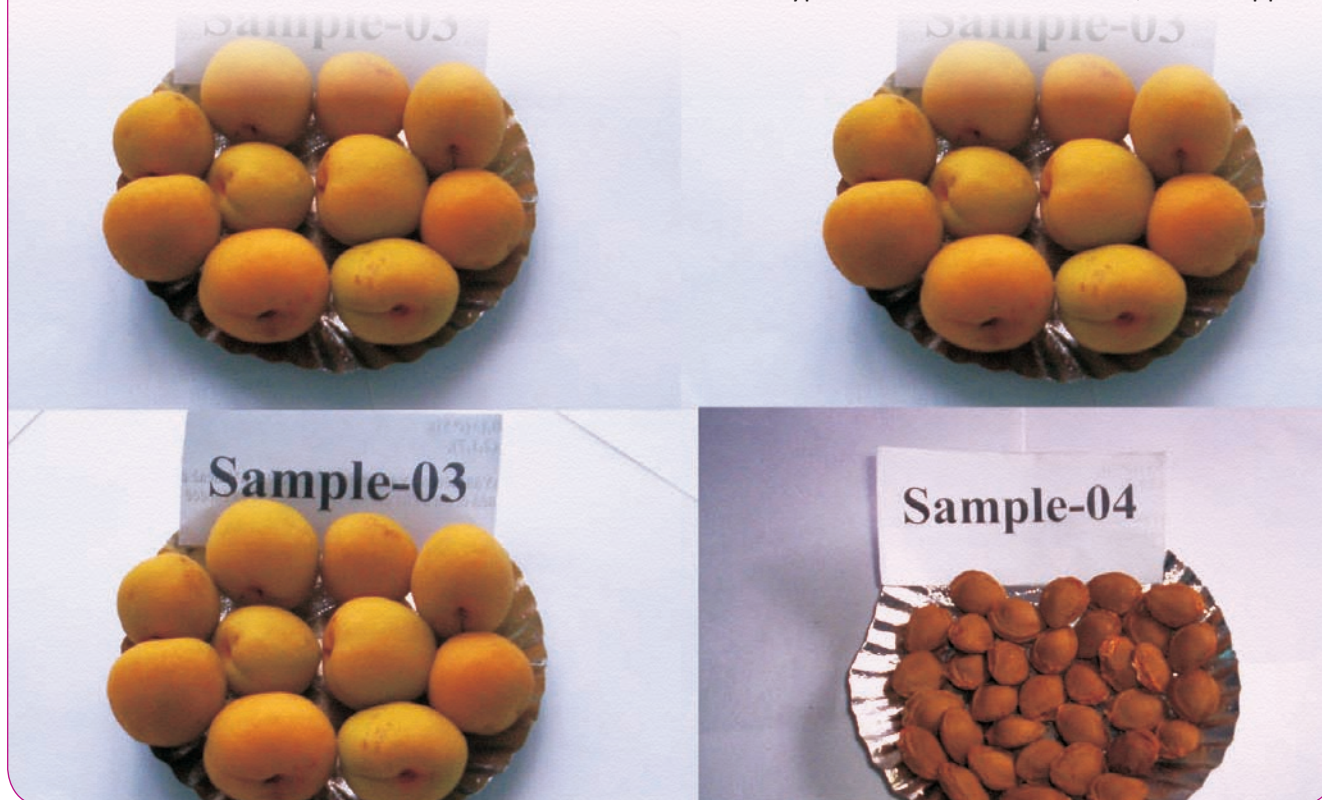
*Efforts are being made by the government to boost the productivity and quality of the wild apricot as it's oil is rich in nutrition and can fetch valuable returns for the farmers in the hilly regions.*

**W**ild Apricot (*Prunus armeniaca* Linn.) is an important Tree Borne Oilseed of the mid hills and dry temperate region of the country. Wild apricot fruits are attractive, delicious and highly nutritious. Apart from being a potential source of edible oil, it also contains vitamin A, carbohydrates, protein, phosphorus and niacin in higher quantity than majority of other common wild and cultivated fruits. In the Himalayan region of the country local communities know it by different vernacular names viz. "Chulli", "Shara", "Khurmani", and "Chulloo" etc. The hill farming communities of these regions have been maintaining wild apricot trees on their farmland bunds and adjoining crop land-support land as part of farm forestry/agro

forestry practices. For most of them wild apricot fruit has been serving as an important source of edible oil, whereas, for some families the major portion of the crop is utilized for the preparation of the distilled alcoholic liquor. Wild apricots are grown with least cultural care in the tracts which are otherwise unfit for cultivating other temperate fruit crops. It is a drought resistant, salt tolerant, hardy plant being rather less susceptible to pests and diseases.

