



Namma Nellu is an initiative of Centre for Indian Knowledge Systems to conserve indigenous rice varieties in Tamil Nadu. The objectives of Namma Nellu initiative are planting and replanting the varieties year after year in two locations for conservation purposes, conducting researches to understand the characteristics of traditional varieties, initiating dialogues on the importance of Agro biodiversity on society and ecology and multiplying seeds to offer for large scale production of traditional rice varieties.

Several individuals, associations, communities, educational institutions, families and organisations have contributed towards this effort.

www.nammanellu.com



THE CENTRE FOR INDIAN KNOWLEDGE SYSTEMS (CIKS)

has been involved in work relating to various aspects of Traditional Rice Varieties (TRV) since the formation of the organization in 1995. The work started initially with the realization that these varieties were important for sustainable agriculture practices since they provide a range of seeds which are suited to various ecosystems, soil types and in many cases have the resistance to various pests, diseases, drought and floods. During the last 25 years the work has progressed extensively as well as deeply and it currently covers various aspects of seeds including seed production, scaling up of cultivation, development of organic packages for seed as well as crop production, helping farmers to create linkages to the market as well as development and standardization of value added products. This publication is in the nature of a stock taking of our efforts to sum up what we have attempted in this journey and plan for the future.

This publication is supported by a project co-financed by GIZ, commissioned by the Government of the Federal Republic of Germany.

CIKS TRADITIONAL RICE VARIETIES OF TAMIL NADU - A SOURCE BOOK



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TRADITIONAL RICE VARIETIES OF TAMIL NADU

- A SOURCE BOOK



Since 1995, Centre for Indian Knowledge Systems has been working towards enhancing livelihood security of small and marginal farmers in Tamil Nadu. Our programmes in the areas of organic agriculture, biodiversity conservation and Vrکشayurveda (the ancient Indian plant science) have helped farmers go organic in a sustainable, effective and profitable way. Drawing from and building on indigenous knowledge and practices, we develop farming solutions relevant to the present day context. Our activities include research, extension work and promoting farmer producer organizations. The extension work comprises of capacity building and production of educational material.

www.ciks.org

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Traditional Rice Varieties of Tamil Nadu : A Source Book

Publication - November 2019

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**Cover Photo : A view of the CIKS Research Farm conserving Traditional Rice Varieties.
Photograph by Evanescence Studios, Chennai**

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- They have carefully nurtured and conserved a stupendous diversity of rice through the ages.
- They have shown a great deal of understanding and insight into the suitability of these varieties for various soil types, water requirements, crop seasons and eco systems.
- They have observed the various characteristics of the varieties with respect to resistance to pests, diseases, droughts and floods.
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BIODIVERSITY & FOOD SECURITY: THE GLOBAL SETTING

It is well known that almost all the areas of high crop diversity as well as food crop origin of our planet are located in the so called “Third World” comprising of the developing countries. As per one rigorous attempt made by the Russian scientist Vavilov it is seen that out of the fourteen biodiversity hotspots (areas of high crop diversity and origin of food crops) twelve are located in Asia, Africa and Southern and Central America and only two are located in Northern America and Northern Europe. It is not surprising that these are the very spots on earth in the neighbourhood of which major human civilisations were nurtured for the last five millenia.

The last five centuries beginning from the time of exploration, discovery and conquests of these lands by people of European origin (beginning from 1490s marked by the voyages of Columbus) represents a period of major upheaval and disruption in many of these areas wherein large efforts were made to carry species that are native to one part of the World to widely different geographic areas and cultivate them on a large scale. These were also accompanied by the introduction of exotic and alien species and in some cases cultivation of extremely large areas of land

with crops built upon a precariously low biodiversity. For example, in the last one hundred and fifty years there have been nine major famines / crop failures that can be tracked to large scale cultivation based on genetic uniformity. Some of the important events are listed in the following in Table – 1. These range from the 1846 Irish potato famine and the attempts to cultivate coffee in Sri Lanka in 1800 to more recent events such as the failure of the rice crop in Indonesia in 1974 where three million tonnes of rice were destroyed or the failure of the citrus crop in Florida, USA in 1984 where eighteen million trees were destroyed. In the decades following the Second World War, many governments in the third world have promoted the Green Revolution package of farming which has in practice meant the selection and large scale promotion of a small number of varieties of major crops such as paddy and wheat which have been selected based on the sole criterion that they can respond to heavy doses of application of chemical fertilisers by producing increased yield of grain. This has led to a situation since the 1950s where most often farmers do not have access to a stupendous varieties of traditional seeds that they were cultivating through the millenia and which contribute to their food and nutritional security.

Table - 1 :
Crop failures and famines due to lack of Biodiversity

DATE	LOCATION	CROP	EFFECTS
1846	Ireland	Potato	Potato famine
1800s	Sri Lanka	Coffee	Farms destroyed
1940s	USA	U.S. Crops	Crop loss to insects doubled
1943	India	Rice	Great famine
1960s	USA	Wheat	Rust epidemic
1970	USA	Maize	\$1 billion loss
1970	Philippines, Indonesia	Rice	Tungo virus epidemic
1974	Indonesia	Rice	3 million tons destroyed
1984	USA (Florida)	Citrus	18 million trees destroyed



Dr. Richharia examines a traditional paddy variety

GRASSROOT EFFORTS

In many of these cases the wide diversity and genetic stock of crops had slowly disappeared from the fields and partly found refuge in the state supported or industry supported – grain storage banks. A majority of these banks were arrangements where the seeds were stored for long terms under extremely low temperature until a small number of them were planted on from year to year. It was considered that these seed storage structures would primarily be dealing with scientists, research laboratories and institutions rather than with farmers who were original sources and suppliers of the seeds as well as the information regarding them.

It is under these conditions that there have been a large number of grass root efforts that have taken up the on-farm conservation of traditional seed varieties. Several of these efforts have been in progress in Asia, Africa and South America.

THE INDIAN SCENARIO

The Indian subcontinent is a region of extremely high biodiversity of plants and in fact, two of the twelve global – “biodiversity hotspots” are currently situated in India. India cultivates a large amount of rice and vegetables both in terms of the volume

and diversity. Currently India is the world’s second largest producer of rice as well as the second largest producer of vegetables. It has been estimated by the National Bureau of Plant Genetic Resources (NBPGR) of the Government of India that currently there are something in the region of 75000 to 100000 land races of paddy available in India. Similarly there are about 5,320 varieties of 23 commonly used vegetables that are being preserved in the Indian Institute of Vegetable Research (IIVR) at Varanasi. In addition there are a significant number of varieties of paddy and vegetables still available with farmers which are not noted or captured by the formal systems.

The National Institute of Nutrition (which is part of the Indian Council for Medical Research of the Government of India) had undertaken the first exercise to compile the nutritive value of Indian foods in 1937 and this was revised in 1971 and 1989. More recently, a comprehensive document – Indian Food Composition Tables (IFCT) has been published in the year 2018. There are no details about nutritional properties of different rice varieties. For example, if one looks at the table of properties given for rice, the only values are for – par boiled and milled, raw and hand pound, raw and milled, rice flakes and puffed rice. However, in the case of vegetables and fruits a beginning has been made and some varieties are described separately.

BIODIVERSITY OF RICE

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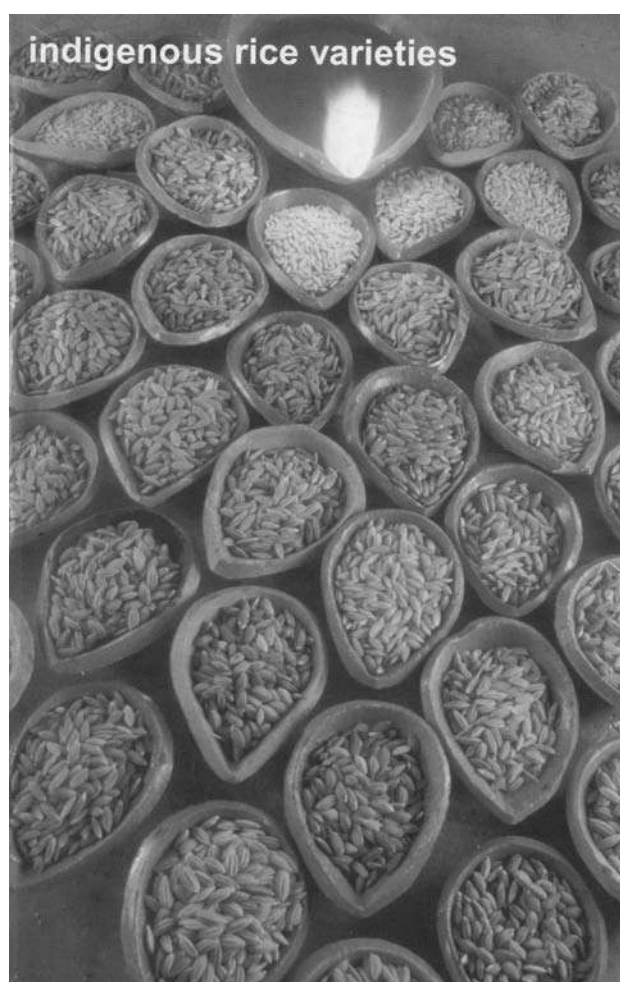


TAMIL NADU SITUATION

Tamil Nadu has been through the ages, recognized as a centre with very high biodiversity of the rice crop. There are extensive mentions of varieties of rice in various kinds of literature and technical texts. For example, a particular type of Tamil literature that goes by the name of – “Pallu” literature, which literally means literature relating to the life of a particular community related closely to the agrarian society contains names of a very large number of rice varieties. A Ph.D. thesis about this kind of literature has listed as many as 233 Traditional Rice Varieties ! It is seen that while some of these varieties are readily recognizable and still available today the names of some other varieties are ambiguous and there are still more varieties which are not known (or at least not widely known today).

Tamil literature abounds in references to traditional paddy varieties. The Tamil lexicon which was a major work produced by the Madras University in the early part of last century has references to hundreds of traditional paddy varieties. A large number of them also have notes and cross references providing information about the sources which include not only ancient and medieval Tamil literature but also historical records, travelers accounts and district gazeteers. The well known dictionary compiled by Sambasivam Pillai also contains references to some traditional rice varieties.

Similarly names of a large number of Traditional Rice Varieties and their properties and uses have been described in Siddha medical literature – these have been dealt with in a separate chapter later in this book.



CURRENT SITUATION AND OUR EFFORTS

Historically, farmers have conserved and cultivated a large number of traditional paddy varieties since this serves several purposes – they are suited to the local climate and soil type, they have a high degree of resistance to pests and diseases and they are known to have specific nutritional and therapeutic properties. In recent times, the Government Agriculture and Extension programmes have been supplying only modern seed varieties which are either hybrids or other modern varieties. This has resulted in a loss of valuable traditional genetic resources, loss of knowledge of cultivating these varieties and erosion of knowledge and traditions about the uses of these varieties. Traditionally farmers cultivated organically using natural products for pest control and enhancement of soil fertility (such as compost, farmyard manure, oil seed cake etc.). However, recently as part of an effort to increase crop production the Government has been promoting chemical cultivation through subsidies,

training and inputs provided for various chemicals. It has also made rice cultivation more dependent on external inputs (seeds, fertilizers and technology of cultivation) as well as increased the risks (the current seeds do not have as much resistance to pests, diseases, problems such as drought, flood, etc.)

As a result of the above there have been several problems such as decline of soil fertility, resistance of pests to chemicals, decline of yields. There is also an increasing realization that this approach is leading to a severe pollution of the land, water and air as well as several diseases that can be traced to chemical cultivation. Currently, the Government is keen on efforts to encourage sustainable agriculture approaches and Prof. M.S. Swaminathan (the father of India's Green Revolution) has given a call for – “Ever Green Revolution” which can be a sustainable approach.

In this context in the second chapter we have outlined and summarized the CIKS work on the conservation of traditional rice varieties and the documentation of agronomic properties.



CIKS WORK ON CONSERVATION OF TRADITIONAL RICE VARIETIES

Currently, our centre is involved in different kinds of activities relating to traditional varieties of rice. This section provides an overview of our efforts in each of these areas.

RICE VARIETIES CONSERVED BY OUR CENTRE

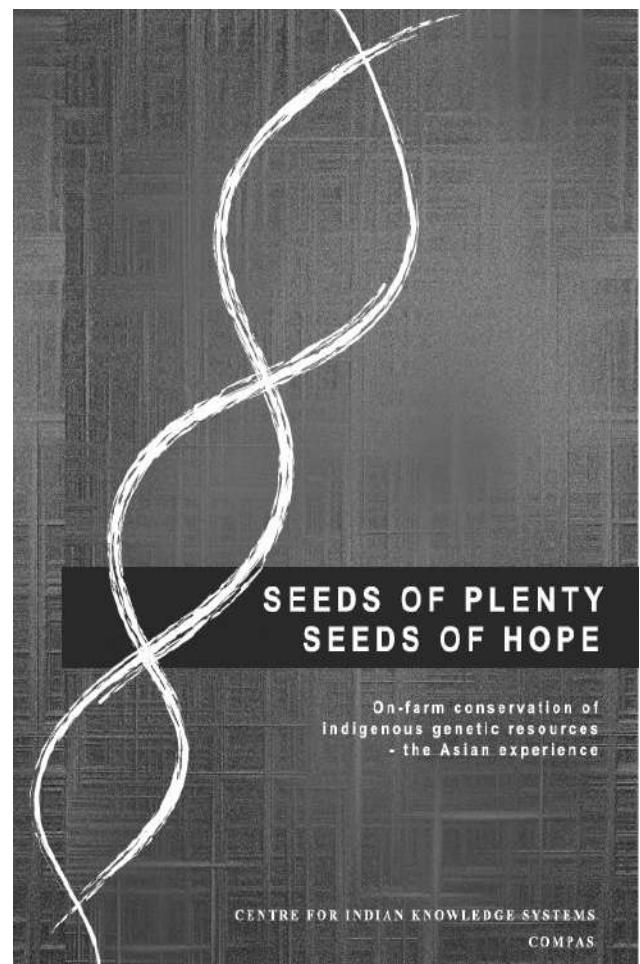
There are several community based organizations in India and South Asia that are conserving traditional varieties of seeds. As early as 2004, we had provided an overview in a publication from our centre. Our centre is currently conserving over 140 traditional rice varieties. A list of all these varieties with the Tamil names in Tamil as well as roman script is given in Annexure - I.

The objective of such efforts, is to ensure that quality seeds of these varieties are available for the use of the farming community as well as for documentation and research. This is necessary since currently these varieties are not being made available to farmers through the regular extension system of the agriculture department.

Some special aspects of this conservation programme are the following –

1. All the varieties are cultivated organically. Organic techniques have been developed and documented.
2. There has been extensive experimentation and standardization of seed conservation through the system of – “Sustainable Rice Intensification (SRI)”. Due to the use of this SRI technique it
3. There has been detailed documentation of the qualities and performance of these varieties for several years in succession. This means that for some of the varieties, we have records spread over several years with respect to parameters such as – yield of grain, yield of straw, weight of 1000 seeds etc.

has been possible to achieve cultivation with much lower seed rates and maintain a great degree of purity avoiding contamination since the quantity of seeds required per unit area of cultivation (the seed rate) is quite low.



4. There has been detailed and extensive photo documentation of these varieties with a collection of pictures including – planted fields, ear heads, grains, close up of grains etc.

***IN SITU* SEED CONSERVATION EFFORTS OF CIKS**

There are two types of seed conservation efforts possible. One is the *ex situ* conservation and the other is the *in situ* conservation. *Ex situ* method of seed conservation is a formal method where seeds are preserved in gene banks in cold storage. Conservation is done outside the natural habitat of plants. *In situ* conservation maintains plants and crops in their natural habitats. This allows the evolutionary process that shaped their genetic diversity and adaptability to continue and develop. This is extremely important for areas where traditional farming is still prevalent and also for crops that are often enriched by gene exchange with wild relatives. In the context of agriculture *in situ* conservation is basically on farm conservation of cultivated crops. This type of on farm conservation of genetic resources is successfully carried out across the world by decentralized Community Seed Banks (CSBs).

Community seed banks are mostly owned and managed by people's organizations or farmer's

groups. It is decentralized and free from the control of seed corporations. The local groups get the long term and short term benefits. Community seed banks are at least partly supported by NGOs as they can provide or augment technical and logistic support. In addition to this they can also help source funds to sustain the enterprise.

The collections in the community seed banks should be dominated by indigenous traditional varieties and wild relatives. If and where possible, farmer bred lines should also form part of this collection. Sufficient facilities must be available for seeds to be stored and seeds must be available to any interested member on agreed terms. Active sharing and exchange policy between other groups should also be worked out. It is very important to obtain the cooperation and involvement of the immediate community. Members of the CSB should be well trained in the principles and methodology of genetic conservation, in basic characterization and documentation work based on criteria relevant to farmers needs. On farm research should be encouraged to help evaluate the performance of promising cultivars. This helps to build the technical capacity of those in charge of the seed bank and also increase their interest and motivation. Seed collected should be properly documented before they are made available to users. If possible, it should also serve as training centres for participatory plant breeding.

In Table-2 we have given a comparison of the functioning of a formal Gene Bank as against a Community Seed Bank.



Table – 2 :
Comparison of a Formal and a Community Seed Bank

GENE BANK	COMMUNITY SEED BANK (CSB)
It is the conventional seed bank.	It is the farmers' seed bank.
This is the formal system for seed conservation.	This is the informal system which is an integrated one.
Seeds are stored under cold conditions.	Seeds are conserved under natural conditions as part of cropping patterns.
There is no room for co-evolution in this system.	There is ample scope for co-evolution and it is continuous.
Expensive high technology methods are used for maintenance of gene banks.	Technologies used are simple and farmer friendly and it is maintained with limited resources.
The main emphasis is on genes that may be useful in breeding.	The emphasis is more on community seed supply which is an important component of sustainable agriculture.
The focus is on exploiting for higher yields.	The focus is mainly on integration of qualities of many individual cultivars.
Market needs are given priority while breeding.	Subsistence, food security and food priority is given more importance.
It is capital incentive and highly centralized in approach.	It is need based and decentralized. It is maintained at a low cost.
The main beneficiaries are breeders, biotechnologists and researchers.	The main beneficiaries are farmers, peoples' organization, farmers' organization, farmers' association and the community.
A very large number of varieties can be collected in one or a few locations, safety can be ensured for seed survival and viability by using high cost technologies such as storage in liquid nitrogen temperatures, very detailed studies and characterization can be carried out for a documentation of the varieties to protect indigenous varieties and prevent biopiracy, interaction possible with plant breeders etc.	The number of varieties protected at each location is likely to be limited, risk of loss of varieties due to vagaries of weather or other natural disasters, limited amount of documentation and characterization possible, poor interface with plant breeders or the formal research system.
High cost, usually the interface with farmers is rather poor or restricted.	Excellent interface with the farmers, documentation of characteristics that may be considered important for the farming community (such as nutritional or therapeutic properties, fodder value, use in rituals, taste etc.).

IMPORTANCE OF *IN SITU* CONSERVATION AND EARLY FIELD EXPERIENCES

Indigenous paddy varieties are important since they have a range of agronomic properties that are suited to various locations, ecosystems, rainfall patterns, availability of water etc. They have been documented by us from the point of various parameters including –

1. Varieties suited to specific types of soil. (Eg.) Varieties that can be cultivated in clayey soil – *Kaliyan samba*, *Samba mosanam*, varieties that can be cultivated in sandy soil – *Kitchili samba*, *Kullakar*, etc.
2. Varieties having resistance to pests and diseases (Eg.) Varieties resistant to brown plant hopper and paddy ear head bug – *Neelam samba*, varieties resistant to many pests and diseases – *Kudhiraival samba*, *Kurangu samba*
3. Varieties that can be cultivated with varied amounts of water availability. (Eg.) Drought resistant varieties – *Vadan samba*, *Kullakar*, flood resistant varieties – *Samba mosanam*, *Kudhiraival samba*
4. Varieties that are important in disaster management – an illustration is given below.

