

#### 4.4 MODERN DILEMMAS AND TRADITIONAL INSIGHTS

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*What can be the role of traditional knowledge in India's quest to achieve 'food for all' in a sustainable way? The Centre for Indian Knowledge Systems, CIKS, has gained considerable experience in studying indigenous knowledge and its potential to meet today's challenges. In the context of the Compas programme, CIKS has experimented with traditional pest control techniques derived from the large number of ancient texts on Indian Plant Science, or Vrkhshayurveda. The practical results are promising. The traditional practices and oral traditions can be strengthened with inputs from the Indian scientific traditions.*

India today is facing a serious dilemma. Agricultural production has increased significantly over the past years: in fact, in the year 2001, India had large stocks of food grains, far exceeding the capacity of the warehouses of the Food Corporation. On the other hand, the per capita consumption of food remains quite low. In the year 1998-1999, India consumed 201 kilograms of food grains per person a year, compared to 314 in China and 1,272 in the USA. However, in terms of the productivity the amount of cultivated food grains (kg/hectare) are 1,600, 4,100 and 5,600. This exemplifies the kind of distorted development that has taken place. While we now have a technology that has increased agricultural production considerably, the cost of the inputs have risen so steeply that many food items have become too expensive for a large number of people.

Hidden behind the statistics of this larger tragedy are smaller tragedies, such as the ones indicated by nutritional studies. These studies show a disproportionate distribution of food amongst our population, with higher malnutrition rates amongst women and small children. According to official statistics on the past 50 years, there has been a significant improvement in the health of the people, when assessed in rates of mortality, morbidity, maternal and infant mortality, as well as life expectancy. At the same time, there is a strong feeling amongst the lower classes of the population that, in many ways, the quality of health has declined. There are several ways to explain this seemingly contradictory reality, for example the changes in life style, habits and food, as well as the very nature of the food being consumed. In terms of the quality of food, farmers say: *"Every year, we have to use more and more pesticides and chemical fertilisers to grow our crops. The soil has become like a drug addict who needs ever increasing dosages of the drugs to get a kick...when we eat this food, our health is obviously affected"*.

**Kancheepuram.** The Kancheepuram district - where CIKS is working in the context of the Compas programme - is the northern most district in the state of Tamil Nadu. The majority of the people in the area are Naikers or Vaniyars, small land holders who have between half to one acre of land, where arable cropping is combined with cattle rearing. The major crop, paddy, is harvested in two seasons. Other important crops are groundnut, sugar cane, maize and sesame. The Kancheepuram district is close to the Chennai

(Madras) urban area and has been strongly impacted by modernisation and urbanisation. The percentage of the population involved in agricultural activities has dropped from 60% in 1961 to 50% in 1991, while the number of industrial units have increased nearly ten-fold over the past twenty years. It is also the district with the lowest forest cover in the state of Tamil Nadu. While the land use is gradually shifting from agriculture in favour of commerce and industry, the people are also moving away from agriculture to industry.

## The Centre for Indian Knowledge Systems

CIKS, the Centre for Indian Knowledge Systems, is a non-governmental research and development organisation. Since 1986 we have been studying agriculture by looking at traditional agrarian knowledge as reflected, for example, in proverbs and folk sayings, and comparing this with classical texts. We soon discovered that there are not many active practitioners of traditional agriculture, unlike traditional medicine with an abundance of them. Since 1990 we started collecting material from the classical texts on Indian Plant Science, called *Vrkshayurveda*, and selected several practices described in these texts for testing. The aim of these tests was to verify their usefulness in developing sustainable farming techniques for farmers today. The work with Compas is mainly related to this process of understanding the current relevance of *Vrkshayurveda* for farmers in the Kancheepuram district. Another important area of work under the Compas programme is organic agriculture and indigenous seed conservation, through community seed banks. The work related to traditional agriculture includes material inputs, such as seeds and biofertiliser, as well as knowledge about pest control, certification, and market linkages. Presently CIKS works in about 35 villages with a network of around 1,200 farmers.

The Compas project acknowledges the 'spiritual' or 'metaphysical' elements in rural people's knowledge and practices. Thus far, the spiritual or metaphysical elements relating to agriculture and natural resource management have been studied mainly by sociologists and anthropologists, while technical studies and field projects have largely ignored these aspects. In spite of their relevance for farmers, these elements were often viewed as part of the problem, or as obstacles to 'progress', by the external agents.