### Area and distribution

Wild apricot appears to be indigenous to India and is almost naturalized in the north-western Himalayas, where farmers have been planting apricot on all types of land viz. wild land, non-cropped





marginal land and wasteland. In India, the wild apricot is grown in J & K (especially Ladakh), H.P., Uttaranchal and to a limited extent in Northeastern hills. In Himachal it is found in abundance in Kinnaur, Lahaul & Spiti, Kullu, Shimla, Chamba and Mandi districts.

### **Nutritive value and utility**

The percentage of various ingredients in the edible portion of fresh Indian wild apricot fruits have been recorded as moisture 85.3%, protein 1.0%, fat 0.3%, fiber 1.1%, other carbohydrates 11.6%, mineral matter 0.7%, Calcium 20 mg, Phosphorus 25 mg, Iron 2.2 mg, Vitamin A 3600 I.U, Thiamine 0.04 mg, Riboflavin 0.13 mg, Nicotinic acid 0.6 mg, Ascorbic acid 6.0 mg and yielding 53 Calories per 100g of fruit.

The wild apricot pits yield 22-38 percent kernels, which may contain 25-30% protein and 42-54% oil besides 4.8 per cent fiber and 8.1 per cent sugar. The fatty oil extracted from the apricot kernels is an important article of commerce. The refined oil is almost colourless or light pale - yellow in colour and is of agreeable flavor and odour. The typical oil obtained from the wild bitter apricot kernels shows fatty acid composition as myristic acid 1.1%, palmitic acid 3.5% stearic acid 2.0%, oleic acid 73.5% and linoleic acid 20.9%. In the tribal belts of the Himalayan state, the wild apricot oil is being used for edible purposes without any toxic signs or symptoms. Almost every part of wild apricot plant is utilized. Stem and branches pruned from the trees during dormant season are a good source of fuel wood and charcoal. After fruit harvest succulent leaves can be harvested in phases and can be used as fodder. The wild apricot fruits in general are unfit for table purpose due to leathery texture, high acids and low sugars. However, they can be eaten fresh or dried and made into jams, apricot nectar, jellies and preserves when mixed with those of the cultivated types. Strained baby foods from pulp are nutritious and a good source of calcium, phosphorus and iron.

Fruit or the juice is a valuable source of vitamin

A, which helps protect against cancer. Wild apricot juice is good taken first thing in the morning to stimulate the organs. It can be used in place of water when making pancakes. Juice can be poured over cooked oatmeal. It can also be used in place of water when cooking curried lamb and salted rice. The wild apricot products have a lot of cosmetics and medicinal properties:-