We share below a few early experiences from the field about the importance of these varieties.

1. *Kappakar* for Food Security

Kappakar paddy variety is usually cultivated in clayey soil as a dry sown crop during the Samba (July – January) season. The duration of this crop is 5 months. More than 30 farmers have been conserving seeds of this variety in Thiruvanaikovil village of Thirukazhukundram block for more than three generations. When we interviewed the farmers as to why they conserved this variety, they reported the following –

“Every year we cultivate *Kappakar* variety as a dry sown crop in about 50 acres. This variety can tolerate drought. It can also withstand floods. The incidence of pest attack is quite low. Altogether, the cost of cultivation is very low. Hence we cultivate this variety every year.



During the *Samba* season (August – January) of this year (2002), our villagers had sown *Kappakar* as a dry crop in about 50 acres of land. Some farmers had sown a high yielding variety called *White Ponni* as a dry sown crop. Since there was no rain for 2 months subsequent to sowing, the crops withered. As soon as it rained, the *Kappakar* crop recovered and turned green. On the other hand, the *Ponni* crop did not recover. The average yield is about 1200 – 1350 kgs per acre. The rice of this variety is ideal for making idli and dosa. It also tastes good if the cooked rice is left overnight and then consumed. The hay of this paddy variety is also a good fodder for the cows.

2. *Samba Mosanam* Paddy Variety – Ideal for Waterlogged Fields

Ranganathan who is a farmer belonging to Mangalam village of Tirukazhukundram block of Kancheepuram district has 2 acres of land adjoining a lake. Out of these two acres, half an acre of land remains submerged in water during the monsoon season. This resulted in crop loss when high yielding paddy varieties were cultivated. So, Ranganathan cultivated *Samba Mosanam* variety of paddy during July – November season by direct sowing.

Since there was heavy rain that year, the water level in the lake was higher than usual. There was about 4 ½ feet of water stagnation in about half an acre of his land. The stalks of *Samba Mosanam* paddy variety remained unaffected and withstood the waterlogged conditions. However, the stalks of high yielding paddy varieties like *Ponni* cultivated by the neighbouring farmers were bent and remained submerged in water. This caused germination of the grains resulting in crop loss.

In waterlogged conditions, wherever *Samba Mosanam* was cultivated, there was no loss in yield. This has motivated the neighbouring farmers to cultivate this variety during the next season.

Special Features of this Variety

- This variety is also called *Puzhudikal*, *Eri nel* and *Maduvu muzhungi* in Tamil. It is suitable for cultivation in the vicinity of lakes. It is said that people travelled by boats and harvested the *Samba Mosanam* in the lakes.
- This variety is good for preparing *aval* (flattened rice), idly and dosa.

3. Karunguruvai Rice

Filariasis is a disease spread by mosquitoes. Even modern medicines do not have a complete cure for this disease. But, people believe that this disease could be cured by Siddha medicine. Murugadasan from the village Thiruppurambiam 5 kms from Kumbakonam says that filariasis can be cured by using the indigenous rice variety called *Karunguruvai*. According to him, the *Karunguruvai* paddy is boiled with cactus milk (*thirugukallipal*), cow's milk and honey and made into a *lehyam* confection. This *lehyam* is stored in a mud pot. People who are afflicted with filariasis should have it for five days continuously and after an interval of three days, again for five days. During the intake of this medicine, ghee, milk, cereals and fried salt should be added to the diet. The method for preparing the *lehyam* using *karunguruvai* also finds a reference in the ancient Tamil text Pulippani Vagadam 500. Ramu of the same village had already undergone this treatment 15 years back and has been cured.

Karunguruvai is an indigenous paddy variety. This can be cultivated during the *Kuruvai* (June 1 - August 31) and *Navarai* (December 15 – March 14) crop seasons. The crop grows well on clayey, coarse and sandy clay soils. Normally, the crop grows to a height of 95.56 cm. The age of the crop is 120 – 125 days. Normally, 55 grains can be obtained from an ear head. This paddy variety was originally cultivated near Kollidam but currently they do not have this variety. CIKS from its collection has given seeds of *Karunguruvai* to a farmer Gunasekaran of this area for cultivation in 20 cents of land.

4. Kalarpalai and its importance in disaster management

During the tsunami disaster in the year 2004, thousands of hectares of land under paddy in the coastal regions of Nagapattinam district were immersed under sea water for various periods ranging from 20 – 120 minutes. After the withdrawal of the water the soil which was rendered saline became unfit for the cultivation of several modern and hybrid paddy varieties. However, we found that one indigenous paddy variety in our collection called *Kalarpalai* which was traditionally considered suitable for growth in saline soils could grow and provide reasonable yields in tsunami affected lands. Similarly we also found that an indigenous paddy variety from the Gorakhpur region of Uttar Pradesh called as *Kalanamak* which was traditionally considered suitable for growth and saline soils could also grow well in this region. Thus, we found that these varieties were extremely important in the process of management and recovery after disaster.



CIKS Publication on Tsunami and the restoration of farmer's livelihoods

WHAT IS IN A NAME?

Indigenous varieties of seeds have names that are rich in information and have their own message about various kinds of properties of the varieties. A few illustrations are given below citing the names of indigenous paddy varieties in Tamil.

- Some varieties give an indication of the colour such as – *Sigappu kuruvikar* (red coloured) or *Karunkuruvai* (black coloured).
- In some cases the crop season in which the variety is usually cultivated is indicated such as – *Samba mosanam* (Samba season), *Karthigai samba* (cultivated in the month of *Karthigai*), *Chithirai kar* (the month of Chaitra/April).
- The crop duration is sometimes indicated by terms such as – *Arubatham kodai* (a 60 day variety).
- Special properties are indicated by names such as *Madu muzhungi* (literally means that it can grow in a water body – this is a flood resistant variety).
- The appearance may be indicated by names such as *Kulla kar* (a short stature kar variety), *Thanga samba* (a samba season variety that has a golden hue etc.).
- Based on shape – *gundu* (bold), *periya* (big), *siru* (small) etc.
- Based on smell / aroma - *Punugu samba*, *Kasthuri samba*, *Karpooralalai* etc. named after specific aromatic substances.
- Based on location – *Salem samba*, *Aathur samba*, *Chengalpattu sirumani*, *Arcot kitchili*
- Indicating the mode of cultivation – *Puzhuthi samba*, *Puzhuthi kar* etc. indicating dryland cultivation.

GENETIC DIVERSITY AND DISEASE CONTROL IN RICE : AN EXPERIENCE FROM CHINA

Recently, there has been a remarkable demonstration of the role of genetic diversity in disease control of rice. In a major experimental

effort that was carried out beginning from the year 1998 (the work is still in progress) experiments in China have shown that by intercropping resistant modern rice varieties with susceptible traditional rice varieties, the incidence of Rice blast can be decreased significantly - in fact, to the point that no floral spray of fungicide was used after the first year. The same experiment also showed that there is an 89% increase in the yield of rice. We are summing up below the salient features of this experiment reported in the Science journal - Nature.

The experiments were carried out in the Yunnan province of China during the years 1998 - 1999. It was an collaborative effort involving the plant protection department and Agricultural Universities in the Yunnan province at China, International Rice Research Institute at Philippines and Botanists in the Oregon State University of USA. In the Yunnan province of China, farmers have been traditionally preserving Glutinous or “sticky” rice varieties which are used for confections and other speciality dishes. These have a higher market value than other rice types but they have lower yields. They are also highly susceptible to blast disease, caused by the fungus *Pyricularia oryzae*. Non-Glutinous hybrid varieties are less susceptible to rice blasts. Experiments were based on a farmer’s practice of dispersing single row of glutinous rice between groups of four rows of hybrid rice. The layout of rice is explained in the given below diagram.

In the first year of the experiment, mixed plots were set up involving two different traditional rice varieties which are susceptible, namely - Huangkeneo and Zinuo. Two hybrid rice varieties were used for intercropping namely Shanyou 63 and Shanyou 22. Four different mixtures were planted in 812 hectares of area in five townships in the Shipping county of Yunnan province. This provided excellent blast control when varieties were mixed. Hence, only one floral fungicide spray was applied. In the second year, the study was expanded to 3,342 hectares of rice fields. This time five townships in the adjacent county of Jianshui were also included. The results were quite spectacular. The diversification had a substantial impact of rice blast severity. In the first year of experiment, the panicle blast severity in the susceptible variety averaged 20% in the monocultures but was reduced to 1% when dispersed within mixed population. Panicle blast severities of hybrid varieties which averaged 1.21 % in monocultures was reduced to varying degrees in mixed plots. Results from 1999 were very similar to 1998 season. Disease susceptible rice varieties planted in mixtures with resistant

Glutinous monoculture

o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	
o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	
o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	2.4
o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	
15 cm				20 cm											

Hybrid monoculture

x	x	x	x	x	x	x	x	x	x	x	x	x	
x	x	x	x	x	x	x	x	x	x	x	x	x	
x	x	x	x	x	x	x	x	x	x	x	x	x	2.4
x	x	x	x	x	x	x	x	x	x	x	x	x	
15 cm				30 cm									

Mixture

x	x	o	x	x	x	x	o	x	x	x	x	o	x	
x	x	o	x	x	x	x	o	x	x	x	x	o	x	
x	x	o	x	x	x	x	o	x	x	x	x	o	x	2.4
x	x	o	x	x	x	x	o	x	x	x	x	o	x	
15 cm			15 cm		30 cm									

varieties had 89% greater yield and blast was 94% less severe than when they were grown in monocultures. The experiment was so successful that fungicidal sprays were no longer applied by the end of the two year programme.

It is interesting to see that the experiments are currently being continued and in the third year - they are being expanded to 40,000 hectares! These experiments, we believe, have great significance in the Indian context. India also has a great varietal diversity of not only rice but also a vast number of other crops. Harvesting is by and large still carried out manually with a sickle and hence separate harvests of intercropped mixed varieties is feasible and possible. The results of the above experiments have drawn great attention and offer enormous possibilities in terms of the use of varietal and species diversity in sustainable agriculture.

Based on the paper - "Genetic Diversity and Disease Control in Rice" Youyong Zhu et.al NATURE Volume 406, 7th August 2000, pp. 718-722. January 2001

CURRENT SITUATION WITH RESPECT TO SEED CONSERVATION

At present CIKS has been conserving about 108 Traditional Rice Varieties for several crop seasons. We had carried out a detailed documentation of these varieties. In general, the following agronomic properties had been noted regularly -

1. Crop duration
2. Average height of the crop and maximum height of the crop
3. Number of grains per earhead
4. Yield of grain per acre
5. Yield of straw per acre
6. 1000 grain weight

In Table - 3 we have provided a table listing the above agronomic properties for 108 traditional rice varieties based on the information available during the most recent crop season. For varieties that have been in cultivation for several years we have taken the average data from two or more of the most recent years.

We summarise this information as below.

1. In terms of the duration of the crop, we have varieties with a crop duration as low as 80 days and those for which the duration is as long as 180 days. The average crop duration is about 132 days.
2. In terms of the average height we have varieties which are as short as 65 cms and on the other hand we have a variety which is 162 cms. The average crop height is 116 cms.
3. However, in terms of the maximum crop height we have a variety which is as short as 75 cms and the tallest of them is a six footer which is 180 cms. The average is 130 cms.
4. In terms of the number of grains per ear head it ranges from a minimum of 55 to a maximum of 260 with average being 135.
5. The yield ranges from 600 kgs per acre to 1800 kgs per acre with the average being 990 kgs per acre.
6. In terms of the yield of straw it is in the range of 880 to 2200 kgs per acre with the average being 1491 kgs per acre.
7. The 1000 grain weight is in the range of 10 – 45 gms with the average being 27 gms.

Table – 3 :
Agronomic Properties of Traditional Rice Varieties Conserved By Centre For Indian Knowledge Systems

S. No	Name of the Variety	Duration in days	Average height of the crop in cm	Maximum height of the crop in cm	Number of grains per ear head	Yield of grain in kgs/acre	Yield of straw in kgs/acre	1000 grain weight in grams
1.	<i>Adukkunel</i>	140	122	135	142	1000	1800	37
2.	<i>Ambemohar</i>	135	85	97	60	600	1800	17
3.	<i>Anaikomban</i>	125	106	115	105	1100	1800	20
4.	<i>Anandanoor sanna</i>	120	97	117	160	920	1800	17
5.	<i>Arcot Kitchili</i>	120	65	85	156	800	1500	16
6.	<i>Arikiravi</i>	130	118	128	125	1100	1900	20
7.	<i>Arupatham kuruvai</i>	105	81	98	97	700	1200	16
8.	<i>Arupatham samba</i>	120	100	116	130	1200	1880	28
9.	<i>Athur kitchili</i>	130	102	118	83	600	1400	19
10.	<i>Basumathi</i>	130	69	75	130	1100	1600	20
11.	<i>Bayakundathan</i>	135	89	101	110	600	1100	25
12.	<i>Cochin Samba</i>	140	128	145	138	900	1300	21
13.	<i>Cuddalore Seeraga Samba</i>	130	148	168	102	1450	1980	25
14.	<i>Garudan Samba</i>	130	118	135	89	900	1300	26
15.	<i>Illuppaipoo samba</i>	120	110	118	135	700	1200	19
16.	<i>Iraivaipandi</i>	120	145	167	148	1350	1800	22

S. No	Name of the Variety	Duration in days	Average height of the crop in cm	Maximum height of the crop in cm	Number of grains per ear head	Yield of grain in kgs/acre	Yield of straw in kgs/acre	1000 grain weight in grams
17.	<i>Jawadhu malai nel</i>	140	126	140	165	650	1200	30
18.	<i>Jil Jil Vaigunda</i>	140	115	129	141	1200	1800	22
19.	<i>Jiljeera</i>	140	95	110	147	600	880	18
20.	<i>Kadaikazhuthan</i>	170	135	150	160	1350	1200	27
21.	<i>Kaivarai Samba</i>	130	145	158	147	650	1300	28
22.	<i>Kalanamak</i>	120	107	125	78	640	1960	23
23.	<i>Kalarpalai</i>	130	105	120	120	550	1110	32
24.	<i>Kaliyan Samba</i>	160	124	150	148	1200	1550	30
25.	<i>Kallundai</i>	110	112	121	140	1110	1200	37
26.	<i>Kallurundaiyan</i>	120	124	126	115	1050	1350	32.62
27.	<i>Kamban Samba</i>	140	110	118	171	1300	1950	20
28.	<i>Kandasali</i>	135	117	120	185	1125	1800	10.14
29.	<i>Kappakkar</i>	150	123	130	180	1350	1800	28
30.	<i>Karikalava</i>	125	125	140	130	600	1200	30
31.	<i>Karunkuruvai</i>	125	95	101	85	825	1200	25.48
32.	<i>Karunseeraga samba</i>	125	128	140	150	720	1609	29
33.	<i>Karuppu Seeraga Samba</i>	120	115	135	113	580	1200	16
34.	<i>Karuppukowni</i>	130	120	144	170	800	1200	42
35.	<i>Karuthakaar</i>	120	93	106	89	900	1350	24
36.	<i>Katcha Koomvazhai</i>	170	122	139	135	600	1400	28
37.	<i>Katta samba</i>	150	126	135	66	1200	1800	28
38.	<i>Kattu Kuthalam</i>	125	123	126	100	750	1050	31
39.	<i>Kattu Samba</i>	135	128	134	136	1125	1800	28
40.	<i>Kattu vanibam</i>	115	162	180	135	1000	1400	32
41.	<i>Kattuyanam</i>	150	160	180	110	900	1400	29
42.	<i>Kichilisamba</i>	140	102	120	130	1125	1050	17
43.	<i>Kollikaar</i>	130	107	113	110	900	1350	34
44.	<i>Konakkuruvai</i>	120	95	100	100	900	1050	38
45.	<i>Koomvazhai</i>	130	135	142	220	1350	1800	28
46.	<i>Kothamalli Samba</i>	135	108	117	132	1000	1900	32
47.	<i>Kottara samba</i>	130	124	140	74	700	1300	22
48.	<i>Kowni nel</i>	160	127	148	150	1350	1800	28
49.	<i>Kudaivazhai</i>	130	135	152	230	1600	1800	32
50.	<i>Kuzhiyadichan</i>	120	80	97	110	975	900	33
51.	<i>Kullakkar</i>	120	87	100	100	1500	1500	30
52.	<i>Kuruvai</i>	125	115	125	140	750	1300	39

S. No	Name of the Variety	Duration in days	Average height of the crop in cm	Maximum height of the crop in cm	Number of grains per ear head	Yield of grain in kgs/acre	Yield of straw in kgs/acre	1000 grain weight in grams
53.	<i>Kuruvai-kalangiyam</i>	140	128	135	170	1200	1650	32
54.	<i>Kuruvikaar</i>	110	128	138	137	750	1750	29
55.	<i>Mappillai Samba</i>	160	137	147	135	750	1600	31
56.	<i>Mathimuni</i>	135	95	111	120	1050	1500	26.15
57.	<i>Mottakuur</i>	125	78	90	66	600	1700	30
58.	<i>Mozhikaruppu Samba</i>	120	125	135	220	600	1600	36
59.	<i>Muttakaar</i>	120	110	145	95	1450	1200	27
60.	<i>Navara</i>	90	108	115	110	700	1087	39
61.	<i>Neelan Samba</i>	180	132	155	185	1500	1800	29
62.	<i>Norungan</i>	124	104	116	150	1125	1350	34
63.	<i>Orissa vasanai Seeraga Samba</i>	120	120	133	147	750	1600	19
64.	<i>Ottadai</i>	150	128	153	147	1000	1800	41
65.	<i>Ottu kitchili</i>	115	96	110	130	1150	1800	20
66.	<i>Pal kudaivazhai</i>	130	132	140	89	600	1300	20
67.	<i>Panankaattu kudaivazhai</i>	135	135	153	120	600	1300	28
68.	<i>Pattaraikaar</i>	105	75	102	60	600	1200	23
69.	<i>Perum Koomvazhai</i>	150	135	157	117	800	1400	30
70.	<i>Perungkaar</i>	125	124	131	149	1350	1800	29
71.	<i>Pisini</i>	130	102	111	160	1350	1500	32
72.	<i>Poompalai</i>	150	130	147	150	1100	1800	40
73.	<i>Poongkaar</i>	100	75	81	80	600	900	17
74.	<i>Poovan Samba</i>	145	125	136	128	1400	2200	30
75.	<i>Puzhuthi Samba</i>	140	110	140	95	825	960	27
76.	<i>Ramakalli</i>	120	90	110	120	600	1300	40
77.	<i>Rasakadam</i>	125	109	120	155	1125	1560	19
78.	<i>Sadakaar</i>	105	119	133	145	1125	1200	30
79.	<i>Salem Samba</i>	135	104	107	150	1200	1800	17
80.	<i>Salem Sanna</i>	125	112	120	160	1043	1800	30
81.	<i>Samba</i>	165	127	147	150	1650	1800	25
82.	<i>Samba Mosanam</i>	170	138	152	200	1800	1950	32
83.	<i>Sandikaar</i>	160	134	146	155	1200	1500	29
84.	<i>Sanna Samba</i>	140	144	155	260	1800	2100	27
85.	<i>Seeraga samba</i>	130	80	93	170	1500	1050	22
86.	<i>Sempalai</i>	105	117	128	150	1125	1350	28
87.	<i>Sivappu kowni</i>	130	145	160	155	800	1750	27

S. No	Name of the Variety	Duration in days	Average height of the crop in cm	Maximum height of the crop in cm	Number of grains per ear head	Yield of grain in kgs/acre	Yield of straw in kgs/acre	1000 grain weight in grams
88.	<i>Sivappu kuruvikaar</i>	125	112	127	120	1050	1050	34
89.	<i>Soorankuruvai</i>	135	118	140	100	1200	1500	31
90.	<i>Sornavari</i>	125	122	135	120	1125	1500	30
91.	<i>Thanga Samba</i>	165	122	145	180	1500	1800	22
92.	<i>Thenkaipoo samba</i>	120	120	140	140	950	1600	24
93.	<i>Thirupathi saram</i>	120	90	115	115	850	1600	22
94.	<i>Thooyamalli</i>	140	115	125	140	1125	1050	27
95.	<i>Vadan Samba</i>	160	127	153	160	1125	1200	27
96.	<i>Vaigunda</i>	160	121	135	200	1350	1800	24
97.	<i>Valan nel</i>	160	150	166	160	800	1200	45
98.	<i>Vallarakkan</i>	160	135	150	130	650	1200	18
99.	<i>Varappu kudainchan</i>	115	108	120	152	900	1200	38
100.	<i>Vasanai Seeraga Samba</i>	120	117	135	160	550	1200	19
101.	<i>Vasaramundan</i>	110	132	145	180	1100	1800	37
102.	<i>Veethivadankan</i>	129	137	152	185	1200	1740	30
103.	<i>Veliyan</i>	175	89	101	81	600	1100	21
104.	<i>Vellai kudaivazhai</i>	130	130	148	79	800	1600	30
105.	<i>Vellai kuruvikaar</i>	120	120	138	55	600	1500	30
106.	<i>Vellai poongkaar</i>	80	135	150	115	800	1200	20
107.	<i>Vellaikaar</i>	110	135	160	150	750	1500	30
108.	<i>Vellaimilagu Samba</i>	165	108	115	200	1300	1900	21
	Average	132	116	130	135	990	1491	27
	Range (Max)	180	162	180	260	1800	2200	45
	Range (Min)	80	65	75	55	600	880	10



SEED PRODUCTION AS A KEY ELEMENT OF CONSERVATION AND UPSCALING

In the following sections we have dealt with certain key aspects of this important topic including – production of quality seeds, seed production techniques specific to paddy, seed treatment techniques for paddy and also the role of SRI (Sustainable Rice Intensification) in rice production.