Meanwhile, at CIKS we also have to be careful not to over-emphasise the spiritual, or to suggest that indigenous practices that do not have a spiritual element are not valid. It is our experience, however, that in trying to pinpoint the spiritual aspect of agricultural practice with groups of farmers, they are often unable to clearly state those practices they considered 'spiritual'. This is linked to the traditional worldview, where physical, mental and spiritual phenomena are not strictly separated, but considered 'woven together', like the threads in a piece of coloured cotton fabric. It is impossible to physically separate the cotton fibre from the thread and the colour.

**Learning about *Vrkshayurveda*.** India has one of the largest collections of ancient manuscripts in the world. While there has never been a precise count, estimates suggest that there may be as many as 300 million texts that pay considerable attention to philosophy, religion, health care, agriculture, livestock, rains and harvests. They include hymns, *mantras* or specific symbolic figures, and ancient prescriptions. Gaining special significance

among them is the classical Indian health (*Ayurveda*) and plant science (*Vrkshayurveda*), which is highly advanced. Several types of *Vrkshayurveda* literature can be distinguished. There are the general texts with only specific sections devoted to traditional plant science, as well as texts that provide the theoretical framework to understand the *Vrkshayurveda* literature. Thirdly, there are those manuscripts devoted directly to plant science. These are of great interest and direct relevance for our work.

The subject matter of the *Vrkshayurveda* ancient texts is vast, detailed and varied. It includes subjects such as the collection and selection of seeds, germination, cultivation, sowing, planting, nursery techniques, soil, manuring, cultivation under unfavourable meteorological conditions, pest and disease management, as well as the traditional names and description of plants. Some of the prescriptions of *Vrkshayurveda* are of a general nature; other prescriptions relate to a particular species. Quite often the prescriptions list a set of ingredients without specifying the proportions to be used.

Even though there is considerable literature on plant life, much of it is not available in a readily accessible form. *Vrkshayurveda* texts are mainly written in Sanskrit, or other ancient Indian languages. Only a small fraction of these manuscripts have been published. There are no inventories of these manuscripts, location or contents, and although many of the prescriptions of *Vrkshayurveda* seem to be promising as pest control techniques, they need to be tested in the field. The conditions under which the prescriptions can be used need to be understood after which they should be standardised. Unless this is done, it will not be possible to propagate these techniques. Our preliminary experiments have shown that *Vrkshayurveda* is a potentially rich source of knowledge that can contribute to extending the knowledge base of sustainable agriculture. It also provides a theoretical framework for understanding farmers' practices.

**Ayurvedic principles of health and disease.** Prior to the introduction of chemical pesticides, farmers used a wide range of traditional pest control practices. These practices are rapidly disappearing in the process of adopting high-yielding varieties that require chemical inputs. The pest control techniques described in the original *Vrkshayurveda* texts include methods like irrigation with herbal solutions, smearing with pastes, and fumigation. It is remarkable that many of these ancient practices are still used by farmers. These practices also appear to be quite sound, when examined in the light of Ayurvedic theory and principles.

The Ayurvedic classification of plants is similar to that used for human beings: it distinguishes between *Vaatha*, *Pitta* and *Kapha* constitutions. Each of these characteristics exists in every living organism and, in good health, are well balanced. The *Vaatha* constitution, in both plants and humans, is slender and tall, light and dry. The *Pitta* constitution is medium in size, weight, colour and height, and is warm and dry. The *Kapha* constitution refers to plants or humans that are short, bulky, humid and cold. It is, however, common to find a plant or person of a combined type, like the *Vaatha-Pitta* type, *Pitta-Kapha* type, or *Vaatha-Kapha*. Plant diseases are also categorised in two types: exogenous and endogenous. Endogenous diseases are caused by a disturbance in the balance between *Vaatha*, *Pitta* and *Kapha* in the plant. Exogenous diseases are caused by external factors, such as pests, cold, hail, or lightning.