### **MEDICINAL PROPERTIES**

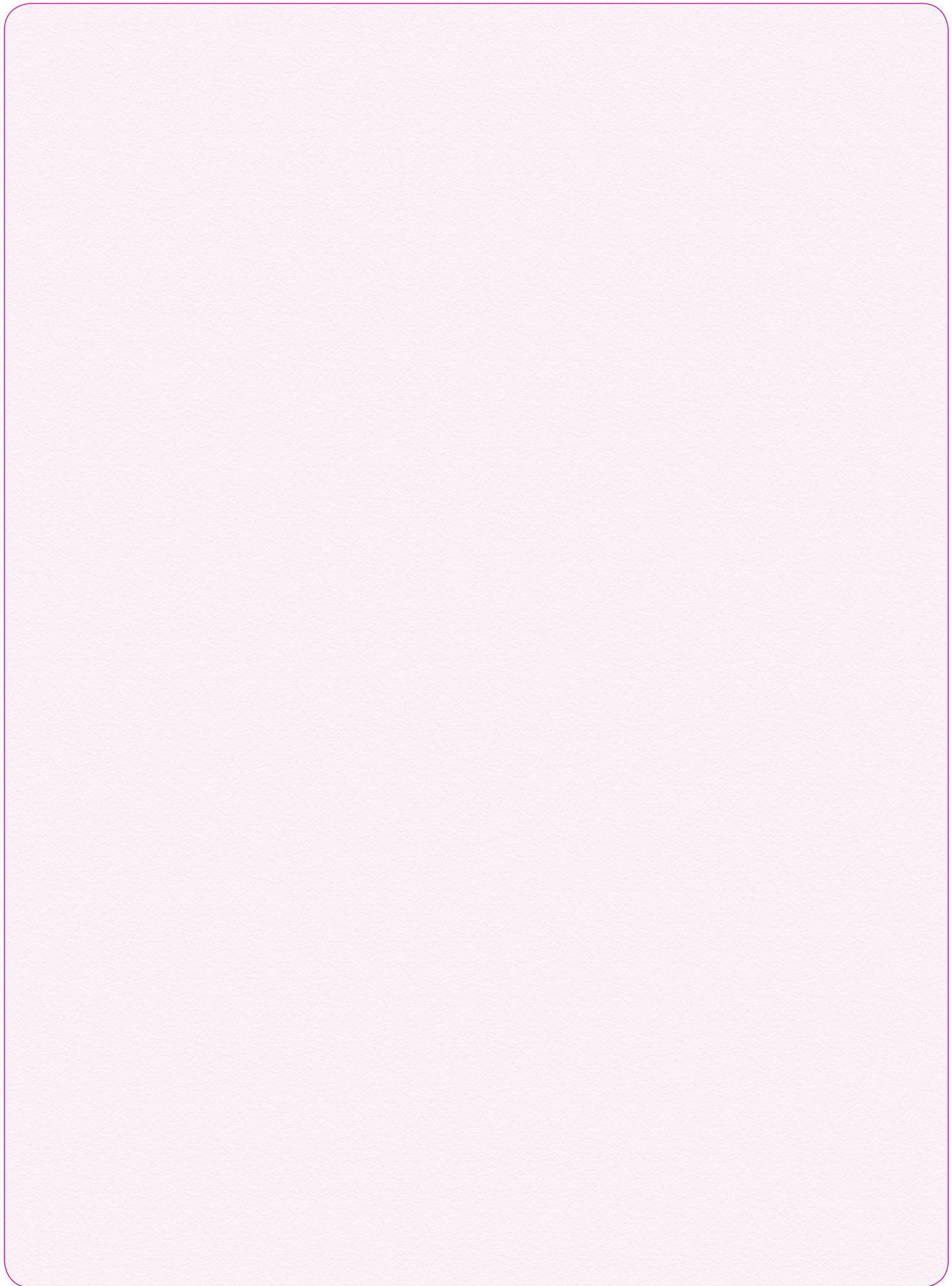
- a) Fresh or dried and mashed fruits are used for preparation of facial mask by mixing with olive oil or dairy cream or lemon juice. It moisturizes the dry skin and provides vitamin A.
- b) The oil is used in cosmetics for its softening action on the skin. It is also used in the manufacture of soaps, cold creams and products of the perfumery trade.
- c) Kernels are anti-tussive, expectorant, sedative, anthelmintic, antispasmodic, demulcent, pectoral and vulnerary and are used for common cold, coughs, bronchial asthma, rheumatism, tumors and constipation in the elderly.
- d) Flowers are tonic and used to promote female fertility.
- e) The dried ripe kernel is used medicinally in Chinese medicine. It is considered tonic and purgative. It is used to control spasms and to expel phlegm from respiratory passage.
- g). The dried ripe kernel is being used in Europe since at least 500 AD against tumors and the oil has been in use for the same purpose since about the 17<sup>th</sup> century.
- h) The Mexico, the Laetrile (an important constituent of kernels), is used in cancer therapy. The belief in this highly controversial therapy is that the laetrile breaks down into several compounds (including cyanide) which act on a tumor material, but not on healthy cells.