PRODUCTION OF SEEDS

The development and use of seed production is important for farmers in various ways because –

- The availability of good quality seeds at the proper time is one of the major limiting factors for crop cultivation.
- Organically produced seeds are a requirement of organic certification but they are either scarce or not available.
- It promotes self-reliance in the locality and with farmers groups
- It also provides an additional income generation option

1. Introduction

Every farmer should be able to access healthy seeds which are genetically pure, with high seed vigour and good germination percentage. Timely availability of good quality seeds at reasonable price ensures good yield and profit to the farmers. The seeds play a vital role in agriculture and act as a carrier of the genetic potential of varieties. Quality seed production which follows efficient certification procedures plays a major role in the increase of food production of our country. To ensure this, the Government has prescribed standards and has brought in seed production techniques, testing, certification and marketing procedures through

the Seeds Act, 1966. In the current scenario, the demand for good quality certified seeds far exceeds the availability in the market. This section provides details about production and procurement of good quality seeds.

2. Definition of Seed

Seed is a basic agricultural input and it is an embryo, embedded in the food storage tissue. Seed is also defined as a matured ovule which consists of an embryonic plant with storage of food and surrounded by a protective seed coat.

3. Structure of Seed Industry in India

Seed sector in India is of two types namely formal and informal. Informal sector is the one where farmers produce seeds without following formal certification procedures and exchange it amongst themselves. The formal type of seed sector follows seed certification procedures and standards to produce a particular variety of seed. The key features of the two systems are summarized and compared in Table - 4.

4. Major players in seed industry

Indian Seed Industry is one of the biggest seed markets in the world and it involves various institutions and organizations like Government institutions, Public sector organizations, Research and academic laboratories and Institutions and Private Sector. Ministry of Agriculture and the Department of Seed Certification, Indian Council of Agricultural Research (ICAR), State Agricultural Universities (SAU), National Seeds Corporation (NSC), State Farm Corporation of India (SFCI), State Seed Corporations (SSCs), State Seed Certification Centers and notified Seed Testing Laboratories are major players in the seed industry. Several large private seed companies nationwide are involved in seed production.

Table – 4 :
Comparing Formal and Informal Seed Production

Formal	Informal
Centrally planned system with mechanized production and homogenous in nature.	System is locally planned, unmechanized production using local resources, no specialization, heterogeneous in space and time.
There exists a system of Quality Control, use of identified and notified varieties, certified and truthfully labelled seeds.	Traditional system of seed processing, use of local seed types, truthfully labelled and other unlabelled seeds.
Seed production is done by National Government Agencies, State Government Agencies, Government Assisted and other cooperatives, MNCs and TNCs domestic private sector and joint ventures	Farmer saved seeds, Farmer to Farmer exchange, Farmers Cooperatives, Community Groups, Non-Governmental Organizations, Seed Growers Associations.
Large quantities of seeds are marketed through Government owned companies, private companies, State Universities.	Small quantities of seeds are marketed through community level. Highly localized, use of conventional and unconventional exchange mechanisms.

5. Difference between seed and grains used as seed

Seeds that are produced in a scientific and systematic manner are superior when compared to the grains that are used as a source of seeds. These two systems are compared in Table – 5 given here.

Table – 5 :
Comparing Seeds and Grains used as Seeds

SEEDS	GRAINS AS SEEDS
Scientifically produced seeds	Grains used as seeds
Production of these seeds follow a well designed seed programme.	No designed seed programme for production is done.
Varietal purity of the seed is clearly identified from its breeder seed and is genetically pure.	Variety purity of the grain as seed is not known.
During seed production process, quality standards like removal of off-types, diseased plants, weed plants and other crop plants are carried out.	Quality standards are not followed.
Seeds have physical purity and good germination.	Physical purity and germination is not ensured.
Scientific seed production follow the processing, treatment, packaging and labelling procedures.	Processing, labelling and tagging are not followed in grain production.

Formal	Informal
Drying of seeds is done in a controlled condition.	Grains are dried in higher temperature and thus the quality of the seeds are affected.
During seeds storage, viability and vigour of seeds are maintained.	During storage grains are protected against pests and diseases and not for vigour and viability.
Seeds produced are certified and labeled properly.	Grains which are used as seeds will not have any certification labels and tags.
Seeds can never be converted into grains unless it is directed by the seed inspector.	Can be utilized for commercial grain purpose and sometimes can be utilised for seed purpose.

SEED PRODUCTION TECHNIQUES FOR CEREALS

Cereals have throughout history been unquestionably the most important sources of plant food for humans and livestock. The development of all the major cereals occurred long before the recorded history for all the oldest civilizations. All cereals are members of the grass family, Gramineae. Wheat, Rye, Rice, Oats and maize are some of the important cereals in the world today. Cereals are important because one or more of them are available in each of the different world climates. They also have a wide range of soil and moisture requirements. They can be cultivated with minimum effort and can give a high yield. The grains are relatively easy to handle and store because of their low water content. The food value of cereals is very high and they contain a high percentage of carbohydrates than any other food. It is becoming very important to increase the yields of cereals to feed the growing population. Good quality cereal seeds play a very important role in increasing yields. This section deals with the seed production techniques for paddy.

PADDY (*Oryza sativa*)

Paddy (*Oryza sativa*) is a well known cereal belonging to the family Gramineae. It is the second important cereal next to wheat in Asia. It is a staple food for more than 60% of the population. Paddy seed production can be taken up in all the seasons like December - January, April - May, May - June, June - July, July - August and September - October.

1. Method of seed production

Paddy is a self-pollinated crop with cross pollination to the extent of 0 – 4%. The crop should be raised in isolation and seeds are allowed to set by open-pollination. To maintain the varietal purity an isolation distance of 3 metres is maintained in both certified and foundation stage of seed production. If isolation by space is not possible then the time isolation of 21 days can be given. Barrier isolation with polythene sheets of 2 metres height or barrier crops like sesbania, sugarcane and maize covering a distance of 3 metres would also serve the purpose.

2. Land selection

The land selected should not be cultivated with the same crop in the previous season. This standard requirement is applicable for both nursery and main field. Land should be free of volunteer plants. Land should be fertile with good irrigation and drainage facilities and with good sunlight and aeration.

3. Seed selection and sowing

Seeds used for the seed production should be of good quality certified seeds from an authentic source. Seeds should be healthy with good germination percentage. Seed rate may range from as low as 5 kgs / acre if SRI techniques are used to 30 kgs / acre under some dryland conditions. It also depends on the exact method used in cultivation. Quality seeds can be separated from unviable seeds by soaking in water. The unviable and damaged seeds that float on the water surface should be removed and the good quality seeds that sink should be used for cultivation. If there is excess of chaffy seeds in the selected seed lot, take some water in a vessel and drop an egg in it and keep

adding salt till the egg reaches surface. Then add seeds to the water and remove the chaffy unviable seeds that float on the surface of the water. Then wash the selected seeds in good water for 2 - 3 times to remove the salt completely. Otherwise it will interfere with germination.

Selected seeds should be treated in order to improve the germination potential, vigour and resistance to pest and diseases.

- Selected seeds should be treated with cow dung and cow's urine solution (0.5 kg fresh cow dung + 2 litres of cow's urine + 5 litres of water). Soak the seeds in water for 10 - 12 hours and then in the cow dung solution for 5 - 6 hours. Shade dry the seeds before sowing.
- Selected seeds should be tied in small cloth bags and soaked in cow's urine solution (500 ml cow's urine in 2.5 litres of water) for 30 minutes and shade dried before sowing.

- Soak the seeds required for 1 hectare in sweet flag extract (1.25 kg of sweet flag rhizome powder in 6 litres of water) for 30 minutes and shade dry before sowing.
- Biofertilizers like *Azospirillum* / *Azotobacter* / *Pseudomonas* @ 10 gms / kg of seeds mixed with 20 ml cooled rice gruel can be used. Mix this with the sprouted paddy seeds. Shade dry the seeds for 30 minutes before sowing.

4. Nursery preparation

To raise seedlings for one hectare of land 800 m² of nursery bed is required. The nursery bed should be ploughed for four times and then spread with neem leaves. Neem leaves should be allowed to decay in the water for 6 - 7 days. After that the land should again be ploughed for four times and leveled. Neem leaves can be substituted with neem cake (8 - 10 kg) or vermicompost (10 - 15 kg). It has to be added and incorporated into the soil during the last plough. Then seeds are sown on a leveled nursery bed.



Leaves of *Adhatoda vasica* can be incorporated into the soil while preparing the nursery. This will increase the soil fertility, act as an insecticide and render the easy uprooting of the seedlings.

5. Nursery level pest and disease management

Seedlings in the nursery are generally attacked by green leaf hopper, green horned caterpillar and diseases like brown leaf spot and blast. These attacks can be prevented at the appearance of the first symptom by spraying 10% cow's urine solution in two doses at 7 days interval. This should be immediately followed by pest management techniques.

Before plucking the seedlings the nursery should be irrigated and applied with 15 – 20 kgs of gypsum to prevent damage to the rootlets. Biofertiliser *Azospirillum* @ 1 kg/acre (2.5 kg/ha) is mixed with 25 kg of farmyard manure and applied to the nursery 30 minutes before plucking. The seedlings are kept submerged in the nursery for 30 minutes and then transplanted.

6. Preparation of main field

The main field should be ploughed and irrigated many times and the bunds are plastered to prevent water leakage. Groundnut or neem cake @ 6 quintals/acre (15 quintals/ha) should be applied as basal manure during final plough. Then the field should be leveled before transplanting. At the time of final ploughing dried cow dung and ash mixture can be spread uniformly to facilitate aeration and to activate microbes in the soil.

7. Seedling treatment and transplantation

Before transplanting the seedlings are treated against pest and disease attack.

- a. Treat seedlings with ash and neem seed mixture. Paddy seedling bundles should be kept in small plots of standing water mixed with ash and neem seed powder mixture (1 kg ash and 500 gms of neem seed powder for 50 bundles of seedlings) for 30 minutes to an hour. Seedlings treated with this mixture produce a crop free from pests and diseases.
- b. Soak the seedlings in groundnut cake and neem cake solution before transplanting to make the seedlings less vulnerable to pest attack.
- c. Paddy seedlings can also be dipped in a solution of *Amirthakaraisal (Amrutpani) / Panchagavyam / Jeevamrut*. These are preparations which include products from the cow such as - cowdung, cow urine, ghee mixed with substances such as coconut water, jaggery, banana etc. in varied proportions.

The optimum age of seedlings for transplanting is 18 – 22 days for short, 25 – 30 days for medium and 35 – 40 days for long duration varieties. 2-3 seedlings per hill are transplanted at a depth of 3 cm. The spacing between the seedlings will vary according to the variety cultivated (Short duration – 15 x 10 cm, Medium duration – 20 x 10 cm and Long duration – 20 x 15 cm). Before transplanting clip off the tips of the seedlings to facilitate uniform growth.



8. Nutrient management

During final ploughing cow dung 5 – 6 tonnes/acre (12 – 15 tonnes/ha) / goat dung 5 tonnes/acre (12.5 tonnes/ha) / poultry waste 2 tonnes/ acre (5 tonnes/ha) / pig dung 1 tonne/acre (2.5 tonnes/ha) can be applied and incorporated into the soil. To meet the nitrogen need biofertilizers like *Azospirillum* / *Azotobacter* / *Phosphobacteria* are also used.

Growth regulators like *Panchagavyam* @ 3% can be applied at the tillering and bootling stages for coarse varieties and at the bootling stage alone for fine varieties. *Amithakaraisal* @ 500 litres/acre (1250 litres/ha) should be mixed with irrigation water.

Green manure crops like sunhemp, daincha, Indian indigo etc., should be raised in the main field and incorporated into the soil 45 – 50 days after sowing. The plants should be allowed to decay in the water for ten days and then ploughed. The decomposed plants convert the unavailable forms of calcium, phosphorus and micronutrients present in the soil into an easily available form.

Application and ploughing of green leaves into the soil will also increase the nitrogen content of the soil. Leaves of *Neem*, *Pongamia*, *Gliricidia* etc., are used as green leaf manure.

Oil seed cakes like neem cake and groundnut cake can also be applied to meet the nitrogen needs of the crop. In paddy neem cake is applied as

basal manure @ 60 kg/acre (150 kg/ha) and as top dressing @ 25 kg/acre (60 kg/ha) or groundnut cake is applied as basal manure @ 40 kg/acre (100 kg/ha) and as top dressing @ 10 kg/acre (25 kg/ha).

9. Weed management

Weeding should be done manually and the weeds removed should be trampled into the field for the conservation of nutrients and for organic matter as mulch. The first weeding should be done at 15 – 20 days after transplanting. After weeding 50 kg of neem cake should be applied to the field. Weeding should be done as and when it is required. Weeds can be controlled by the following methods,

- Weeds can be controlled by flooding the field to a height of 5 – 8 cm at an early vegetative stage.
- *Calotropis* (*Calotropis gigantea*) can be used as green manure to control the weeds.
- During land preparation leaves and twigs of poison nut (*Strychnos nux-vomica*) can be added and incorporated into the soil. This will suppress the weed growth.

10. Irrigation

Water is stagnated in the field at a depth of 2 – 5 cm till the transplanted seedlings are well established. Then 5 cm of water is maintained upto the dough grain stage of the crop (the stage when the milky



portion of the grain turns into soft dough). Flooding is not necessary if the field is saturated with rains. In this case irrigation should be done during initial seedling period covering about 10 days, during tillering to flowering, a critical stage and panicle initiation stage to flowering (heading).

11. Pest and disease management

Paddy is commonly affected by pests and diseases like leaf eating caterpillars, leaf folders, case worm, green leaf hopper, yellow stem borer, blast, brown leaf spot, sheath blight, stem rot, bacterial leaf blight, tungro virus etc., at different growth stages.

12. Rouging

Rouging should be done from vegetative phase to harvesting phase. The seed production field should be checked and off-types and diseased plants should be removed. Major rouging is done before flowering stage to assure the genetic purity of the seeds. Off-types are identified by plant type, plant height, days taken for flowering, leaf colour, flag leaf shape, panicle shape and colour of glumes etc. Maximum percentage of off-types permitted at the final inspection is 0.050% for foundation seed production and 0.20% for certified seed production.

13. Field inspection

Normally, external inspection is carried out only during the production of seeds which are formally certified. However, during seed production in

CIKS, we go through various of those procedures which are carried out, in order to produce good quality seeds. Wherever chemicals are used, we have found satisfactory organic / natural product substitutes.

14. Harvesting

Harvest is done soon after the maturation of the seeds that turns from green to straw yellow colour. Ear heads should be harvested when the seeds have attained their maximum physiological maturity i.e., 90% of the seeds are straw yellow in colour. Irrigation to the seed plot should be withheld at this point as it delays the drying of the plants/seeds. Plants should be harvested with their panicles intact.

15. Threshing and processing

Harvested plants should be stacked on a clean floor of the threshing yard free from other varieties. Harvested plants with a moisture content of 15 – 18% should be threshed by hand beating or by using machineries in bulk quantities. This level of moisture content is safe for threshing without any mechanical injury to the seeds. Threshed grains are winnowed and cleaned. Cleaned seeds are dried to attain a safe moisture content of 10 – 13% and graded using the preferable size of sieve to remove chaffy, ill filled, under and over sized seeds.

16. Drying and storage

The cleaned and graded seeds are dried to attain 10 - 13% of moisture content. Normally paddy seeds can be stored for 1 – 2 years under ambient storage conditions without losing much of germination potential. Seeds can be stored for more than 3 years in moisture vapour proof containers with an initial moisture below 8%.

17. Seed standards

The percentage of minimum physical purity of certified and foundation seeds should be 98% with a minimum of 80% of germination capacity and 8 - 13% of moisture content. The presence of inert and husk less seeds should not exceed 2.0% and other crop seeds, other distinguishable varieties and weed seeds should not be more than 10 Nos/kg for foundation and 20 Nos/kg for certified seeds.



SYSTEM OF RICE INTENSIFICATION (SRI) FOR SEED PRODUCTION

1. Introduction

Among the various methods of rice cultivation, the SRI (System of Rice Intensification) method is gaining great popularity in recent days. Farmers in several parts of Tamil Nadu have adopted this method on a trial basis. SRI is a method that has been introduced in agriculture to increase productivity. In this method of cultivation, techniques like transplanting of very young seedlings, transplanting seedlings with sufficient spacing, use of weeders to manage weeds etc., are adopted to increase the yield. Moreover use of inputs like seeds, irrigation water, manures is lessened. In general SRI is recommended along with the use of chemical fertilizers and the focus is to increase productivity. CIKS has been also promoting the practice among its organic farmers. Trainings and demonstrations have been organized for this purpose. CIKS has also brought out a publication titled, “System of Rice Intensification— An introduction” in the year 2009 and was authored by its technical team. CIKS documents and evaluates the feedback of farmers on the adoption of this practice.

Earlier work of CIKS has shown that indigenous varieties grow well in organic farming condition. Besides this, indigenous varieties provide the basic genetic material for developing any other variety in future. The major challenge with indigenous varieties is that, enough quantity of seeds is not available readily. It has to be sourced from different farmers who have been conserving it and then multiplied. Many varieties fulfill specific nutritional and other dietary needs. Till recent times, our Indian farmers have identified good quality seeds, crossed them to produce several other varieties and have preserved them. Indigenous varieties adapted to the local environmental conditions are fast disappearing. There are many reasons why indigenous varieties are still conserved in spite of all odds. High yielding varieties are not suited to all farming conditions and there are situations where indigenous varieties are better suited. For example, in the alkaline soils of Tamil Nadu, an indigenous variety of paddy called *Kalarpalai* alone can be cultivated.