## Project activities

**Experimenting with ancient pest control practices.** As we observe farmers' practices and gather prescriptions and procedures from Vrکشayurveda texts, we need to reflect on the methods used for experimenting with them. It has been our experience that technologies and practices that were tested, validated and verified by the western laboratory method, do not always suit traditional societies. Often the western method addresses only one aspect of a problem, isolating it from its linkages with other elements in nature. This is in contrast to the traditional method that looks at the world as a whole, trying to understand the multiple linkages. The solutions sought are those that can address problems without destroying this integrity. Methods drawn from Vrکشayurveda texts can be a valuable starting point in several ways. Techniques from the texts can be experimented with, in order to provide viable alternatives for the farmers that they are currently not aware of. Techniques that are already in use by farmers can be examined more rigorously in the field, as well as analysed in the light of Vrکشayurveda theory. And finally, using the principles and theories of Ayurveda, one can extend the use of currently available practices to new situations and problems.

At first glance, the prescriptions of Vrکشayurveda may look extravagant. The frequent mention of honey, milk and *ghee*, or clarified butter, might make one wonder if they are practical. However, many of these recipes are easy to work with. Even in cases where relatively expensive ingredients are specified, they are often used in quantities that make the effort very worthwhile. In some cases effective practices used by farmers are also found in the descriptions from Vrکشayurveda. One such practice or example is the *Ural Marundu*, literally meaning the 'brewed decoction'. In this practice, farmers fill up a pot with leaves from a wide variety of plants with known pesticidal properties, and add some cow's urine and water to it. This pot is covered, buried, and left to brew for at least two weeks. After uncovering the pot, the liquid is separated and diluted at least ten times with water. The resulting 'broad spectrum biopesticide' is then sprayed on the crops to prevent or control pests. CIKS encourages this practice rather widely, adding new components according to Vrکشayurveda.

**Experiments on paddy.** After 1997, we started experimenting with rice to study the effects of Vrکشayurveda recipes on improving germination, pest and disease resistance, and stimulation of plant growth. The recipes from the ancient texts were screened and selected based on the cost of ingredients, the ease of preparation, the possibility of replication, and the effort involved in carrying out the treatment. The experiments were conducted on *Kullakar*, a traditional rice variety.

### *Plant growth regulators*

In the germination experiments, 1,000 grains of seed were subjected to four different treatments before being sown on a tray: soaked in water for 24 hours; soaked in a mixture of cow's urine and powdered vacha (*Acorus calamus*) for 24 hours; soaked in milk for 24 hours, then rinsed with water and coated and rubbed with cowdung, then dried in the shade for 6 hours, smeared with honey, and fumigated with powdered vidanga (*Embelia*



*Paddy seedlings are dipped in different solutions of plant growth regulators.*

*ribes*); and soaked in cow dung mixed with water for 24 hours. The control seeds were given no treatment. The percentage of germination as well as plant height was measured after seven days. After being transplanted into pots on the 25th day, a plant growth regulator was sprayed, which contained a mixture of goat flesh extract, black gram powder and sesame seeds. We observed a remarkable impact of the growth stimulators on plant height and the number of tillers, as well as on the yield of grain. The yield of paddy nearly doubled when the growth regulator was applied.

In starting up our experiments, we encountered the problem that the treatments described in the ancient texts involve several steps and components. Because of these characteristics, we did not know exactly how to apply the prescriptions, or at what level we should look for results. For example, when we soaked the paddy seeds in milk, they curdled it. Later, when we washed the germinated seeds and transplanted them, the level of germination was quite low. We felt that this might be because the tips of the germinating seeds were injured when we washed them to remove the curdled milk. However, an anthropologist who had observed similar practices in a tribal area suggested that the objective of this exercise may be to ensure that the most robust seeds were selected, those that can survive this washing. We had to admit that this was an interesting possibility, but to test this would be quite a laborious process. We discussed the results of the experiments with a wide cross section of people and decided that in our next phase we would decrease the number of variables as well as the number of pots. We continued the experiments, both in farmers' fields and in our own fields, for two more cropping seasons. During this

period we could confirm the positive results, especially with the use of plant growth regulators.

**Other experiments.** Subsequently, we carried out several other experiments. When paddy is soaked in diluted cow's urine before sowing, it considerably reduces the incidence of two diseases known as 'leaf spot' and 'rice blast'. We also found that soaking paddy seeds in milk stimulated resistance to certain viruses, especially the 'tungro' virus and 'stunt' virus. For this experiment paddy seeds were again allowed to germinate in a moist bag for two days. They were then soaked in milk mixed with water and sown immediately. We observed that seeds subjected to this treatment showed resistance to both the tungro and the stunt virus, even when plants in neighbouring fields were affected.