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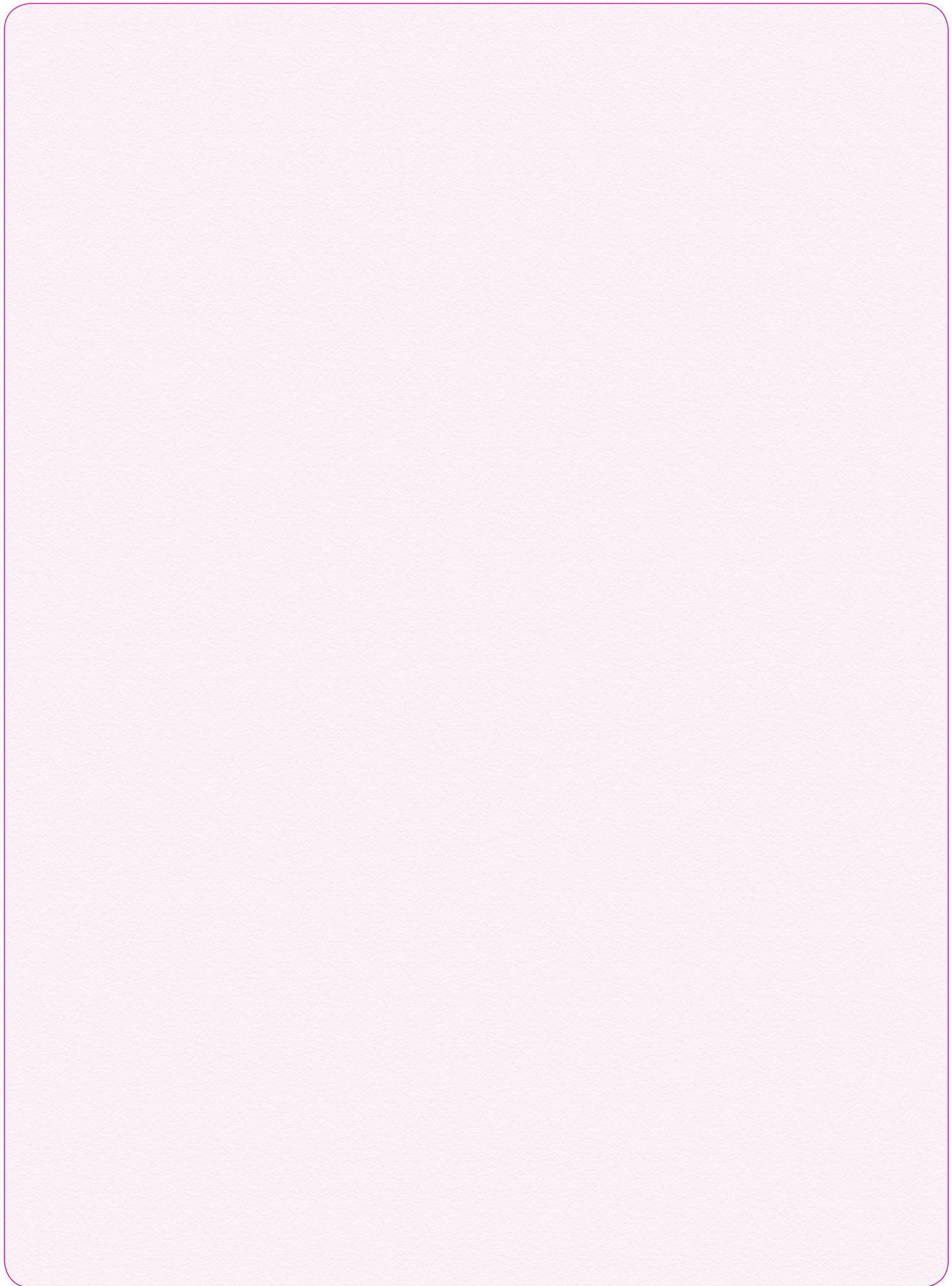














# Prospects for Development of Non-Conventional and Renewable Sources of Energy for Rural Development

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Non- conventional sources of energy are cost- effective, sustainable and eco-friendly. These renewable sources of energy have become increasingly important in last few decades. However, a new paradigm of energy security is needed in rural India to address the development goals as a removal of poverty which remains an immediate necessity. This would imply not only an assured supply of energy to vast population but energy at affordable prices which is environmental friendly and can lead to sustainable development

In India, energy is a mixed combination of commercial and traditional sources. Traditional renewable sources such as biomass and animal waste fulfill 30 percent needs of energy in the country. Some of the major and extensively used non-conventional sources of energy include wind, tides, solar geo-thermal heat, biogas

including farm and animal waste as well as human excreta. These sources are natural, inexhaustible, renewable as well as inexpensive in nature.