Good quality seeds are extremely important in increasing the productivity of any crop. Currently, seed production in rice is fraught with several problems and farmers getting access to good quality seed is becoming a major issue. This is even more problematic in the case of organic seed production. Organic certification agencies insist during the process of certification that organic farmers should use seeds which are produced only through organic production methods. However there is dearth of organic seeds in the market. CIKS wanted to explore the feasibility of using SRI for organic seed production.

2. The CIKS Experience with SRI

CIKS has an Organic Agricultural Research Farm of 4.4 hectares in the Kancheepuram district of Tamil Nadu, India. Every year for the last five years nearly 100 indigenous rice varieties are grown in 5 cents each under SRI for seed production.

Table - 6 provides the advantages that have been observed in the field by using SRI for seed production as against the conventional method. It was also only through SRI that it was possible to document the characteristics of the indigenous rice varieties like height, thickness of the stem, number of tillers, length of the ear head, 1000 grain weight, age of the crop and yield. Thus it was evident that SRI method of cultivation under organic production method offers many advantages over conventional method when looked in the angle of seed production as well as yield estimation.



Table – 6 :
Comparison of Conventional and SRI Method of Cultivation for Seed Production

S. NO.	PROBLEMS IN CONVENTIONAL CULTIVATION METHODS	SOLUTIONS THROUGH SRI
1.	Seed Selection The amount of seeds used in conventional cultivation is very high. This is nearly 30 – 40 kgs per acre. Hence, it is extremely difficult to select good quality seeds manually.	The amount of seeds used in SRI is very low. It is as low as 1 – 2 kgs per acre. Since the quantity used is very low it is easy to select good quality seeds manually.
2.	Nursery When the nursery is raised for several varieties next to each other there is a possibility of varieties getting mixed up with each other if there are rains immediately after sowing.	The nursery raising technique for using SRI is normally done in an elevated area and the area for raising the nursery is very small (8 cents in the conventional method for an acre and 1 cent for SRI). Hence, the nursery for different varieties are separated from each other with proper spacing and this helps to avoid varieties getting mixed up.
3.	Main Field It is difficult to handle a large number of seedlings of different varieties separately.	Since the seedlings involved is very less they can be handled efficiently.
4.	Planting according to a season If it does not rain properly during the planting season it may not be possible to conserve many varieties together.	Since the water requirement is low we can plant several varieties in the same season.
5.	Lodging The lodging takes place in the bootling stage itself and as a result of this the earheads are not formed properly.	Lodging takes place only at a very late stage after the earhead formation. Besides this it is possible to remove admixtures of other varieties in the field itself.





CIKS Experimental farm at Sukkankollai village



Lush green paddy field with a spread of traditional rice varieties

The following two pages depict - Traditional rice varieties conserved in the CIKS farm – the varieties are seen to have a range of colours and hues







Separating seedlings from the nursery bed during SRI cultivation

Transplanting seedlings by the square method during SRI cultivation



Natural pest control using yellow sticky trap



Traditional rice varieties come in a range of colours – pure white, off white, yellow, red, brown and even black

Germinated seeds ready for the nursery



Grains of *Karunseeraga samba* – a dark coloured aromatic rice



Chef Deva, Executive Chef, Crowne Plaza, Chennai sharing his experience curating the lunch with traditional rice varieties

Curd rice made from *aval* (pounded / f attened rice) of *Kullakar* – a rice variety with low Glycemic Index



Kuzhiyadi rice with sweet pepper – a variety rich in calcium and recommended for pregnant women and lactating mothers



Ms. Vijayalakshmi Das, CEO of Friends of Women's World Banking (FWWB), Ahmedabad, launching the *Namma Nellu* rice gift box, seen with Dr. K. Vijayalakshmi, Director of Sempulam Sustainable Solutions

Namma Nellu rice gift box with bricks of vacuum packed rices



A gift pack of *Seeraga samba* and *Kuzhiyadichan* rices with jaggery



We are proud to bring to you these
TRADITIONAL RICE VARIETIES.

Some of our Conservers



Thank you for your support!

A group of our conservers from the Kancheepuram district of Tamil Nadu



The CIKS team involved in various aspects of conservation of traditional rice varieties

The farmers who had undertaken seed production of rice under organic method through SRI also reported satisfactory yield of 5.5 tonnes/ha of rice seed. CIKS had trained the farmers in seed production technology. The seeds thus produced had two certification namely; certification from the Seed Certification Department of the Government as well as organic certification from the organic certification agency, with which the farmers were registered. It was hailed as a first instance in the state of Tamil Nadu where seeds with double certification was produced.

3. Conclusion

The study in the CIKS organic farm and farmers' field showed that System of Rice Intensification (SRI) is an effective tool for indigenous seed conservation as well as for organic seed production. There is an increase in demand for indigenous seeds of rice like *Seeraga samba* and *Kitchili samba* in the state of Tamil Nadu, India as the nutritional and other properties are now increasingly recognized. Nevertheless, there is dearth for good quality indigenous variety of rice seeds. Farmers who have conserved it could offer only limited quantity of seeds to those interested. In this context, SRI offers the scope to produce seeds under SRI with limited base material, which could then be multiplied. The evaluation also showed that SRI is effective for indigenous seed conservation also. Farmers' involved in commercial rice seed production through organic methods can effectively utilize SRI rather than conventional method.

GOVERNMENT INSTITUTIONS AND LEGISLATIONS FOR PROTECTION OF INDIGENOUS VARIETIES

1. National Bureau of Plant Genetic Resources

The National Bureau of Plant Genetic Resources (NBPGR) <http://www.nbpgr.ernet.in> evolved out of the Botany division of the Imperial Agricultural Research Institute (IARI) which has been in existence since 1905. The NBPGR in its present form was set up in 1976. It is the nodal institute at the National level for the acquisition and management of indigenous and exotic plant genetic resources for food and agriculture as well as research and human resource development for the sustainable growth of agriculture. It has its headquarters in New Delhi and maintains 14 regional

stations in various parts of the country. From time to time the Bureau conducts workshops and training programmes and brings out publications of interest. Accessions of genetic materials through field surveys in various parts of the country are reported periodically. The NBPGR interfaces mainly with agricultural scientists, universities and researchers and has very little interaction with farmers or community based organizations directly. However recently the NBPGR has come out with a publication on – “Community Seed Banks” documenting the experience of working with an NGO Seva Mandir based in Rajasthan. The publication is available both in English and Hindi and can be downloaded from the website of the Bureau (www.nbpgr.ernet.in).

2. Protection of Plant Varieties and Farmers Rights Authority

The Government of India enacted – “The Protection of Plant Varieties and Farmers Rights (PPV and FR) Act, 2001” about 10 years back. The Indian Legislation is not only in conformity with the International Union for the Protection of new varieties of plants (UPOV) 1978 but also has provisions to protect the interest of breeding institutions and farmers. To implement the provisions of this Act the Department of Agriculture and Cooperation established the – “Protection of Plant Varieties and Farmers Rights Authority” in November 2005. The authority has 15 members of which 8 are ex-officio members representing Departments and Ministries, three from State Agricultural Universities and State Governments and one representative each from amongst farmers, tribal organizations, seed industry and women's organizations associated with agricultural activities.

Functions of the Authority

The authority is responsible for registration of new plant varieties, as well as characterization and documentation of registered varieties. It is also responsible for the documentation, indexing and cataloguing farmers varieties. It maintains the National Register of Plant Varieties and National Gene Bank. It is also responsible for recognizing and rewarding farmers, farming communities and particularly tribal communities engaged in conservation improvement and preservation of plant genetic resources. The website of the authority (www.plantauthority.gov.in) carries information regarding the activities, answers to several F.A.Qs (frequently asked questions) copies of bulletin and technical specifications relating to DUS (Distinctness, Uniformity and Stability) testing of various crops and forms for the application for registration of varieties.

THE STUDY OF NUTRITIONAL AND THERAPEUTIC PROPERTIES OF TRADITIONAL RICE VARIETIES

During the initial period of our work, the focus was largely on the documentation, characterization and study of agronomic properties. However, over a period of time, we observed that there were several instances where the farmers would report that there are rice varieties that have specific nutritional and / or therapeutic properties. We were also beginning to be increasingly aware of literature on this topic from other areas as well as from the texts of traditional medicine. Later on we had started to take up studies on this topic.

In this section we describe various stages and efforts of CIKS with respect to the documentation and study of nutritional and therapeutic properties.

STUDIES BY MOP VAISHNAV COLLEGE STUDENTS

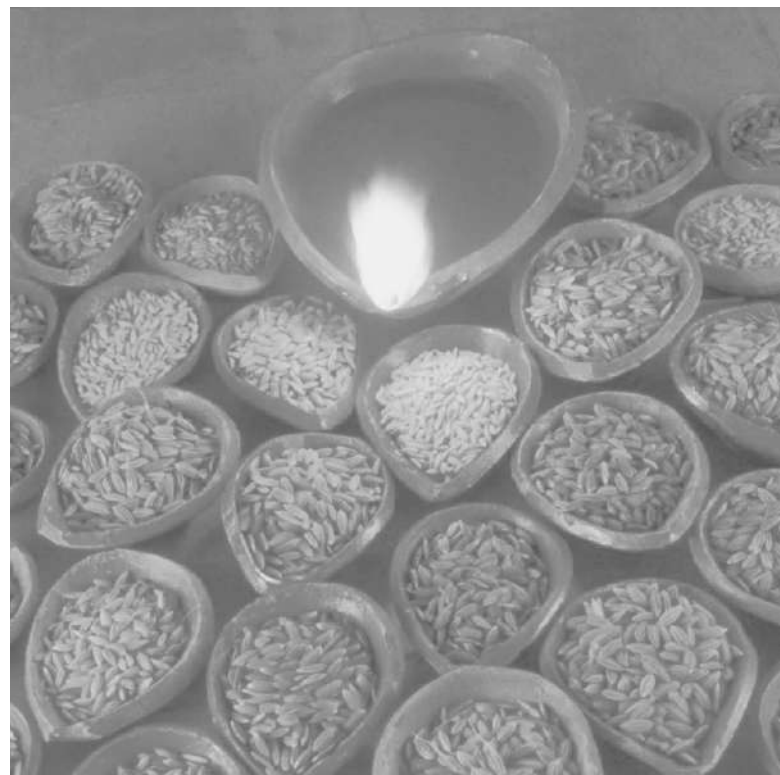
During the year 2009 CIKS entered into a collaborative arrangement with the Department of Food and Nutrition at the MOP Vaishnav College at Chennai. A set of five Traditional Rice Varieties were taken up for studies, namely – *Perungar*, *Kappakar*, *Kowni nel*, *Neelan samba* and *Salem samba*. A set of 19 students carried out number of studies with these varieties. The list of 19 studies is given as part of the Bibliography which is an Annexure to this book.

The studies that were carried out were on the following themes –

- Physico chemical properties
- Physical characteristics

- Textural properties
- Quality analysis
- Nutrient composition
- Milling characteristics
- Effect of milling and parboiling on cooking
- Cooking characteristics and
- Conversion to specific products such as – noodles, idly, bakery products, instant dosa etc.

Not all these studies were carried out on every one of the rice varieties. Table – 7 provides a summary of these student projects listing against each of these rice varieties the kind of studies that were carried out. This table also carries a cross reference to the specific studies which has been identified based on the serial numbers for these references (from 1 to 19) which have been given in the specific section in the bibliography where these references have been listed.



S. No	Ref. No.	Rice Variety	Physico chemical properties	Physical characteristics	Textural properties	Quality analysis	Nutrient composition	Milling characteristics	Cooking characteristics	Products	Remarks
5 b	19	<i>Perungar</i>									Effect of milling and parboiling on cooking
5 c	7	<i>Perungar</i>		✓			✓				
6 a	3	<i>Salem Samba</i>	✓								
6 b	11	<i>Salem samba</i>		✓			✓				
6 c	14	<i>Salem samba</i>						✓	✓		
6d	17	<i>Salem Samba</i>								Instant Dosa	

PILOT STUDY ON NUTRITIONAL AND THERAPEUTIC PROPERTIES OF INDIGENOUS RICE VARIETIES

During the year 2013, CIKS had taken up a survey of literature to identify knowledge about nutritional and therapeutic properties of traditional paddy varieties. This covered the folk knowledge of farmers and leads from the field as well as information from Ayurveda and Siddha texts. Based on these leads we shortlisted eight varieties for detailed examination in terms of laboratory tests. An overview of the methodology and findings is given below.

1. Laboratory Tests – Collaboration with Ethiraj College for Women, Chennai

Based on a preliminary discussion and assessment with various laboratories and academic institutions it was decided to enter into a collaboration with Ethiraj College for Women in Chennai. The major considerations were the following –

1. The College has active research departments on the subject of nutrition and also allied areas such as biochemistry and chemistry.
2. The College offers post graduate courses in these subjects and has a large student body.
3. We were able to identify a staff member who was keen and enthusiastic to collaborate with sufficient technical knowledge.

CIKS entered in the collaboration agreement for research along with Ethiraj College for Women, Chennai.

2. Overall objective of the study

The study analysed the physico- chemical properties, nutrient value and standardized and evaluated the acceptability and tested the Glycemic Index of the eight organically grown traditional / indigenous rice varieties. The varieties were - *Karungkuruvai*, *Mapillai samba*, *Kudaivazhai*, *Kalanamak*, *Perungkar*, *Kouni*, *Kullakar* and *Neelam Samba*. The properties of these varieties were compared with respect to the modern rice variety *White Ponni* which was used as a control.

3. Study design

The study was carried out in a – “Double Blind” manner. Neither the student volunteers and researchers nor the investigators knew the identity of the samples. They were provided a set of



10 samples of which the first sample (CIKS No.1) was White ponni and the other nine samples (CIKS No. 2 – CIKS No. 10) were coded samples of the eight indigenous varieties of which one was a replicate.

4. Specific Objectives of the study

1. To check the physicochemical properties of organically grown indigenous rice varieties
2. To analyze the nutritive value of organically grown indigenous rice varieties
3. To formulate and standardize a recipe based on organically grown indigenous rice varieties
4. To test the acceptability of organically grown indigenous rice varieties
5. To check and compare the glycemic index of organically grown indigenous rice varieties with white ponni, white bread and glucose as control.

5. Approval by Ethics Committee

As per the research methodology guidelines, an Ethics committee was formed which included a nutrition expert, a medical doctor, sociologist and a lawyer as members. The committee approved the design of the study looking at ethical considerations.

6. Highlights of the study

Some of the key findings are -

1. The variety *Karungkuruvai* which is highly valued by the Siddha physicians has a high content of protein, fat and phosphorous.

2. The variety *Neelam samba* has the highest content of Calcium and it is interesting that this is recommended as the variety of choice for pregnant women and lactating mothers.
3. *Kalanamak* which has a high amount of potassium is recommended for high blood pressure.
4. In terms of the Glycemic Index (GI) it is seen that all indigenous varieties have a GI that lower than the modern variety. Table – 8 provides the GI of these 8 varieties with respect to glucose as a control.
5. When the GI of the indigenous variety is compared to the modern variety White Ponni, on a scale when the GI of White Ponni is 100, it was found that the GI of Kullakar, Kovuni, *Karungkuruvai* and *Kalanamak* are in the range 50-55 while *Mappillai Samba* and *Kudaivazhai* are in the range of 66 - 70.

In terms of details of other parameters such as protein, carbohydrates, fat content and minerals we have carried out a comprehensive study of 50 of these varieties more recently in the year 2019. These have been described in the next section of this publication.

Table – 8 :
Glycemic Index of Indigenous Rice Varieties

RICE	MEAN GI (WITH WHITE PONNI AS CONTROL)
<i>Karungkuruvai</i>	53.81
<i>Mappilai Samba</i>	68.84
<i>Kudhaivazhai</i>	66.34
<i>Kalanamak</i>	50.71
<i>Perungkar</i>	75.84
<i>Kovuni</i>	52.36
<i>Kullakar</i>	52.25
<i>Neelam Samba</i>	84.37

TESTING OF NUTRITIONAL PROPERTIES OF SELECTED TRADITIONAL RICE VARIETIES

During the latest phase of our work (2019) it was decided to select about 50 Traditional Rice Varieties and subject them to detailed analysis. The factors analysed for each rice variety were the following –

- Moisture and total ash
- Total protein, total fat and dietary fibre
- Carbohydrate by difference
- Energy value by calculation
- Potassium, Iron, Calcium, Magnesium, Zinc and Phosphorous

These tests were carried out in the Laboratory Services Division of National Agro Foundation, Chennai which has a laboratory accredited as per the National Accreditation Board for Testing and Calibration Laboratories (NABL).

These values were tested for a total of 49 rice varieties which included both raw rice and parboiled rice.

- For each rice variety the sample given for analysis was the raw rice sample or the boiled rice sample, depending on the common way in which the rice variety is currently being used. For example, for varieties such as *Adukku nel*, *Kappakar* and *Karungkuruvai*, the boiled rice samples were given for analysis. However, for rice varieties such as *Iluppai Poo Samba*, *Kalanamak* and *Seeraga samba*, the raw rice samples were given for analysis.
- It was also decided that for two selected rice varieties we would prepare both the raw rice and boiled rice preparations and give the samples for analysis. This was carried out for – *Kitchili samba* and *Thenkai poo samba*. For *Kuzhiyadichan* and *Neelan samba* the boiled rices were prepared in two different ways for comparison.

1. Detailed Results

The details of these tests are summarized as a single document in Table - 9. In this table the nutritive value for all the 49 varieties is given for each one of the 13 parameters listed above. As we can see, there are a total of 53 entries in the Table since for four of the varieties there are analyses presented for both the raw rice and the boiled rice samples.