Introducing new prescriptions and methods is the most challenging task facing CIKS, and has proved to be very slow and time consuming. We need to study various aspects of a prescription, experiment with it for at least two or three cropping seasons and standardise it, before widely recommending it to farmers. Currently we have tested prescriptions to improve the germination of seeds, to treat rice crops during transplantation, and to secure the regulation and promotion of plant growth. We have moved our experiments from the laboratory to the farmers' fields. These joint activities are undertaken on the understanding that the farmer will be compensated for any unexpected loss as a result of the experiment.



*Measuring plant height and tillers on the 45th day in an experiment with plant growth regulators.*



*Farmers are facing the impact of modernisation. The work of CIKS resulted in more confidence of farmers in traditional practices for pest control and traditional rice varieties.*

**Seed conservation.** Another part of the action research with Compas focused on seed conservation. India is home to a great diversity of both wild and cultivated crops. In recent years, however, there has been a marked decline in the variety and diversity of the commonly cultivated crops, such as rice and cereals. With the advent of the green revolution, the emphasis has been primarily on the increase of yield; consequently a small number of paddy varieties were selected and promoted for their capacity to give high yields in response to the application of high doses of fertilizer. As a result the genetic base of paddy has narrowed down considerably. Yet, farmers in every part of the country have deep knowledge of their own rice varieties, which has enabled them to harvest a crop even under the most severe stress conditions. Farmers also possess high yielding varieties of their own, which are not included in the agricultural extension programmes.

programmes.

The alarming ecological and biodiversity destruction, as well as the need for conservation, has been recognised at the level of farmers and the state. Farmers have experienced that high yielding varieties are not suited to all farming conditions; indigenous varieties are better adapted to alkaline soils or drought, have more resistance to pests, and require less farm inputs, such as chemical fertilisers and pesticides. They yield straw valued by farmers as cattle feed as well as roofing material, while many varieties fulfil specific nutritional and other dietary needs. Moreover, indigenous varieties provide the basic genetic material for developing other varieties in the future.

After conducting a detailed survey of traditional seed varieties of the state, CIKS embarked on a seed collection. The paddy seed collection counts over 130 varieties, each with a detailed documentation of its properties. A similar collection of vegetable seeds is being done with the involvement of more than 200 women. Meanwhile, a network of farmers has been organised, for exchange of seeds and information, and on-farm conservation of local crop varieties in different parts of Tamil Nadu. Farmers who put aside part

of their land for conservation of indigenous grain varieties are provided with an initial supply of seeds, procured by CIKS from farmers who already grow it. These farmers are also supported in organic manuring of their fields and natural pest control methods. At the end of the season the farmers return twice the quantity of seeds taken from the seed bank. We maintain detailed records on every farmer involved.

In this connection, the CIKS farmer bulletin called 'News from our farmers' network' quoted a farmer's experience: "*Sri Ranganathan lives in Mangalam village of Kancheepuram district. His land is close to an irrigation lake and is prone to flooding. He has incurred heavy losses by cultivating high yielding varieties for the last several years. This year he cultivated an indigenous variety called Samba mosanam obtained from the CIKS seed bank. The rains were very heavy this year and his half-acre plot cultivated with Samba mosanam was flooded with 4½ feet of water. This did not affect his crop in any way. However, his neighbours who had cultivated other varieties, incurred heavy losses. The performance of Samba mosanam has convinced farmers in this area of the variety's excellent ability to withstand flooding.*"

**Supporting traditional Indian Veterinary Science.** In 2001, CIKS commenced documentation and training in the area of *Mrgayurveda*, or traditional Indian veterinary sciences, in collaboration with another Compas partner, FRLHT based in Bangalore. Training programmes have been held by FRLHT for ethno-veterinary and veterinary practitioners, in collaboration with the Tamil Nadu Cooperative Milk Federation and the National Dairy Development Board. The approach builds on the large body of knowledgeable practitioners in veterinary traditions in many parts of India, combined with Ayurvedic principles, theories and literature.

## Discussion

India has an extensive and rich knowledge base of farmers' practices and a scholarly tradition. It is essential that in our quest for sustainable agriculture, we also take note of the philosophical and theoretical foundation of this traditional knowledge. The experiments of CIKS with *Vrkshayurveda* are promising attempts in this direction.