Significantly, India has enough potential for generation of power from renewable energy sources. It has been projected that renewable may account for 5 to 6 percent of India's energy mix





by 2031-32. During the last two decades, India's renewable energy programmes have grown in volume and major expansion was witnessed in activities from the 1980s onwards (put it in Box). Thus, the sources of energy in rural areas through biogas, improved cooking stoves and solar energy is increasing everyday.

Against an estimated renewable energy potential of about 80,000 megawatts from commercially exploitable sources, more than 4,000 megawatts has been harnessed to date. Further more, biogas and solar lighting system have reached 3.5 million and 1 million households respectively. But still India faces a major challenge of providing energy to more than 600,000 human settlements spread over 300,000 square kilometers-with a population of 1 billion.

In this context, a key challenge in the energy sector is to provide access to India's vast rural population. If we need to achieve sustainability in rural development with emphasis on livelihoods and the means of enhancing the economic well being of the poor households, it is necessary that affordable access to energy is needed to these households. Therefore, the primary need is an integrated development strategy to use energy to improve health, education, nutritional and economic activities of rural households.

According to energy experts, India's non-conventional energy potential is estimated at about 1,95,000 MW. An around 31 percent of this potential comes from Sun, 30 percent from ocean thermal, 26 percent from bio-fuel and 13 percent from wind. During the last two decades, several renewable energy technologies have been deployed and developed across rural areas in the country. These achievements of far reaching consequence are given in (Table No-1) along with estimated potential.

### Some of the non conventional sources of energy in India are as follows:

**Solar Energy:** India receives abundant energy from the sun because of its location in the equatorial Sun Belt of the earth. India receives solar energy equivalent to over 5,000 trillion kwh per year which is far more than the total energy consumption of the country. The daily average of solar energy incident over India varies from 4 to 7 kwh/m<sup>2</sup> depending upon the location. Harnessing of solar energy can be done through both the thermal and photovoltaic routes for a variety of application like cooking, water heating, drying of farm produce, water pumping, home and street lighting, power generation for meeting decentralize requirements in Villages, Schools, Hospitals etc. Parts of Kathiawar Peninsula, Maharashtra, Karnataka, Andhra Pradesh, Madhya Pradesh, West Bengal, Jharkhand, Bihar, Uttar Pradesh, Haryana and Punjab hold great possibilities of harnessing solar energy. On the other hand, vast expanse of the Thar Desert could well earn the distinction of being the biggest

solar power house of the world. Thus, India is fast becoming a solar panel manufacturing hub. (PUT IT IN A BOX) And now, in view of its vast untapped solar energy potential, the country has announced an incentive scheme for solar power generation. Obviously, it is also predicted that it is going to be the energy of future when fossil fuels, namely coal and oil, would be totally exhausted.

**Wind Energy:** India now ranks as a "wind superpower" with an aggregate installed capacity of 7660.2 MW as on 30.9.2007. This comprises 225 KW to 1650 KW unit capacity. From all sources of total renewable power capacity of over 1300 MW, a

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**Table No-1: Details of estimated Renewable Energy Potential and Cumulative Achievement in the Country as on 30.09.2007 are as under:**