Table – 9 :

Nutritive Analysis of Selected Traditional Rice Varieties

All values are expressed per 100g of produce

S. No	Rice varieties name	Status	Mois- ture (g)	Total Ash (g)	Total Protein (g)	Total Fat (g)	Dietary Fibre(g)	Carbho- hydrate (g)	Energy (Kcal)	Pota- ssium (mg)	Iron (mg)	Cal- cium (mg)	Magne- sium (mg)	Zinc (mg)	Phos- phorus (mg)
1	<i>Adukkunel</i>	Boiled	11.15	1.37	9.39	2.10	1.60	74.39	354.02	253.90	3.70	34.00	86.10	1.80	284.0
2	<i>Ambemohar</i>	Boiled	12.12	1.63	9.13	1.44	1.34	74.34	346.84	271.50	7.60	37.60	94.90	1.50	330.0
3	<i>Garudan samba</i>	Boiled	12.08	1.41	8.85	2.29	1.20	74.17	352.69	231.60	5.60	35.10	89.00	1.40	270.3
4	<i>Illupaipoo samba</i>	Raw	11.14	0.54	9.47	1.85	BDL (DL:1.0)	77.00	362.53	86.60	3.40	22.10	28.60	1.80	119.1
5	<i>Iraivaipandi</i>	Boiled	11.48	1.31	9.68	0.59	1.87	75.07	344.31	229.00	3.60	44.30	82.70	1.50	254.3
6	<i>Jeeragasalae</i>	Raw	11.93	0.52	9.82	0.70	BDL (DL:1.0)	77.03	353.70	97.50	1.90	21.80	34.60	1.10	116.3
7	<i>Kadaikazhuthan</i>	Boiled	12.31	1.50	9.70	2.84	1.26	72.39	353.92	237.10	4.90	42.50	83.10	1.40	266.8
8	<i>Kaivari samba</i>	Boiled	11.63	1.30	9.54	2.99	1.90	72.64	355.63	327.90	5.80	41.50	79.50	1.60	234.4
9	<i>Kalanamak</i>	Raw	10.56	0.42	10.49	1.25	BDL (DL:1.0)	77.28	362.33	116.00	2.80	29.60	26.50	1.30	120.6
10	<i>Kalarpalai</i>	Raw	11.16	0.50	9.15	0.90	BDL (DL:1.0)	78.29	357.86	149.90	1.70	28.00	28.20	2.00	105.5
11	<i>Kaliyan samba</i>	Boiled	12.19	1.32	9.79	1.20	2.06	73.44	343.72	237.40	2.60	45.10	86.20	1.90	289.7
12	<i>Kamban samba</i>	Raw	11.98	0.46	9.49	0.50	BDL (DL:1.0)	77.57	352.74	75.30	2.60	23.70	27.80	1.50	112.4

S. No	Rice varieties name	Status	Moisture (g)	Total Ash (g)	Total Protein (g)	Total Fat (g)	Dietary Fibre(g)	Carbohydrate (g)	Energy (Kcal)	Potassium (mg)	Iron (mg)	Calcium (mg)	Magnesium (mg)	Zinc (mg)	Phosphorus (mg)
13	Kappakar	Boiled	12.40	1.48	8.60	1.19	2.34	73.99	341.07	244.80	7.90	30.10	124.40	1.90	323.4
14	Karunkuruvai	Boiled	11.84	1.54	8.22	1.91	1.92	74.57	348.35	249.70	7.60	37.70	94.70	2.80	344.5
15	Karuppu Kouni	Boiled	12.19	2.80	8.94	1.42	3.64	71.01	332.58	254.60	6.50	36.90	112.80	1.60	313.6
16	Kattuyanam	Boiled	12.03	0.72	8.51	1.76	2.10	74.88	349.40	335.00	7.30	40.10	154.50	2.20	437.4
17	Kitchili samba	Raw	11.70	0.56	9.02	0.92	BDL (DL:1.0)	77.80	355.56	112.40	5.40	30.00	31.40	1.60	144.7
18	Kitchili samba	Boiled	11.52	0.80	8.36	1.24	BDL (DL:1.0)	78.08	356.92	183.90	3.30	29.20	36.10	1.20	148.8
19	Koomvazhai	Boiled	12.22	1.52	8.86	0.75	1.90	74.75	341.19	250.10	2.70	42.50	114.40	2.10	302.1
20	Kothamalli samba	Raw	12.00	0.48	9.03	1.88	1.14	75.47	354.92	98.00	2.10	29.20	29.10	1.10	223.6
21	Kottara samba	Boiled	11.00	1.38	8.66	2.38	2.60	73.98	352.00	195.80	4.40	27.30	83.10	2.10	223.7
22	Kudaivazhai	Boiled	11.21	1.53	8.28	2.76	2.58	73.64	353.00	279.00	7.10	35.20	108.20	2.40	308.6
23	Kuliyadichan	Boiled	10.73	1.06	9.73	2.57	2.35	73.56	356.00	233.50	6.80	34.50	102.90	1.90	285.1
24	Kuliyadichan	Hand pound	11.28	1.70	10.21	2.98	1.84	71.99	356.00	281.10	5.60	48.50	132.40	2.50	364.6
25	Kullakkar	Boiled	11.16	1.93	8.64	2.41	2.60	73.26	349.00	291.60	7.50	50.40	121.70	2.50	347.7
26	Mappillai Samba	Boiled	11.92	1.75	7.91	2.18	1.79	74.45	349.00	299.90	6.90	43.60	117.90	1.90	334.0
27	Mozhikaruppu Samba	Raw	10.17	1.09	6.72	2.48	BDL (DL:1.0)	79.54	367.00	93.90	1.50	17.70	26.80	1.70	67.2
28	Mullian kaiama	Raw	11.68	1.21	7.95	2.60	BDL (DL:1.0)	76.56	361.00	84.30	1.90	17.40	23.90	1.60	87.3

S. No	Rice varieties name	Status	Mois-ture (g)	Total Ash (g)	Total Protein (g)	Total Fat (g)	Dietary Fibre(g)	Carbho hydrate (g)	Energy (Kcal)	Pota-ssium (mg)	Iron (mg)	Cal-cium (mg)	Magne-sium (mg)	Zinc (mg)	Phos-phorus (mg)
29	Navara	Boiled	11.61	0.98	8.97	2.36	1.80	74.28	354.00	320.50	8.60	35.10	123.20	2.50	384.4
30	Neelan Samba	Boiled	11.95	1.62	7.22	2.47	1.68	75.06	351.00	242.40	1.80	28.70	117.40	1.90	295.7
31	Neelan Samba	Hand pound	10.59	1.49	7.29	2.97	1.34	76.32	361.00	237.70	3.60	38.70	114.30	1.70	286.7
32	Orissa vasanai seeraga samba	Raw	11.00	1.31	8.43	2.66	BDL (DL:1.0)	76.60	364.00	120.70	1.70	20.10	38.80	1.50	127.7
33	Ottadai	Boiled	11.52	1.42	8.42	1.80	1.20	75.64	352.00	232.30	3.50	29.40	91.60	1.90	235.4
34	Pal kudaivazhai	Boiled	10.43	1.32	7.51	2.39	1.96	76.39	357.00	148.00	3.10	20.30	61.10	1.50	141.9
35	Pisini	Boiled	11.89	1.36	8.60	2.84	3.13	72.18	349.00	91.40	1.10	13.00	41.40	0.70	95.7
36	Poompalai	Boiled	10.38	1.10	7.47	2.46	2.85	75.74	355.00	245.70	4.70	29.60	95.40	1.60	260.9
37	Poovan Samba	Boiled	10.70	1.56	7.58	1.86	2.42	75.88	351.00	305.60	5.60	36.70	132.40	2.50	344.5
38	Rasakadam	Raw	10.30	0.58	7.95	2.22	BDL (DL:1.0)	78.95	368.00	142.80	1.90	20.20	47.10	1.90	109.8
39	Salem Samba	Raw	13.57	1.51	8.55	2.43	BDL (DL:1.0)	73.94	352.00	159.40	2.00	18.30	62.60	1.40	118.7
40	Samba Mosanam	Boiled	10.90	1.39	8.89	1.97	2.72	74.13	350.00	162.70	2.60	40.40	67.60	1.20	157.9
41	Sanna Samba	Raw	12.85	1.45	8.37	2.69	2.10	72.54	348.00	90.20	21.00	11.80	23.50	1.30	82.6
42	Seeragasamba	Raw	12.51	0.48	7.69	0.79	BDL (DL:1.0)	78.53	352.00	223.00	4.80	37.90	111.30	1.90	258.4
43	Sivappu kowni	Boiled	13.22	1.49	7.07	2.47	3.80	71.95	338.00	228.90	8.00	31.20	115.40	1.80	297.3
44	Sivappu kuruvikaar	Boiled	12.10	1.46	7.87	2.83	2.90	72.84	348.00	257.40	40.80	31.40	130.60	2.20	325.8

S. No	Rice varieties name	Status	Mois- ture (g)	Total Ash (g)	Total Protein (g)	Total Fat (g)	Dietary Fibre(g)	Carbho- hydrate (g)	Energy (Kcal)	Pota- ssium (mg)	Iron (mg)	Cal- cium (mg)	Magne- sium (mg)	Zinc (mg)	Phos- phorus (mg)
45	Soorankuruvai	Boiled	12.05	1.46	7.92	1.64	2.84	74.09	343.00	222.40	3.50	36.70	95.80	2.00	251.3
46	Thanga Samba	Boiled	11.57	1.70	8.27	2.23	1.85	74.38	351.00	203.70	3.30	42.70	99.40	1.70	252.9
47	Thenkaip oosamba	Boiled	10.28	0.95	9.29	1.84	BDL (DL:1.0)	77.64	364.00	137.10	2.30	18.00	19.90	1.20	121.8
48	Thenkai poosamba	Raw	12.81	0.48	8.41	2.02	BDL (DL:1.0)	76.28	357.00	95.60	2.20	16.50	21.90	1.30	97.1
49	Thooyamalli	Raw	11.94	0.65	8.07	2.23	BDL (DL:1.0)	77.11	361.00	98.10	2.30	21.20	32.30	1.60	130.7
50	Vadan Samba	Boiled	11.96	1.79	8.78	2.45	2.12	72.90	349.00	140.60	2.00	20.20	41.50	0.30	30.8
51	Vaigunda	Boiled	12.12	1.77	8.77	2.44	2.54	72.36	346.00	148.90	1.90	22.20	47.40	0.40	35.4
52	Valiya chennel	Raw	12.36	1.62	8.53	2.48	2.81	72.20	345.00	193.60	2.20	24.70	78.40	0.90	49.1
53	Vellai milagu samba	Raw	11.47	0.50	7.92	1.27	BDL (DL:1.0)	78.84	358.00	46.00	2.00	17.60	14.00	1.20	13.9

2. Comparative assessment of the nutritive value of TRVs

How does the nutritive value of TRVs compared with what may be considered as – “Normal” rice ? One way of answering this question would be to compare this with the data for rice varieties provided by the NIN. For the sake of reference we have also provided as part of the tables the values listed in IFCT (Indian Food Composition Tables) which is the most comprehensive and detailed analysis of Indian Foods that was published by NIN as recently as the year 2018. This provides some basis for comparison.

In Table – 10 we have compared the following for the set of 13 parameters that were tested.

- a. In the first two columns we have provided the values from the NIN data for both raw rice as well as boiled rice.
- b. In the next column we have given under the heading – “TRV value” two sub-columns wherein we have listed both the minimum and maximum value for various parameters among the set of 49 rice varieties that have been tested.
- c. In order to make observations and comments about the values of various of these nutritional properties we have adopted the following method.

- i. For each nutritional parameter we have defined a range within which the value is defined as – “High”
- ii. For each nutritional parameter we have also defined a higher range within which the value is defined as – “Very High” and “Extraordinarily High”

d. Illustrations

We illustrate this by taking two parameters in the table.

- i. With respect to – “Protein” we find that the values of TRV or in the range of 6.72 to 10.49. As per the NIN data the protein content is in the range of 7.81 to 7.94. Hence, for the purpose of this book we have defined the protein content as being high if it is in the range of 8.0 – 10.0 and very high if it is greater than 10.0.
- ii. With respect to – “Iron” we find that the values of TRV are in the range of 1.1 to 40.8. As per the NIN data, the Iron content is in the range of 0.65 to 0.72. Hence, for the purpose of this book we have defined the iron content as being high if it is in the range of 1.0 – 5.0, very high if it is greater than 5.0 and extraordinarily high if it is greater than 20.0.

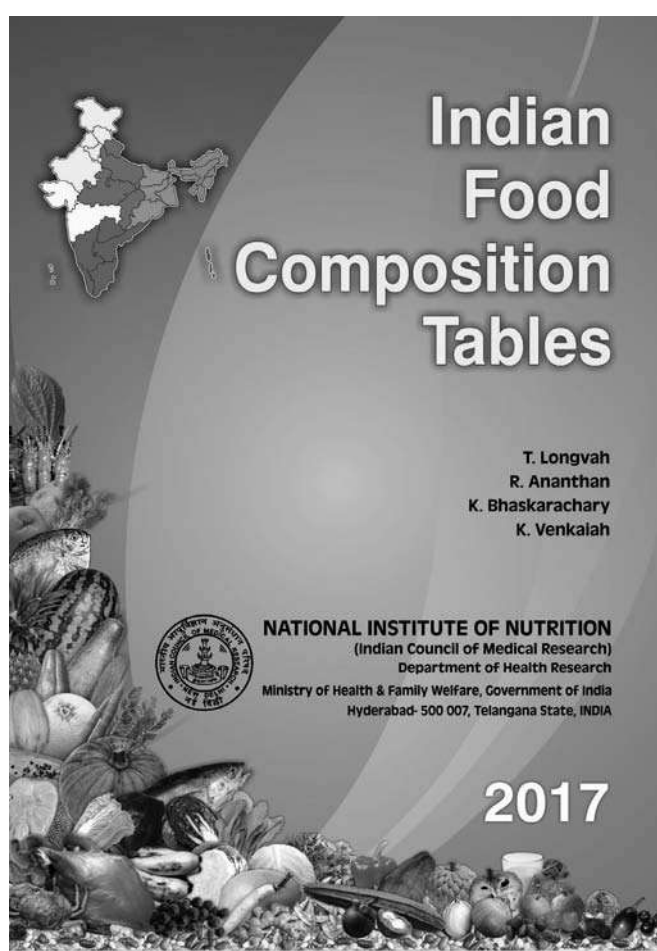


Table – 10 :
Range of Nutritive values of Traditional Rice Varieties in
comparison with National Institute of Nutrition values

S. NO	NUTRIENTS	NIN (RAW)	NIN (BOILED)	TRV VALUE		OUR BOOK DEFINITION		
				MIN	MAX	HIGH	VERY HIGH	EXTRA-ORDINARILY HIGH
1	Mositure (g)	9.93±0.75	10.09±0.43	10.17	13.57	-	-	-
2	Total Ash (g)	0.56±0.08	0.65±0.08	0.42	2.8	1 - 2	> 2	-
3	Total Protein (g)	7.94±0.58	7.81±0.63	6.72	10.49	8 - 10	> 10	-
4	Total Fat (g)	0.56±0.08	0.65±0.08	0.50	2.99	1 - 2	>2	-
5	Dietary Fibre(g)	2.81±0.42	3.74±0.36	BDL (DL : 1.0)	3.80	-	-	-
6	Carbhohydrate (g)	78.24±1.07	77.16±0.76	71.01	79.54	-	-	-
7	Energy (Kcal)	356.36	351.58	332.58	368	-	-	-
8	Potassium (mg)	108±10.9	142±20.3	46.0	335	200 - 300	> 300	-
9	Iron (mg)	0.65±0.11	0.72±0.20	1.1	40.8	1 - 5	>5	>20
10	Calcium (mg)	7.49±1.26	8.11±1.01	11.8	50.4	10 - 30	> 30	-
11	Magnesium (mg)	19.30±6.99	26.72±8.52	14	154.5	30 - 100	> 100	-
12	Zinc (mg)	1.21±0.17	1.08±0.20	0.7	0.3	1 - 2	> 2	-
13	Phosphorus (mg)	96±16.30	140±25.0	67.2	13.9	200 - 300	> 300	-

3. Summary of information

The following are some observations summarizing the information in the tables as below.

- a. With respect to moisture content, dietary fibre, carbohydrate content and energy we do not see any significant differences between the values given in the NIN table and the values for the TRV.
- b. However, with respect to several other parameters we do see significant differences which we can sum up as below.
 - **Total Ash:** 36 rice varieties are high in total ash and one rice variety is very high, namely *Kalanamak* and *Kuzhiyadichan*.
 - **Total Protein :** 39 rice varieties are high in protein and two rice varieties are very high, namely - *Kalanamak* and *Kuzhiyadichan*.
 - **Total fat :** 17 rice varieties are high in fat and 30 rice varieties are very high.
 - **Potassium :** 24 varieties are high in potassium and four rice varieties are very high, namely *Kaivari samba*, *Kaatuyanam*, *Navara* and *Poovan samba*.
 - **Iron :** 35 rice varieties are high in iron and 17 rice varieties are very high. Two rice varieties, namely *Sivappu kuruvikaar* and *Sanna samba* shows extraordinarily high value of iron
 - **Calcium :** 29 rice varieties shows high in calcium and 25 rice varieties show very high calcium levels.
 - **Magnesium :** 27 rice varieties are high and 16 rice varieties are very high.
 - **Zinc :** 40 rice varieties are high in Zinc and 9 rice varieties are very high.
 - **Phosphorus :** 17 rice varieties are high in phosphorus and 13 rice varieties are very high.



TRADITIONAL KNOWLEDGE AND WISDOM FROM AYURVEDA AND SIDDHA SYSTEMS OF MEDICINE

The Indian sub-continent is a region of extremely high biodiversity of plants. Along with the rich spread and diversity of rice and vegetables there is also extensive literature and knowledge regarding the therapeutic and nutritional properties of rice and vegetables. Such knowledge is rich, varied, nuanced and has been with a great understanding of differences in nutritional properties between varieties of the same grains or vegetables. This is made possible due to the following reasons –

- India has one of the richest, continuous and unbroken traditions on medical knowledge with written texts of classical medicine (in at least two Indian languages namely – Sanskrit and Tamil) dating back to three thousand years from today. Practitioners of *Ayurveda* and *Siddha* systems of medicines who are knowledgeable in these texts and practices flourish right down to this day. Knowledge and understanding of food and its properties has always formed an essential part of the traditional medical understanding.
- India also has a great and rich diversity of folk knowledge and there are over four thousand ethnic communities in India who have a deep knowledge and understanding of the properties of natural products particularly plants with which they live in close communion. The All India Coordinated Research Project on Ethnobiology (AICRPE) of the Government of India which is an exercise undertaken from 1980s onwards produced a midterm report in 1994 which stated that the ethnic communities in India alone (who constitute only 7% of our population) had knowledge of around 9500 species of plants which are used for varied purposes, the major ones being for medicine (7500 species) and food (3900 species).

This chapter describes the results of an effort that was undertaken by us a few years back to obtain

an overview of the information relating to various aspects of traditional rice varieties in the Ayurveda as well as Siddha systems of medicine. In terms of the information obtained it includes –

1. Properties of various traditional rice varieties
2. Impact of type of cultivation, season etc. on these properties
3. Various medical preparations in which specific rice varieties are used as ingredients
4. Methods of processing rice varieties and the impact of these methods on the final products
5. Various kinds of dishes and preparations

In the following sections we provide an overview of information compiled from Ayurveda as well as Siddha systems of medicine.

SURVEY OF LITERATURE FROM AYURVEDIC MEDICAL TEXTS

The Foundation for Revitalization of Local Health Traditions (FRLHT), Bengaluru was a partner agency to undertake this survey. The scope of the work in terms of information that was collected is listed below.

1. The general properties and nutritional and therapeutic qualities of rice in general that are described in Ayurveda texts.
2. Names of specific varieties as well as their properties.
3. Use for treatment of humans, animals and also plants.

4. Various parts of rice plant and their uses including – straw, bran etc.
5. Methods of use other than consuming as food such as – external application, fomentation etc.
6. Information regarding properties and uses of rice cultivated in different seasons, different kinds of land or by various methods (direct sowing, transplantation etc.)
7. Types of preparations of rice and their qualities – cooked rice, *kanji*, fermented preparations etc.
8. Differences in methods of processing – raw rice / parboiled rice, hand pounded rice etc.

A report was prepared which contain the following types of information.

- Ayurvedic classification of rice varieties
- A set of tables listing properties of various groups of rices identified in Ayurveda, application of these rice groups to various disease conditions, physiological effects of rice based on various factors etc.
- List of rice varieties mentioned in the *Pakasastra* texts like *Bhojana Kutuhalam*
- Lists of medicinal properties of rices processed in different ways.
- Towards the end there is a set of references after which in the last part is a note on various texts of Ayurveda that have been surveyed.

A few of the highlights are given below.

1. Rice is divided into four broad groups known as – *Sali*, *Vrihi*, *Shashtika* and *Nivera* and for each of them there are descriptions of qualities and effects of doshas based on Ayurvedic terminology.
2. The utility of each of the above types of rice in various disease conditions is described. For example, *Sali* rices are useful in diarrhea, *Rakta sali* (red variety of *Sali*) are valuable in pregnancy etc.
3. The physiological effects of rice varies based on how it is cultivated and stored. For example, rice grown in dry regions are light to digest while

those grown in wet regions are heavy to digest. Similarly new rice (freshly harvested) is said to be aphrodisiac whereas old rice (milled after storing for at least a few months) is said to be light to digest.

4. Medicinal properties of rice processed in different ways are described. For example, puffed rice is said to be light to digest and useful in vomiting and diarrhea whereas boiled rice stimulates the digestive capacity and is wholesome.
5. Ayurveda identified rice groups according to the growing seasons: transplanted rice was referred to as *Sali* (July to November–December); broadcasted rice as *Vrihi*; and summer rice maturing in 60 days was called *Shashtika*. All types of rice – short, long, white, red, and black rice – are known to possess medicinal properties. The data is pooled from ancient texts like *Caraka Samhita*, *Susruta Samhita*, *Astanga Sangraha*, *Astanga Hridaya*, *Nighantus* (lexicons) and *Pakashastras* (work on various aspects of food related to Ayurveda).