Over the past years CIKS has developed an excellent overview of the literature and scope of *Vrkshayurveda*; both the primary sources in Sanskrit and the secondary sources in English have been surveyed. Certain traditional farmers' practices that were on the verge of disappearance have been revived, such as the *Ural pot*, a traditional 'broad spectrum' biopesticide. The training programmes on traditional agriculture have been very successful, and CIKS has now moved on to training trainers in selected target villages.

**Some constraints.** While we have created a more positive and confident outlook in farmers vis-à-vis traditional practices, their participation has been limited and slow to build up. Many initial trials have to be done before starting the experiments with farmers. The major interest of farmers is in the rice crop - a 4-6 months crop - which makes trials time consuming. CIKS has been very cautious in making recommendations to farmers, even at the level of small-scale experiments, in order to avoid any problem or loss if they take to a 'nascent' technology in a big way. Most often farmers seek solutions to immediate prob-

lems, an exploratory phase that is a foundation for future possibilities does not always interest them. For example, in testing the effect of a plant growth regulator, we had to experiment for 18 months before being able to start the farmer participation stage.

Educational and training material on Vrکشayurveda is lacking in the Tamil language. A Tamil version of a user's manual was published in November 2001. The recipes and specific growth promoters that have been recommended in it are based on field trials carried out by CIKS. Two publications on organic farming and organic vegetable gardening have also been translated into Tamil.

#### *Training of field staff*

Training programmes in many organisations tend to put field staff in a 'teacher-student' relationship with the local farmers, rather than foster a mutual learning situation. Meanwhile, our work on Vrکشayurveda revealed to us that the field staff also needed training and orientation on the basic principles and approach, since it is not an area in which they had received prior training. In fact, in this area the farmers and rural people have a distinct lead, as the technical terminology and worldview of Ayurveda is very much part of the living tradition of rural India. This aspect requires constant attention. In 2001, for example, a special session on Ayurvedic home remedies for minor ailments was conducted with CIKS staff, which provided a good introduction to the Ayurvedic way of thinking.

**Interaction with universities.** Scientists and field staff of CIKS have started interacting with agricultural universities and the State Department of Agriculture. We have also been interacting with scientists in several agricultural universities of Tamil Nadu, especially the Gandhigram Rural University, in the documentation and assessment of seed performance. We have also been in touch with the National Bureau of Plant Genetic Resources, which is the Apex body of the Government of India (functioning under ICAR - Indian Council of Agricultural Research) for the collection and preservation of seeds. Initially the Bureau took the position that its role is to interact only with other scientists and not with farmers and NGOs. Currently, the Head of the Conservation Division of the Bureau has agreed that samples of seeds deposited with them by NGOs or farmers can be taken from their collection for future use by the NGOs or farmers.

**Networking.** The numerous publications in English, Tamil and Hindi are used as educational and training material by a wide range of individuals and organisations. On the invitation of 'The Hindu', which is one of the leading daily newspapers of India, CIKS produced a supplement on Indian health traditions in October 2000 with special emphasis on traditional medicine. This gave rise to a lot of feedback and discussion about the value of traditional Indian sciences. CIKS has made a good beginning in the task of networking with other groups involved in traditional agriculture, by way of exchange of information, materials and visits.

We plan to hold a major national conference on the theme of Vrکشayurveda with the participation of some leading Ayurvedic practitioners. The purpose of this conference is to draw the attention of academics, researchers and policy makers to the potential and



*Indian Compas partners discuss the effect of light traps in an organic cotton field.*

possibilities of Traditional Indian Plant Science. And if such a cross-section of Indian society is impacted, traditional knowledge may eventually find its way into the mainstream programmes.

**Looking forward.** We are encouraged by the results obtained thus far with the experiments in the experimental centre and the farmer's fields, and feel that the prospects are bright. Our experience indicates that there are two major lines of work to be followed in the future. On the one hand, we need to continue conducting controlled experiments to test the applicability of ancient texts for present day agriculture. Meanwhile, there are many questions that need to be answered in this process, such as 'How can experiments based on ancient techniques be designed and interpreted?', 'Which parameters should be used?', and 'How can we incorporate the hymns and symbolic figures mentioned in the texts into our work?'

On the other hand, we need to look carefully at the living folk practices of farmers so as to understand and analyse them. The ancient Vrkhayurveda texts offer us many possibilities, especially in providing us a theoretical and practical basis for analysing and understanding farmers' practices. We are convinced that combining farmers' practices with the knowledge available in the ancient texts can revitalise present day agriculture.