SL.No.	Sources/Systems	Estimated Potential	Cumulative Achievements as 30.09.2007
1.Power From Renewables			
A.Grid-interactive Renewable Power.			
1	Bio-Power(Agro residus& Plantation)	16,881	560.30MW
2	Wind Power	45,195	7,660.20MW
3	Small Hydro power(up to25MW)	15,000	2,014.66MW
4	Cogeneration-bagasse	5,000	692.33MW
5	Waste to Energy(Urban& Industrial)	2.700	55.75MW
6	Solar Power	-	2.12MW
	Total(in MW)	84,7760	10985.36MW
B.	Captive/CHP/Distributed Renewable Power		
7.	Biomass/Cogen(non-bagase)		59.00MW
8.	Biomass Gasifire		86.53MW
9.	Energy Recovery from Waste		20.21MW
	Total		165.74MWeq.
II	Remote Village Electrification		3332/830 village/ hamlets
III	Decentralised Energy System		-----
10	Family type Biogas Plants	120 lakh	39.40 lakh
11	Solar Photovoltaic programme		-----
	i.Solar Lighting system		61,321 nos
	ii.Home Lighting System		3,63,399 nos
	iii.Solar Lantern		5,64,931 nos
	iv.Solar Power Plants.		2.18 MWp
12	Solar Thermal Programme		-----
	i.Solar Water Heating System	140 sq.m collector area	2.00 million sq.m collector area
	ii.Solar Cookers		6.17 lakh
13	Wind Pumps		1180 nos
14	Aero-generator/Hybrid System		608.27 Kw
15	Solar Photo Voltaic Pumps.		7068

Source: Ministry of Non-Conventional Energy and Resources.



major contribution of 9000 MW has come from wind power. India ranks fourth in the world in wind power installed capacity. 216 potential sites having annual mean wind power density of 200 watt/square metre or at 50 metre elevation have been identified which seems to be considered suitable for installation of wind power projects.

Areas with constant and high speed winds are suitable for the purpose of wind generated energy. The state of Gujarat, TamilNadu, Maharashtra, Orissa, AndhraPradesh, West Bengal and vast areas of Madhya Pradesh and Rajasthan are better places in regard to this energy. Further, under the process of wind resource assessment programme, The largest installation of wind turbines in country so far has been in Muppandel Perungudi (Kanya Kumari, TamilNadu) with an aggregate capacity of about 425MW, this represents one of the largest concentrations of wind capacity at a single location next only to that of California (USA).

**Biomass Energy:** India, a tropical country is blessed with abundant sunshine and rain which offers an ideal environment for biomass production. With an estimated 350 million tonnes of crop residues produced every year can be used to meet energy needs. The estimated potential of Biomass based on renewable energy options in India are as follows.

Biomass Enemrgy	16,00MW
Biogass Co-Generation	3,500 MW
Total	19,500

Biogass power projects of 650-MW capacity, based on combustion of crop residues and agro-industrial waste has been set up. Apart from this, super plus power of about 900MW capacity is being exported to the grid from bagasse project. This bagasse based co-generation of power is of particular significance in the area of biogass based power generation. It has been estimated that around 3,500 MW of additional power can be produced if all of the 430 sugar mills in India could switch over to modern techniques of cogeneration. Thus, biomass power is an important alternative for providing energy in the rural sector.

**Small hydro power:** Generation of electricity from small sized hydropower sources is a low cost, environment friendly and renewable source of energy. This commercial and economically viable power has been recognized as an instrumental in improving the energy position in parts of the country, especially in rural, remote and inaccessible areas. The country has an estimated small hydro potential (SHP) of about 15,000 MW. The database for SHP project created by new and renewable Energy sources now includes 4233 potential sites with an aggregate capacity of 10324 MW.

**Tidal Energy:** This is another unlimited and inexhaustible source of new bio and renewable energy in the country. The Gulf of Khambhat is the best suited area with about 7000 MW potential of tidal energy. This is followed by Gulf of Kutch (1000 MW) and Sunderban (100MW), preferably suited to build up electricity for the energy produced by high and lofty tides entering in to slender creeks.

**Ocean Thermal energy:** India's ocean thermal energy is estimated at 50,000MW. The first ever plant for ocean thermal energy conversion with a capacity of 100 MW costing about RS 750 crore is proposed to be set up on the coast of Tamil Nadu.

**Wave Energy:** Wave energy potential in India is estimated at about 40,000 MW. Coastal areas are betterly placed in this category. A wave energy plant with a maximum 150 KW has been installed at VZhinjam near the Thiruvananthapuram. Next one of wave energy plant is being set up in the Andoman and Nicobar islands.

**Geothermal Energy:** India has vast potentialities of developing and exploiting geo thermal energy. Govt have conducted extensive survey for the development of geothermal energy for direct heat and power generation. The potential sites of geo-thermal energy are Jammu and Kashmir, Himachal Pradesh, Uttaranchal, Jharkhand and Chhatisgarh.

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