1. Summary of Properties of Various Rice Varieties and their Uses

Varieties of *Sali* were considered sweet in taste, cooling in potency, light in digestion, and capable of imparting strength. They were supposed to subdue *pitta*, and slightly increase *vata* and *kapha*. Of these, Red *Sali* (*Raktasali*) was the most efficacious in subduing deranged humors. It was considered diuretic, invigorating to the eye, cosmetic, tonic, and pleasant. It was good for fever and ulcers and was antitoxic. Other species of *Sali* were considered slightly inferior. The *Vrihi* varieties were described as sweet and astringent, and hot in potency. They were supposed to increase the secretions of internal organs, and bring on constipation of the bowels. The *Krishna Vrihi* (black) was considered the best among the *Vrihi* group.

In the following section we have summarized the findings as below -

- a. Properties of various groups of rices as identified in Ayurvedic literature (Table – 11)
- b. Application of these rice varieties for various conditions in terms of diet and disease (Table – 12) and
- c. The physiological effect of rices based on various factors (Table – 13)

Table – 11 :
Properties of various rice groups identified in Ayurveda

TYPE OF RICE	RASA (TASTE)	GUNA (QUALITY)	VEERYA (POTENCY)	VIPAKA (POST DIGESTIVE EFFECT)	INCREASE OF DOSHA	DECREASE OF DOSHA
Sali	Sweet	Light	Cool	Sweet	Vata, kapha	Pitta
Vrihi	Sweet	Heavy	Hot	Sour	Pitta	
Shashtika	Sweet	Light, unctuous	Cool	Sweet		Tridosha

Table - 12:
Application of different rice groups in various disease conditions

TYPE OF RICE	USES
Sali rice	<p>As a diet: Diarrhoea, fracture, fever, skin diseases, disturbed sleep, vitiated breast milk, erysipelas, hemorrhage, cough, alcoholism, post-operative procedures, aphrodisiac therapy, rejuvenative therapy</p> <p>In various conditions:</p> <p>Bleeding piles: Sali should be given along with milk</p> <p>Piles: Sali should be given along with goats milk</p> <p>Ulcers: Should be frequently anointed with preparation of milk using Sali</p> <p>Deep burns: Paste of the chaff of Sali mixed with ghee should be applied</p> <p>As a component of formulation:</p> <p>Apatyakarisastikadigutika: Aphrodisiac</p> <p>Sastikapindasveda: Debilitating neuro muscular disorders, arthritis</p>
Rakta Sali (red variety)	<p>In various conditions:</p> <p>Sustenance of pregnancy: Red Sali should be given with honey and sugar</p> <p>Scanty formation of stool: Boiled red Sali along with ghee and sour ingredients</p> <p>Abortion: Red rice mixed with honey and ghee should be taken along with milk</p> <p>Cough associated with blood: Intake of milk cooked with red rice</p>

TYPE OF RICE	USES
Purana Sali (old rice-more than a year old)	<p>Ulcers: Preparations using Purana Sali added with fats helps in healing ulcers</p> <p>Diabetes: Is taken as a diet</p> <p>Intermittent fever, anemia: Is taken as a diet</p>
Shashtika Sali	<p>As a diet: Vomiting, intermittent fever, anemia, hemorrhage, asthma, cough, diabetes, ailments caused by poisoning, bleeding piles, alcoholism, as aphrodisiac, as galactagogue</p> <p>In various conditions:</p> <p>Bleeding in pregnancy: Gruel should be given made of Shashtika Sali</p> <p>Piles: Is added with ghee and consumed along with milk</p> <p>Diarrhoea: Flour of Sali and Shashtika added with sugar and honey</p> <p>Ulcers: Should be frequently anointed with preparation of milk using Shashtika Sali</p>

In addition to varietal differences, rice was traditionally classified according to growing areas, soil types (marshy or dry soils), land preparation (ploughed or unploughed land), planting method (broadcast or transplanted), volunteer crop and ageing of rice (new or one/two-year-old rice). Ayurvedic treatises document the properties of different varieties, grown in different seasons and areas, and on various soil types. It records the works of effects on human physiology (Table -13).

Table 13 :
Physiological effect of rice based on various factors

TYPE OF RICE	EFFECT ON HUMAN PHYSIOLOGY
Rice grown in dry regions	Light to digest, sweet and slightly bitter in taste, promotes strength
Rice grown in wet lands	Sweet, slightly astringent and sour, heavy to digest, aphrodisiac, promotes strength
Rice grown in burnt land	Astringent, light to digest, dry
Rice grown on ploughed land	Astringent, aphrodisiac, promotes intellect and strength

TYPE OF RICE	EFFECT ON HUMAN PHYSIOLOGY
New rice	Aphrodisiac
Old rice	Light to digest
Rice grown in saline water	Causes disease
Rice grown in clean water	Tasty, cures all maladies

There is a well known traditional text relating to cooking called as Bhojana Kuthukalam which makes a mention of several rice varieties and their properties in terms of Ayurvedic parameters. In

Table – 14 we summarise the properties of 10 important rice varieties mentioned in this text. Among the various species of rice, *rakta saali* was considered the best.

Table - 14 :
Rice varieties mentioned in Bhojana Kutuhalam

RICE VARIETY	PROPERTIES
<i>Rajaanna Sali</i>	Unctous, sweet, light, stimulates digestive fire, promotes strength and when rendered wholesome, imparts complexion and is aphrodisiac. Alleviates the three doshas
<i>Krshna Sali</i>	Sweet, nourishing, promotes complexion and lustre, imparts strength, cures burning sensation and is aphrodisiac. Alleviates the three doshas
<i>Rakta Sali</i>	Sweet, light, unctous, strengthening, imparts taste, strength and complexion, stimulates the digestive fire, treats burning sensation, thirst, fever, improves vision, diuretic, enhances taste, increases the quantity of semen. Alleviates the three doshas.
<i>Munda Sali</i>	Sweet and sour in taste, treats poisoning, wounds, dyspnoea, cough, burning sensation, numbness of the mouth and relieves pain, stimulates the digestive fire, imparts nutrition, confers strength. Alleviates the three doshas
<i>Mahaa Sali</i>	Sweet, delicious and cold, treats chronic fever, hyperthermia, abdominal disorders. Is wholesome for children, youth and elderly people and should be consumed by all men. It improves digestive power, strength and virility. Alleviates pitta dosha
<i>Sookshma Sali</i>	Sweet and light, treats haemorrhage, burning sensation, stimulates the digestive fire, promotes digestion. Alleviates vata dosha

RICE VARIETY	PROPERTIES
<i>Gandha Sali</i>	Sweet, extremely aphrodisiac, treats exhaustion, loss of appetite and burning sensation. It stimulates the secretions from the breasts, firmly secures the growing embryo, imparts strength. Alleviates pitta dosha, slightly increases kapha dosha
<i>Triya Sali</i>	Sweet, unctous, cold, treats burning sensation, imparts taste, is wholesome and treats all maladies. Alleviates the three doshas
<i>Shashtika Sali</i>	Imparts taste, cold in potency, strengthening, wholesome, stimulates the digestive fire and promotes virility. Cures afflictions of doshas
<i>Gaura Sali</i>	Sweet, astringent, unctous, aphrodisiac, combats worm infestations, fever and hematological disorders, gives strength, removes fatigue, confers virility, imparts taste and nourishes the tissues. Alleviates pitta and kapha dosha

2. Medicinal properties of rices processed in various ways

Ancient Ayurvedic and agricultural treatises also describe the effect of food/rice processing on the humanbody. Sometimes a change in property

can result from the manner in which something is processed, for e.g. old rice that is boiled is light but the same if flattened is rendered heavy. Some of the commonly used methods for processing and their effect on the properties of rice is summarized in Table – 15.

Table – 15 :
Medicinal properties of rice processed in different ways

PROCESSED RICE	PROPERTIES
Laja (fried grains)	Sweet, cold, light to digest, increases appetite, useful in vomiting, diarrhoea, diabetes, obesity, burning sensation, disorders of blood
Saktu (Grains fried in a frying pan and then pounded in a machine)	Appetizer, light to digest, cold, sweet, constipating, wholesome and strengthening. They also increase semen levels
Pruthuka (grains that have not burst open are threshed till they become flat in contour)	Heavy to digest, when eaten with milk, they promote growth, is aphrodisiac, imparts strength and loosen the stools
Yavagu (water is six times the quantity of boiled rice)	Strengthening, nourishing
Vilepi (water is four times the quantity of boiled rice)	Nurturing, sweet, aphrodisiac, useful in piles.

PROCESSED RICE	PROPERTIES
Peya (rice prepared in 14 parts of water)	Light to digest, nourishes the tissues
Yusha	Strengthening, beneficial to the throat, light after metabolism and aggravates kapha
Boiled rice	Stimulates the digestive fire, imparts taste, nourishes the tissues, is wholesome and light to digest
Cold rice	Is cold in potency, causes weakening of the digestive fire, dyspnoea, increased salivation, obstruction to the passage of faeces, treats haemorrhagic disorders, fainting, dizziness, vomiting and intoxication
Rasodana (boiled rice mixed with meat soup)	Antipyretic, strengthening
Ghollabhakta (green gram rice)	Is cold in potency, sweet and cordial, promotes digestion, stimulates the digestive fire, treats colicky pain, haemorrhoids and imparts nourishment and taste
Krsara (Rice, its husk intact, is cooked in water along with addition of salt, wet ginger and asafoetida.	Increases semen quantity, imparts strength, is heavy and difficult to digest, causes constipation and excessive production of faeces and urine

3. Other information

Rice-water is used as anupana for many medicines. It is either used by just soaking rice in water, or prepared by boiling rice in excess water. The context in which rice can be put to use as Anupana is mentioned. Similarly, it is indicated that - *Sali* should be included in the diet during summer, autumn and rainy season as the body metabolism during these seasons will be low and rice is easily digestible. During the summer season the food intake should be sweet, cold so *Sali* etc. is included in the diet. Diet should include old rice, wheat, barley etc. during rainy season.

SURVEY OF LITERATURE FROM SIDDHA MEDICAL TEXTS

The Centre for Traditional Medicine and Research (CTMR) based in Chennai was identified as the expert agency to undertake this work. The following were the set of questions identified for information to be gathered from Siddha medical texts and interviews with Siddha practitioners.

- What are the general properties, nutritional and therapeutic qualities of rice in general that are described in Siddha texts.
- Names of specific varieties as well as their properties.
- Use for treatment of humans, animals and also plants
- Various parts of rice plant and their uses including – straw, bran etc.
- Methods of use other than consuming as food such as – external application, fomentation etc.
- Information regarding properties and uses of rice cultivated in different seasons, different kinds of land or by various methods (direct sowing, transplantation etc.)
- Types of preparations of rice and their qualities – cooked rice, *kanji*, fermented preparations etc.
- Differences in methods of processing – raw rice / parboiled rice, hand pounded rice etc.

1. Organisation of Information

The document is organized in the following broad sections.

- An introductory section about the health benefits of rice.
- A note on the sources of information i.e., the basic texts of Siddha medicine.
- A listing of 32 paddy varieties whose names are found in the Siddha texts.
- The major section wherein the list of rice varieties is given along with the information regarding each variety as it is found in the Siddha texts – the name is given in English and a summary translation from Tamil.
- In the later part for this report a set of rice based products and dishes are listed (such as raw rice, parboiled rice, rice flour, puffed rice, etc.) with translations and transliterations of the material from Siddha texts.

2. Source of Information

The Classical siddha texts contain around 30 traditional varieties of rice which derive their name on the basis of season, origin, quality, texture, colour, fragrance, size, duration, and specific location. (*Samba, Senkuruvai, karunkuruvai*). The earliest documentation on rice varieties are available in Sangam literature *Manimekkalai*, (200 BC- 100CE), which mentions a glittering variety *Kandasalli. Ivanam* – a popular variety suitable for highlands, *Vennel* -white rice were mentioned in *Madurai Kanchi* a classical Tamil literature of sangam period. The above verses suggest that the *Pisanam* varieties are countless while *samba* varieties are ten.

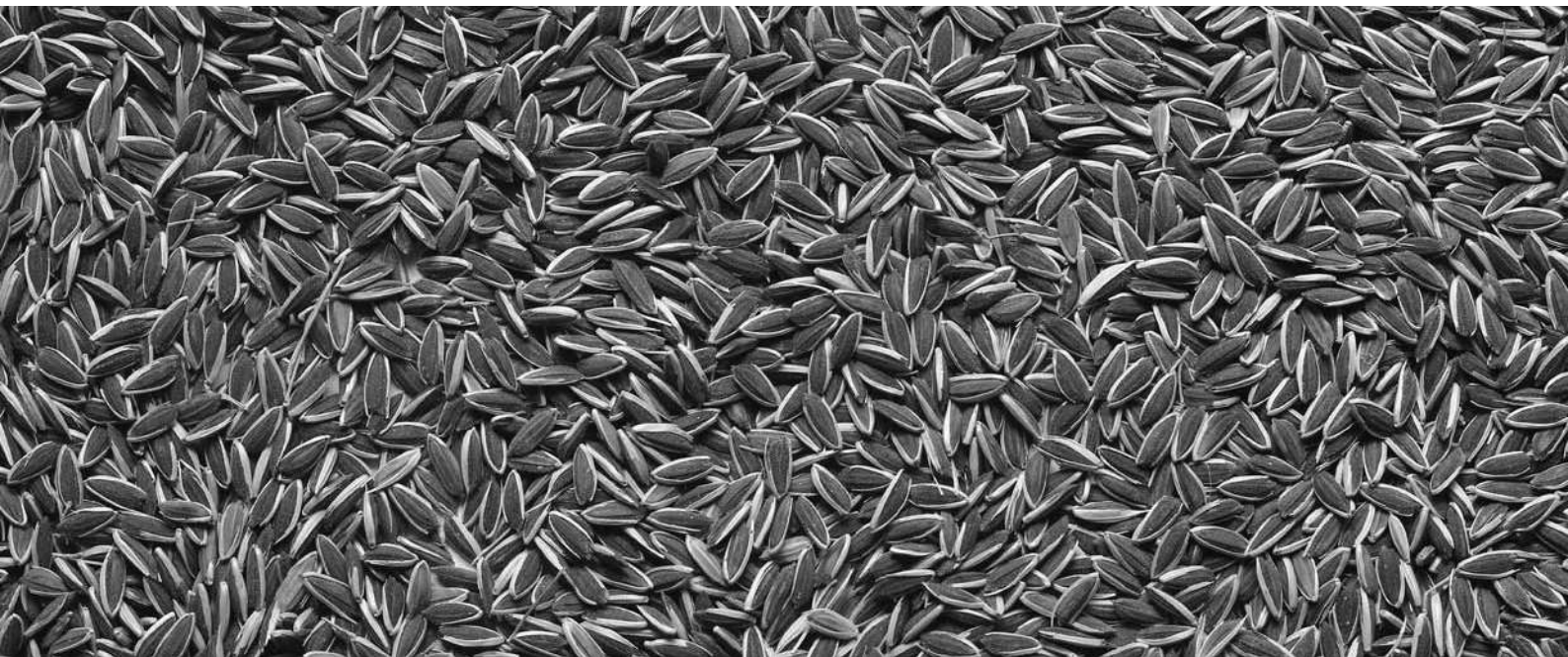
Pazhani Cheppu Pattayam (Copper Inscription), 1528, published by Tamil Nadu State Archaeology Dept. provides information about a meeting of farmers from all three kingdoms (*Chera, Chola and Pandiya*) in which 120 representatives took part discussed about the traditional history of paddy, (*Sen Nel* – unique variety of rice) origin and cultivation techniques such as transplanting of seedlings, management of water, harvesting, post harvest, that they introduced and practiced. Besides, they discussed about a construction of a common place for free food supply. The major feature of the *Pattayam* is that, it mentions about 100 different varieties of rice. (*Pattayam* Lines 133-151).

There are specific Siddha literatures that elaborate the property of various materials used as food, medicine or aromatic substances. They contain information not only of herbs but also of animal products and marine products, water from different source including different rivers of India. The treatises that provide these details are called *Gunapadam*; the Commonest of them is *Agathiyar Gunapadam* or *Gunavagadam*. Surprisingly there are few books of the same title but they do not give the descriptions and properties of plants. The *Agathiyar gunapadam* with description of properties of 815 materials is still in the form of Palm Manuscript written some 350 years ago, as the day of writing of that particular copy as mentioned in the end of the manuscript. Possibly this was copied from an earlier manuscript the origin of which cannot be traced. This is the only retrievable treatise available in the name of a *Siddhar*. The other texts which provide details of properties of herbs is *Pathartha Guna Chintamani*, which have similar verses with slight variations in words used but providing the same meaning as the *Agathiyar gunapadam*. The reference to rice and rice based products as a food supplement during treatment, external applications, processing of other drugs, storing drugs are found spread across different classical treatise of *Agathiyar, Bogar, Theriyar* and also in the Sarabendar texts of the Marathi rulers of *Thanjavur*.

3. Traditional rice varieties in Siddha texts and their properties

There are thirty rice varieties mentioned in the book '*Siddha maruthuva thogai agharathy*' a Publication of Tamil University, Thanjavur.

1. *Kuruvai*
2. *Aanaikomban*
3. *Kadambu*
4. *Kalinga Samba*
5. *Kaar*
6. *Kalundai*
7. *Katraazhai*
8. *Madangal*
9. *Manikathai*
10. *Manavaari*
11. *Milaghu Samba*
12. *Mosanam*



13. *Nariyan*
14. *Navarai*
15. *Neela Samba*
16. *Neervellai*
17. *Otadan*
18. *Pisaanam*
19. *Pisisni*
20. *Poombaalai*
21. *Kaadaikazhuthan*
22. *Sirumaniyan*
23. *Eesurakovai*
24. *Karunaivellai*
25. *Champa*
26. *Thillai*
27. *Thiruvaangam*
28. *Thuyyamalli*
29. *VariChampa*
30. *VaadaiChampa*
31. *Vaalan*
32. *Vellaimilagu.*

4. Properties of specific varieties

In the following section we have summarized the properties of some key varieties of rice as described in the Siddha literature. For the sake of easy reading we have used spellings and pronunciations that are currently in vogue as against more obscure usages wherever the identity is clear.

- *Annamazhagi* : It is very tasty to eat and is also healthy. It wards off all diseases and regulates deranged Pitta.
- *Irkku Samba* : It has a good look and taste and is liked by all. This is good for offering prayer and to feed the noble.
- *Karunkuruvai* : This is a dark variety of paddy maturing in three months. Parboiled *karunkuruvai* rice wards of skin diseases, urinary tract diseases, poisonous stings and bites and promotes health.
- *Kalundai Samba* : A kind of paddy yielding hard round rice, harvested after 200 days from planting. The one who take food made of this variety of rice gets the muscle strength of a boxer and this enhances the stamina and physical endurance. They gain great pleasure. The rice is also tasty.
- *Kaadai Samba* : It provides strength the body and makes the disease fly like Common Quail (*Coturnix coturnix*) particularly of the urinary tract like burning micturation.

- *Kaalaan samba* : The name *Kalan* suggests the duration of the crop. If one consumes the food made of this rice at proper times after digestion of the previous meal, it provides enormous strength and also wards of diseases caused by derangement of *Vaatha*
- *Kichili samba* : If properly cooked rice of this variety is consumed it not only improves the physical strength enables weight gain, but also improves the complexion. This has a pale orange thin grain with pleasant aroma.
- *Gundu samba* : It causes indigestion, skin diseases but controls thirst. In general it suppresses *Pitta*.
- *Kundai samba* : It spreads excema causes indigestion but controls thirst. The grain is stout.
- *Kurunj samba* : The food made of this variety increases *Pitta*, dermatitis, but controls deranged *vaatha* and enhances libido. This is probably a late flowering variety with a short grain.
- *Kaivarai samba* : It provides good strength and nourishes the body and is healthy. The name suggests the grain has linear marks like fingers.
- *Kodai samba* : It regulates all three doshas and therefore all diseases pass off like a passing cloud. This is paddy crop grown during summer. May be a drought resistant variety grown even in summer.
- *Korai samba* : It provides a cool feel and controls *Pitta*, it cures urinary tract diseases and controls pruritis. The straw is as hard as that of the nut grass.
- *Koran samba* : It provides a cool feel and controls *Pitta*, it cures urinary tract diseases and controls pruritis. The grass is as hard as that of the nut grass
- *Seetha bogam* : The verse says that it is cultivated in the North and named after *Seetha*. If one consumes the *Seetha bogam* rice every day, it provides strength, complexion and improves spermatogenesis. It wards of indigestion.
- *Seeraga samba* : It is very tasty to eat and it regulates excess *vaatha*, easy to digest. It controls flatulence. The grains resembles cumin seeds.
- *Chensamba* : It controls excessive appetite, cures itching, pyoderma and wounds and this red rice is a preferred rice variety for a feast.
- *Puzhugu samba* : The variety is preferred by the farmers because of its ability to quench thirst and hunger and strengthens the body, removes fatigue and provides a pleasant feel. This has the aroma of civet.
- *Manakathai* : It controls skin diseases, helps in poison bites, heals ulcers if one takes this variety regularly. This rice has the odour of the pleasant smelling wood.
- *Manisamba* : It is an ideal food for diabetic patients, growing children as well as elders. It is easy to digest. It is round in shape like a bead.
- *Malligai samba* : It is very tasty to eat, good for nourishment, strength and growth, prevents dermatitis. Burning sensation of the eyes subsides. This is pure white in colour like jasmine and has a pleasant aroma.
- *Milagu samba* : It improves appetite, regulates thirst, gives a pleasant feel, wards of many diseases. This is again a bead like rice variety.
- *Maisamba* : It regulates deranged *vaatha* and *Pitta*, Cures fever, vomiting, ingested toxins and removes ageusia, anorexia. This rice is dark black in colour like the eyeliner.
- *Kundumanisamba* : It regulates deranged *vata* and alleviates a lot of diseases.
- *Valaithadisamba* : It causes *vaatha* and *Pitta* derangement, distention of abdomen due to flatulence, upsets digestion and causes skin eruptions. This grain has a curvature.
- *Vaalaanarici* : It suppress anorexia –loss of taste but improves complexion, adds weight. But in order to get proper nourishment and improve spermatogenesis use judiciously.

4. Types of rices and rice preparations

There are descriptions and properties about rices processed in various ways as well as certain preparations based on rice.

a. Raw rice

Food made of raw rice controls the digestive fire and burning sensation.

b. Parboiled rice

Food made of parboiled rice is ideally suited for children as well as those who suffer from flatulence, it is also recommended as a food during convalescence period.

c. Old rice

Old rice is good for both children and elderly; it cools the body and eliminates all diseases.

d. Parched paddy

Sun dried paddy is filled in mud jars and is moistened with hot water. After 2-3 min. the water is decanted and the jars are kept in an inverted position for 8-10 hours. Next the paddy is exposed to the sun for a short time and then parched in hot sand as in the preparation of parched rice. Puffed rice is prepared by throwing pretreated paddy into sand heated to a high temperature in an iron pan. During parching the grain swell and burst into a soft white product. The parched grains are sieved to remove sand and winnowed to separate the husk. Parched paddy controls morbid thirst, indigestion, excess vaatha, anorexia and diarrhoea.

e. Pori urundai

A sweet made with unrefined cane sugar and parched paddy controls excess vaatha-Pitta and also kapha vaatha. Parched paddy is used in many medicines as an ingredient

f. Puffed rice

This popular ready-to-eat snack product is obtained by puffing milled parboiled rice. In the traditional process rice is gently heated on the furnace without sand to reduce the moisture content slightly. It is then mixed with salt solution and again roasted on furnace in small batches with sand on a strong fire for a few seconds to produce the expanded rice. Rice expands about 8 times retaining the grain shape.

g. Flaked rice

This is another important value added product prepared from paddy. Traditionally, it is prepared from soaked paddy, after heat treatment and immediate flattening using a flaking machine (an edge runner). It is made from parboiled rice. Paddy is soaked in water for 2 -3 days to soften the kernel followed by boiling water for a few minutes and the water is drained off. The paddy is heated in a shallow earthen vessel or sand in iron pan till the husks break open. It is pounded by a wooden pestle which flattens the kernel and removes the husk. The husk is separated by winnowing. Flaked rice is thin and papery in consistency.



h. Rice based Food

There are descriptions available about properly cooked rice and also uses of over cooked rice. A few preparations where rice is cooked and eaten along with buttermilk, curd and meat are also mentioned.

i. *Pongal* – properties and variations

Pongal is rice and lentil mix cooked with spices, nuts and ghee for a savoury version, while jaggery and cardamom are added for sweet version. *Pongal* made with *Samba* rice nourishes the body but causes indigestion, flatulence and body pain. Sweet *pongol* corrects anorexia, controls vomiting, brings down elevated *Pitta*. Sweet pongal in which rice is cooked in milk along with unrefined cane sugar and clarified butter increases kapha and *vaatha* but controls *Pitta* and has no equivalence in its pleasant taste. *Pongal* with black pepper enhances appetite, controls elevated *vaatha*, increased abdominal peristalsis and brings a balance of all three humors.

j. Food made with rice batter

There is mention about various foods made with rice batter such as dosai and idli. There are also mentions of many preparation which are still widely in use including *Kanji* and *Adhirasam* and there are also some indications and descriptions about the properties.

PROPERTIES OF RICE : UNDERSTANDING THE PERSPECTIVE OF TRADITIONAL MEDICINE

In India, choices of food among the people at large are still derived from the Ayurvedic worldview and understanding. This is an area where the local communities abound in various do's and don'ts, which often appear to be not comprehensible to the modern investigator. This is perhaps one of the reasons why there is a poor understanding of the nutritional value of many substances that were traditionally valued very highly such as rice. The characterisation and description of rice that is found in the texts of Ayurveda make use of terminologies which is entirely different from the modern medical terminology.

1. Basic Terminologies

Although nutritional properties in modern medicine are described using terms such as protein, caloric content, and vitamins, traditional medicine uses entirely different terms. Among the basic terms used, some of the key concepts are as follows:

1. *Rasa*—This literally refers to the taste of a substance. It is believed that different tastes impart or correspond to different nutritional qualities.



For example, a substance that is bitter in taste is likely to have properties that are krimigna (it controls krimi, “deworming”) and a substance that is sour in taste can increase the intensity of agni (capacity to digest).

2. *Guna*—This refers to a large number of specific qualities.
3. *Virya*—This refers to the potency of a substance, which may be ushna (hot) or sita (cold). This indeed refers to the overall impact or feeling in the human after ingesting/digesting the substance.
4. *Ganas*—Charaka, another classic Ayurvedic authority, classified drugs into 50 group or ganas according to their action. Various other authors have added more terms to describe the action of all substances, be it food or medicine.

The gap is quite wide on these matters between the modern and the traditional and there have been only a few scattered and sporadic efforts to bridge this gap. In fact, concepts such as hot and cold are not only not understood but also dismissed as superstition. Consider the following answer, to a question, which appeared in a journal published by the National Institute of Nutrition. “It is true that there is a widespread belief that some foods are “hot” and others “cold.” However there appears to be no scientific basis for such classification. It is not desirable to limit the choice of food based on such beliefs.”

2. Modern Studies on Traditional Knowledge—Hot and Cold

There has been an attempt to directly understand and assess the concepts of traditional medicine such as hot or cold employing modern nutritional laboratory techniques. At the outset, it may appear that the concepts of traditional medicine such as hot and cold are completely outside the scope of understanding of modern medicine, and few would think that there is any kind of dialog possible. However, it is interesting to note that in the late 1960s an attempt was made by a scientist from the National Institute of Nutrition, Hyderabad, to try and understand the biochemical basis for the Ayurvedic understanding of hot and cold foods.

A list of food items that are believed to produce either heat or cold when consumed was prepared, and from among these, two diets were formulated. The first consisted mainly of hot foods and the second cold foods. Hot foods were generally those that, when consumed, produced a subjective feeling

of burning eyes, burning micturition, and a feeling of warmth all over the body. Four normal healthy adult subjects from the laboratory staff were selected for the metabolic study. Protein, fat, and calorie intakes were adjusted according to the Nutrition Advisory Committee recommendations. The subjects were first placed on a diet comprising mostly of the hot foods for a period of 10 days followed by the second period of 10 days when they were given a diet consisting mainly of cold foods. The period of intake of each of these types of foods was 10 days. When the subjects were consuming hot foods, the acidity of the urine was much higher than when they were consuming cold foods. The high acidity of the urine may be the possible cause for the burning sensation during micturition. Urinary excretion of sulfur was also found to be higher in hot foods than in cold foods, indicating a possibility that the high sulfur content of the urine may be the cause for the high acidity of the urine. Nitrogen retention was found to be lower in hot foods than in cold foods, although the total nitrogen content was the same in both the diets. Surprisingly, this remains the only research report in India where such an effort has been made to comprehend Ayurvedic parameters through a laboratory exercise.

3. Folk Knowledge

The body of knowledge and practices related to nutrition exists both in the classical and the folk forms. Although this is a subject that merits a detailed investigation, a brief overview is provided below. There is a vast body of textual literature in Sanskrit and various other Indian languages (such as Tamil, Telugu, and Kannada), which not only have detailed and rich descriptions of the properties of foods but also provide a theoretical framework for this knowledge. Linked to this understanding, there is a rich folklore and traditional knowledge that still strongly influences and governs the choice of food by the people of India. This includes the understanding of what is healthy food, what is a balanced diet, which foods are appropriate or inappropriate during various seasons, incidence of illness, and various stages of life and growth such as infancy, women attaining puberty, pregnant and lactating mothers, and old age.

IN CONCLUSION

It is seen that there is a whole world of information and wisdom contained in the literature on traditional medicine relating to rice varieties. We summarise some general observations below.

1. Only a small amount of this literature has been systematically surveyed and there are a large amount of texts that still need to be examined.
2. The information is rich and varied including material about – types of rices, effect of cultivation during various seasons, nutritional as well as medicinal properties, types of preparations and processing.
3. This information is in the technical language of traditional medicine using terms such as vaatha, pittha, kapha etc. with which the modern scientific community has no familiarity and this poses a challenge. Currently, there is still a rural population as well as an urban population which may be in declining numbers which can still relate to this terminology.
4. There is a gap to be bridged in terms of identifying and mapping the names of various varieties of rice or groups of rice with the varieties that are commonly in use and the names that are prevalent today.

It would require a careful and patient work often interdisciplinary in nature to comprehend this information in terms that are useful for today's practice and research but the effort may be quite worthwhile in terms of the results that it would yield.



MARKETING AND SALES : ASSESSMENT OF POTENTIAL AND PILOT EFFORTS

Right since the early stages of our work, we had to face the question of what is required to be done to scale up the cultivation of traditional rice varieties on a large scale so that the farmers may derive a suitable benefit. On the one hand in a scattered manner, members of the farming community were cultivating small quantities of these varieties. They were putting it to various uses based on their own traditions and experience. However, in terms of scaling up the cultivation, there were key questions to be answered, namely –

- Can they have access to quality seeds as planting material ?
- If large quantities are produced is there a market that can offer a suitable value for it.
- Can there be a suitable link between the producer and the consumer?
- Having worked with farmers and with seed production for several years we felt that we now need to move on to address the question of markets. We identified the following steps which are listed below. These efforts were not actually in sequence but several of them were running parallel to each other and also overlapping. We list some of these key efforts and then go on to describe them in some detail.
- The *Namma Nellu* programme for the conservation and scaling up of cultivation.
- Testing and standardization of information relating to traditional rice varieties
- A rapid assessment of the potential market for traditional rice varieties – overview of the effort and major conclusions – as part of this effort we also carried out a survey of - retail stores and niche restaurants in the Chennai city
- More recently we organized, an experiential lunch with traditional rice varieties in collaboration with a hotel in the Chennai city.

We provide a summary of each of these efforts below:

THE *NAMMA NELLU* PROGRAMME: CONSERVATION AND THE SCALING UP OF CULTIVATION

Namma Nellu (a Tamil term meaning – “Our Rice”) is an initiative of Centre for Indian Knowledge Systems (CIKS) to conserve traditional rice varieties in Tamil Nadu. The objectives of *Namma Nellu* initiative are planting and replanting the varieties year after year in two locations for conservation purposes, conducting researches to understand the characteristics of traditional varieties, initiating dialogues on the importance of Agrobiodiversity on society and ecology and multiplying seeds to offer for large scale production and rice for consumption. Though CIKS has been involved in the conservation of rice varieties since 1995 the upscaling efforts started in the year 2016 when *Namma Nellu* was launched. This initiative has progressed very well and in this summary we will also briefly outline some of the additional efforts that we plan to launch this year.

1. Conservation Efforts

This year (2018 - 2019) we have cultivated 140 traditional paddy varieties during the two seasons namely Samba and Navarai. We have documented various agronomical properties like – height of the plant, number of tillers, number of productive tillers, number of grains per ear head, yield per plant, total yield per plot, total straw yield, 1000 grains weight of all the varieties. In the experimental farm

at Sukkankollai we have conserved all the 140 varieties. In Agani at Sirkazhi we have extensively cultivated one variety “*Karuppu Kouni*” which is preferred by the market. Besides this, 50 different traditional paddy varieties were conserved by 50 farmers in Kancheepuram and Tiruvannamalai districts. Detailed monitoring and technological support was provided. Through all these conservation efforts we have been able to produce nearly 10 tonnes of seeds (10,000 Kgs).

2. Capacity building, awareness and trainings

During the course of the current year around 75 training programmes were conducted for farmers on the cultivation of indigenous varieties and their importance. This was done throughout the State of Tamil Nadu. Besides this nearly 2000 farmers visited the conservation sites to observe the varieties and learn about them. Awareness programmes for general public and schools were also conducted.

As a part of a farm school programme conducted for the Sprouts Montessori School the children learnt about the cultivation of a traditional variety from “Seed to Market”. The students practically did all operations like seed treatment, nursery raising, ploughing, transplanting, weeding, pest control and harvest. They finally sold the product to the parent community. This generated a lot of enthusiasm and interest amongst the parents and teachers.

3. Who is supporting *Namma Nellu* efforts ?

The *Namma Nellu* programme is a novel crowd funding effort. Support is being offered of various kinds, by various persons and professions, kinds of institutions as well as from many States. We summarise a few key points below –

- Support is being offered by – Individuals, families, educational institutions, non-profits as well as by Corporates.
- The supporting individuals are drawn from varied backgrounds and professions and they include – teachers (from schools, colleges, universities, IITs, Indian Institute of Science etc.), ecologists, textile technologists, nature lovers, molecular biologists, lawyers, physicists, sailors, environmental scientists, energy experts, IT experts, chemists, physicians etc.

- The supporters are drawn from various locations including – Tamil Nadu, Karnataka, Andhra Pradesh, Telengana, Gujarat, Maharashtra, Uttar Pradesh, New Delhi etc.
- The support ranges from a minimum of Rs. 15,000/- as a one time contribution which provides for the expenses of conserving a single rice variety in one location for one year to persons who are continuously providing support for the conservation of a dozen or more varieties in one or two locations continuously for several years !

4. Marketing efforts

A pilot scale marketing effort was done this year with one of the producer companies procuring about 70 tonnes of traditional varieties from the farmers and another company procuring about 20 tonnes. Most of the varieties were sold in the wholesale markets and some were also supplied to the retail stores. Enormous lessons have been learnt in the process which will be useful for marketing in the coming years. These are described in some detail later in this chapter.

TESTING AND STANDARDISATION OF INFORMATION RELATING TO COOKING OF TRADITIONAL RICE VARIETIES

Currently the consumers are only familiar with a few widely prevalent rice varieties in the market and they know how to cook it in terms of – ratio of rice to water, time required for cooking, number of whistles etc. However, with respect to the large number of traditional rice varieties being marketed there is a need to test and standardise information relating to the cooking qualities. In this respect the following kinds of information need to be tested and standardised.

- Does the rice need to be soaked / pre-soaked before cooking? If it needs to be pre-soaked how long should this be?
- What is the suggested ratio between water and rice – how much volume of water should be added for a standard amount of rice such as – 100 gms, 1 cup or a standard kitchen measure that is in use in the kitchen.

- What is the procedure to be used if the rice is cooked in a pressure cooker? We have to suggest the time for which it has to be cooked either in minutes or the number of whistles.
- What is the texture of the rice that is cooked? For example - coarse texture of rice implies - the grains are well cooked but the outer layer is still visible and that makes it coarse. Fine texture of rice implies - the grains are well cooked, but the outer layer is delicate enough in such a way it goes unnoticed.
- What do we have to say about the aroma of the rice? Earthy aroma implies a flavour of rice that is strong due to the outer layer of rice.
- No flavour implies the rice is neutral and can normally take on the flavour of what it is mixed with (sambar/rasam)
- What does the rice pair with in terms of dishes that are popular in a particular region?

For example, in Tamil Nadu one may have to comment on whether it pairs with - Sambar, Rasam, Kootu etc. While, this is to some extent, the expression of a personal taste and preference it would be valuable to give some indication to the consumer.

- One may have to comment on whether there is water retention after cooking.
- One would also have to comment on whether there is stickiness in the cooked grains.

Instructions for use

Based on the above observations attempts have been made to provide instructions for the user. As an example, in the accompanying page we reproduce an instruction sheet that was given to the user along with a package of traditional rice varieties which is the - "Luxury Collection"

INDIGENOUS RICE VARIETIES

JIL JILVAIGUNDA
A drought resistant variety

PISINI
A drought resistant variety with features to aid pain free deliveries.

KOWNI NEL
A variety that helps in secretion of insulin in diabetic patients

THOYAMALLE
A variety with high fiber content

KALIYAN SAMBA
Highly resistant to pest and disease.

THANGA SAMBA
A variety known to increase the longevity of human beings

VADAN SAMBA
A variety that can survive upto a month without irrigation

MAPPILLAI SAMBA
A variety with properties to help diabetes patients



COOKING INSTRUCTIONS AND INFORMATION (THE LUXURY COLLECTION)

SL. NO.	NAME OF THE VARIETY	COOKING INSTRUCTIONS	DISHES FOR WHICH IT IS USED	NUTRITIONAL INFORMATION
1.	Kitchili Samba (Raw White Rice)	Ratio of rice to water is 1 : 2. Whistles – 4. Fine texture.	Excellent table variety. Good for mouthwatering Bisebelabath (Sambar Rice). Also, used for Sweet Pongal.	Consumption improves skin texture. Easily digestible and provides high energy.
2.	Seeraga Samba (Raw White Aromatic Rice)	Ratio of rice to water is 1 : 2.5. Whistles – 3-4. Fine texture.	Table rice. Ideal South Indian aromatic variety for Biriyani and Kheer (Payasam).	Rich in Iron and easily digestible. Highly suitable for children.
3.	Kullakar (Boiled Red Rice)	Ratio of rice to water is 1 : 2.5. Whistles – 3. Coarse texture. Soak for 3 hours before cooking.	Table variety. Delicious Idlis and Kuzhipaniyaram (rice dumplings)	Low Glycemic Index. High in Iron. Zinc and Antioxidants. 27.1 mg / kg of Zinc.
4.	Kuzhiyadichan (Boiled Red Rice)	Ratio of rice to water is 1 : 2.5. Whistles – 4. Coarse texture. Soak for 3 hours before cooking.	Good table variety for boiled rice lovers. Used for delicious Sweet Pongal and Poondu Kanji (Garlic flavoured porridge - Chettinad Dish).	Rich in Antioxidants and Calcium. Recommended for children, pregnant and lactating mothers. 355.5 mg/kg of Calcium.
5.	Mappillai Samba (Boiled Red Rice)	Ratio of rice to water is 1 : 3. Whistles – 4. Coarse texture. Soak for 3 hours before cooking.	Table rice for boiled rice lovers. Can be mixed with Aval (Poha) and Aval Aappam can be made. Also good for Dosas and Idlis.	Low Glycemic Index. Rich in Iron. Has high fiber content. Most suited for diabetic patients.
6.	Karunkuruvai (Boiled Red Rice)	Ratio of rice to water is 1 : 2.5. Whistles – 4. Coarse texture. Soak for 3 hours before cooking.	Table rice and goes well with Sambar and Rasam. Also used for preparation of Aappam.	Low Glycemic Index. Rich in Iron, Calcium and Zinc. Highly nutritious containing a number of minerals. 124.4 mg/kg of Iron and 367.7 mg/kg of Calcium.

Note : The instructions given above are for cooking in pressure cooker and not in an electric rice cooker (water quantity should be increased if it is in rice cooker).

- Full whistles in a pressure cooker (in high flame) and switch off immediately after that.
- The cooking whistles are for those who prefer the grains to be separate and not mushy. If you need it to be mushy increase it by 2 more whistles.
- While some of the varieties have been mentioned for specific purposes and conditions (like Diabetes) it can be used by everyone.
- Soaking of certain red varieties is required for better cooking. Adjust soaking time according to requirement and preference.

Please send us your feedback (sempulamss@gmail.com) based on your experience and we will be happy to learn and improve!

PACKAGING, BRANDING AND RETAIL MARKETING

With an aim to create an awareness amongst consumers regarding the traditional rice varieties which will lead to the large scale consumption it was decided to launch a gift hamper for the festival season. CIKS was supported in this effort by Sempulam Sustainable Solutions. The development and marketing efforts were taken up by this company. The gift hamper was launched on September 19th, 2018. The product launched had the following special features.

- The rice varieties were vacuum packed and have a shelf life of a year.
- The gift box had six rice varieties.
- The box includes a listing of the varieties and suggestions about cooking (water required, cooking time and its suitability for various specific dishes).
- The box includes a greeting card from the farming community and a brochure about the *Namma Nellu* programme with art work specifically designed for the box.
- The rice varieties could also be purchased as individual mini boxes and customized boxes with 3, 4 and 5 varieties can also be made upon special request.

Additional gift hampers

During the course of the current year three additional gift hampers have been developed and

we summarise below the three themes and the contents of these gift hampers. The gift hamper that was launched during the year 2018 has now been relabelled as – “The Luxury Collection” and for the sake of completion it is also listed below.

1. The Aromatic Collection

The Aromatic Collection contains selected special aromatic varieties from across India. It includes the anthocyanin, antioxidant rich black rice from Manipur, the mineral rich *Mullan Kaima* from Kerala, the famous Buddha rice *Kalanamak* from the Gorakhpur region and the Biryani special *Seeraga Samba* from Tamil Nadu.

2. The Red Collection

Red collection includes the following varieties – *Kuzhiyadichan*, *Kullakar*, *Mappillai samba*, *Valiachennellu*, *Muttakaar* and *Sigappu kowni*

3. Mother and Child Collection

Mother and Child collection includes varieties specifically focusing on pregnant, lactating mothers and children. Varieties included in this box are – *Kuzhiyadichan*, *Seeraga samba*, *Navara*, *Neelan samba*, *Mullan kaima* and *Valiachennellu*.

4. The Luxury Collection

The standard luxury collection boxes include the following rice varieties - *Mappillai samba*, *Karunkuruvai*, *Kitchili samba*, *Seeraga samba*, *Kuzhiyadichan* and *Kullakar*.



A RAPID ASSESSMENT OF THE POTENTIAL MARKET FOR TRADITIONAL RICE VARIETIES –OVERVIEW OF THE EFFORT AND MAJOR CONCLUSIONS

CIKS had taken up a Tamil Nadu focused rapid study of the market for traditional rice varieties between December 2018 and January 2019. The major findings are summarized below.

- **The business case:** From a triple bottom line perspective, it is evident that traditional rice varieties are suitable for people (farmers and consumers) and the environment. It is also evident from this study that there is a compelling business case for traditional rice varieties.
- **The supply constraint:** Food businesses, Retailers, traders and millers have responded that the supply constraint is the critical challenge; they are confident they can market and sell increased production volumes of the top traditional rice varieties.
- **Volumes:** Significant monthly volumes of varieties such as *Seeraga Samba*, *Mappillai Samba* and *Kitchili Samba* are consistently registered by retailers, traders, millers, and farmer-aggregators in different locations of Tamilnadu state; these range from 1.5 tons retailed per month to 10 tons traded per month to 130 tons milled per month.
- **Consumer awareness:** Awareness levels of consumers are already increasing due to a combination of factors; with the increase in disposable income, this is resulting in a willingness to sample traditional rice varieties and value-added products; working on awareness and adoption can result in more households becoming regular consumers of traditional rice varieties for different consumption occasions.
- **Other drivers:** Interest is also evinced by stakeholders, such as *Siddha* and *Ayurveda* vaidyas and naturopaths,) who have a role in the promotion of Indian systems of nutrition and treatment.

Why traditional rice varieties?

Traditional rice varieties (also known as indigenous rice varieties) are important for a number of reasons:

For Consumer

1. More nutritious in comparison with modern varieties
2. Safer, as they can be cultivated organically.
3. Suited for specific groups (such as pregnant women and lactating mothers)
4. Suited for specific food preparations
5. Specific medicinal properties
6. Have lower Glycemic Index

For Producer

1. Have lower water requirement
2. Need less inputs (seed, fertiliser) in comparison
3. Varieties suitable for specific local soils (eg. saline, clayey, etc.)
4. More pest and disease-resistant, in comparison
5. Drought and flood-resilient
6. Yield more fodder
7. Greater resilience to climate change

Natural, socioeconomic, and cultural

1. Not harmful to the environment, water and soil.
2. Important part of rich biodiversity

1. Consumers

- a. At present, a selected number of varieties (a total of 30 varieties in Chennai city) account for the major share of the traditional rice varieties consumed.
- b. They are drawn by the appeal and novelty of – ‘traditional’ and the health gains that they promise.
- c. They look for specific varieties to meet the bulk of their requirements (for making tiffin items such as idlis or dosas and for consumption as part of the traditional meal).
- d. They seek more widespread availability through the year to purchase more easily and regularly; presently, traditional rice varieties are available in a limited number of stores during some parts of the year.
- e. Top drivers of consumer interest are:
 - i. A lifestyle with growing health consciousness and concerns
 - ii. Enhanced taste experience, and
 - iii. Affinity for the traditional
- f. In the larger market, consumers prefer polished rice, which limits their nutrition and health gains. However, there is a niche market where there is a great awareness about the benefits of these rices which are sought out and preferred. Increased acceptance of red rice varieties may be achieved by introducing dishes where the food in final form is naturally coloured (for example, sambar rice).
- g. Semi-polished rice may be the appropriate form to promote, in order to optimise both consumption and benefits.
- h. Most consumers do not differentiate between specific varieties of red rice; the marketer must weigh the costs and benefits of getting consumers to make the differentiation consistently.
- i. While some consumers accept the trade-off between benefits and inconvenience, most consumers give convenience a great deal of preference. For such consumers it is essential to provide help by offering ready to use mixes, powders etc. along with detailed instructions for cooking and handling.

2. Markets

- a. Effective marketing will need the application of - the 4P's (Product, Price, Place, and Promotion) framework, and also the 4A's (Acceptability, Affordability, Accessibility, and Awareness) framework.
- b. Of the 4A's, all respondents have highlighted the need, at the consumer end, to build the right awareness and increase acceptability; increased supply will take care of availability. For this, the marketer must work closely with the consumer in co-creating value (variety consumed, application, form (such as rice, flattened rice, or batter or snacks), unit size, and engagement).
- c. High-level value addition is also a possibility; specifically, one respondent referred to the possibility of developing, in appropriate form such as capsule or tea bag, a food supplement derived from traditional rice.
- d. Consumer segments have to be clearly defined, using geographic, demographic, behavioural, and psychographic parameters.
- e. The marketer who will play a key role in defining the market, the growth of the market, and in creating a well-established market for traditional rice varieties. The market has very few organised players; this represents an opportunity to gain the first mover advantage.



- f. Marketing must transform Curious Consumers into Committed Consumers.
- g. Some trends pull in opposite directions: one expert respondent noted that while the number of cooking shows continues to increase, the amount of time families with higher disposable incomes spend on cooking is coming down; having said so, it is also observed that the innovators/early adopters are willing to invest more money and time in tasting the traditional and experiencing the health gains. The experience could be aided by offering recipes, additional information, and videos hosted on popular portals like YouTube.
- h. The market creators will need to work a lot on ensuring convenience so that traditional rice varieties become **the staple** in the consumer's food basket; for instance, while a specific variety may be suitable for idli/dosa, a consumer may not have the time or inclination to go through the process; the marketer may consider tying up with organised players who are selling the batter. Reach and penetration will require collaboration with new channels/categories (new format restaurants, health clinics, naturopathy centres, producer companies, federations of women's groups, and other such routes).
- i. Some confusion is seen in the common parlance, in which millets are also referred to as *arisi* (rice).

3. Traders

- a. Traders can play a key role in aggregating and shaping the category, if a business win is designed for them.
- b. Traders see demand growing and identify supply side constraints as a key challenge.
- c. Trader practices vary; the tendency and ability to pass off one variety as another variety show the supply side constraints and a lack of consumer awareness respectively.
- d. Traders do not differentiate with respect to varieties of red rice as most consumers do not make the distinction.

4. Processors

- a. Some millers process specific varieties exclusively.

- b. The steady batch processing of traditional paddy through the year benefits the miller, helping them stay active during the conventional off-season for milling.

5. Producers

- a. Many farmers are committed to cultivating traditional rice varieties and have played a key role in conserving the varieties.
- b. If farmers get a good price and predictable demand, they will strengthen their commitment by increasing acreage and production.
- c. The market seems to be constrained by a combination of low prices to farmers, low productivity, and low acreage. Supply side and demand side interventions can minimize or eliminate these constraints – irrigation and inputs to ensure better yields, cultivation of traditional varieties in new areas where modern varieties are cultivated, and marketing initiatives that will generate better margins and returns to the farmers.
- d. Among the helpful interventions would be timely supply of good quality inputs.
- e. Marketing can also be helped by door step procurement.
- f. Efforts must be made to increase farmers income by helping them to move up the value chain. This could be achieved by locating some part of value addition activities at the farm or close to it such as – production of hand pounded rice, preparation of ready to use mixes and flours etc.
- g. We may consider creating a business design that ensures a role for such farmer aggregators. This will create one category of aggregator, in addition to the category of producer companies.
- h. We should consider working with a selected number of traders to drive the chain, with the right belief system.
- i. Keeping in mind the time it will take to catalyse an increase in production, it seems prudent to focus on - Widening consumer awareness and sampling (getting more consumers curious about traditional rice varieties) on the one hand and deepening adoption (nudging the occasional consumer to become a regular convinced consumer).

6. Retail stores : a snap shot from the Chennai city

During the early part of 2018 we carried out a survey of 12 existing well known and popular outlets for traditional rice varieties in and around Chennai. As part of branding, price fixing and market positioning of our traditional rice varieties, it was important to understand the existing varieties currently on the shelves and online markets and the prices and quantity at which they are sold. The key observations and findings of this study are listed below.

- The survey was conducted with twelve stores, both online and through physical visits.
- This exercise revealed that more than 32 varieties of traditional rice are currently available in the market.
- More than ten varieties were available in at least three stores, namely Bamboo rice, *Kavuni*, *Karunkuruvai*, *Kitchili Samba*, *Kullakar*, *Kattuyanam*, *Mappillai Samba*, *Navara*, *Poongar*, *Thooyamalli* and *Seeraga samba* (while Bamboo rice is not truly a – “variety of rice” it is included in this listing since in various stores, articles, cook books etc. it finds a mention today).

The information about the prices is summarised below.

- The prices of the varieties range from a lower limit of Rs. 90/- per kg (the price of *Arupatham Kuruvai* in one store) to an upper limit of Rs. 530/- per kg (the price of *Khasi Red Rice* in one store).
- The average price of a traditional rice variety is Rs. 197/- per kg.
- In terms of the distribution of prices in various ranges the following is a summary of the price per kilo gram in Rupees.

• Less than Rs. 100/-	3 varieties
• Between Rs. 100/- and Rs. 200/-	17 varieties
• Between Rs. 200/- and Rs. 300/-	4 varieties
• Between Rs. 300/- and Rs. 400/-	5 varieties
• Between Rs. 400/- and Rs. 500/-	1 variety
• Above Rs. 500/-	2 varieties

The above rices include both conventional (chemically cultivated) varieties as well as organically cultivated varieties.

Some of the important takeaways from this survey are the following : -

- The consumers place a greater value on – “Traditional varieties” than on the “Organic” label.
- A regular supply of the varieties with an assured quality will ensure a good market.
- Consumers are very open to paying a premium price for good quality traditional varieties as seen from the fact that the average price commanded by these varieties is as high as Rs. 200/- per kg.

7. Niche restaurants : a snap shot from the Chennai city

- More than 70% of the chefs use three or more rice varieties of rice at their restaurant
- Basmati is the most popular variety with 85% of the chefs using Basmati rice.
- Jasmine and Risotto rices are the next most popular with 30% of the chefs using them
- A few chefs already use Red rice and Black rice in their menus.
- Fried rice, Jeera rice, Biryani and Risotto are the most popular dishes made by chefs where the above rices are used.

Based on the responses we can draw the following conclusions -

- The “sticky” character and long grain (not aroma) of rice is the reason for the popular usage of the variety.
- More than 70% chefs mentioned that Biryani is their most selling dish but Red rice has found favour with a few chefs for making dosa.
- What is encouraging is the already existing awareness and usage of varieties of Red and Black rice to provide a differentiated experience. It seems like supply and awareness would quite easily drive demand.

AN EXPERIENTIAL LUNCH WITH TRADITIONAL RICE VARIETIES

On 20th October, 2019 CIKS organized an experiential lunch using traditional rice varieties. It was organized in collaboration with Crowne Plaza Hotel and the objective of this effort was to create a visibility and public awareness about these varieties as well as provide an opportunity for a cross section of interested persons to savour a lunch prepared with these varieties.

The participants in this meet included –

- Farmers and representatives of farmer producer organisations from the districts of Kancheepuram, Tiruvannamalai and Nagapattinam.
- Scientists and technical staff who have been involved in conservation and documentation of the properties of these varieties in the field.
- The team members of Sempulam Sustainable Solutions who have been involved in developing products and special packaging for the marketing and promotion of these traditional varieties.

- Persons who have been involved in studies and research in various ways including – nutritionists, culinary artists, food technologists, medical specialists and others.
- Individuals and institutions which have been supporting this effort in various ways including – representatives of companies, non-profits and financial organisations.
- Members of the press and social media and bloggers particularly those specializing in food and culinary events.

In the first part of this celebration CIKS introduced to the participants the field staff and farmer representatives involved in this effort. The CIKS Director gave an overview about the CIKS efforts going back to the last 25 years. The Director of Sempulam Sustainable Solutions provided an overview of the efforts to promote and develop a market for these products.

Following this three persons shared their experience with testing and cooking a variety of dishes using traditional varieties. These were Ms. Parvathy working with Sempulam Sustainable Solutions in Chennai, Mrs. Revathi Shanmugam, well known Chef and Mr. Deva, Executive Chef of



CELEBRATING TRADITIONAL RICE VARIETIES

MENU

SOUP

- Cream Of Wild Rice (Mullan Kaima)

SALADS

- Red Rice (Karunkuruvai) & Mint With Soya Dressing
- Vegan Rice (Kuzhiyadichan) With Sweet Pepper
- Mappilai Samba With Jaggery & Coconut

MAIN COURSE

- Thengai Poo Samba Besibella Bath
- Seeraga Samba Kaai Brinji
- Mullan Kaima Malabar Biryani
- Kullakar Red Rice & Kadamba Sambar
- Kullkar Red Rice Kuzhi Paniyaram
- Madulai Aval (Kullakar Aval) Thayir Sadam

BREADS

- Akki (Seeraga Samba) Roti
- Kitchili Samba Idiyappam

LIVE COUNTER

- Karuppu Kowni Arisi Dosa & Kadamba Sambar
- Tomato / Coconut Podi /Curry Leaves Podi
Coriander/Tamarind With The Following Rices
Mappillai Samba/Thengaipoo Samba /Mullan Kaima,
Kuzhiadichan/Chakkhao Poireiton

DESSERT

- Karuppu Kowni Arisi Ladoo
- Ilupaipoo Samba Payasam
- Chakhao Poireiton Phirni

Crowne Plaza Hotel. Following this the gathering honoured both Mrs. Revathy Shanmugam and Mr. Deva with shawls for their role in promoting and publicizing the use of traditional rice varieties.

Celebrating Traditional Rice Varieties

The highlight of the gathering was a lunch that had been organized making use of various traditional rice varieties. The meal included soups, salads, main courses, breads and deserts in addition to a – “live counter” which was preparing and serving a range of dishes on request. We are happy to share in the accompanying page a menu of the items that was served.

UPSCALING CULTIVATION AND MARKETING-PLANS FOR THE COMING YEAR

Besides continuing the conservation activity which is the core of *Namma Nellu*, we plan to upscale the cultivation of at least 25 traditional varieties in 1250 acres of land in the coming year. Through the producer companies and Sempulam we hope to market at least 1000 MT of traditional varieties thereby creating a high visibility and markets for these varieties.



Mrs. Subhashini Sridhar, CEO of Valanadu Producer Company honouring the well known Chef Mrs. Ravathy Shanmugam



Mr. A.V. Balasubramanian, Director, CIKS honouring Mr. Deva, Executive Chef of Crowne Plaza Hotel, Chennai

PROFILE OF SELECTED TRADITIONAL RICE VARIETIES

Based on our efforts during the last 25 years we have shortlisted a set of about 50 rice varieties which we consider as important. These have been selected based on various criteria such as –

1. Agronomic properties
2. Nutritional and therapeutic properties
3. Importance from the point of view of climate change resilience
4. Demand in the market

We have focused upon these varieties and taken up the following activities –

1. Identified a set of farmers who have taken up to conserve the seeds and scale up the supply to meet future demands.
2. Characterisation of nutritional properties of these varieties
3. Consolidation of information about the agronomic properties from our field records and
4. Consolidation of information from the literature, both technical as well as popular literature

PROFILE OF THE VARIETIES

In terms of the profile of each variety we have presented the following :

1. Name
2. Agronomical aspects including – season, method of cultivation, crop duration, average and maximum height, lodging characteristics, suitability of soil type for cultivation etc.
3. Yield details – yield of grain, yield of straw and number of grains per ear head
4. Grain characteristics – colour, 1000 grains weight, nature of the rice
5. Nutritional properties

6. Cooking / dishes
7. Other information such as – folklore, importance for disaster management etc.

Of course, not all these details are available for each of the varieties. For some varieties the details available are more extensive and richer.

DEFINITIONS AND INTERPRETATIONS

1. Crop seasons

In terms of the crop season we have used the following terminology which is widely in use for varieties that are cultivated in Tamil Nadu

- i. *Sornavari* : April 15 – August 15 (Tamil months *Chithirai – Adi*)
- ii. *Samba* : July 15 – January 14 (Tamil months *Adi – Margazhi*)
- iii. *Late samba* : September 15 – February 14 (Tamil months : *Puratasi – Thai*)
- iv. *Navarai* : December 15 – March 14 (Tamil months : *Margazhi – Masi*)

2. Nutritional properties

With respect to nutritional properties, we have used terms such as – high, very high etc.

For the purpose of communication in this book we have defined these terms for the rice varieties by comparison with standard values of nutritional properties of traditional rice varieties given in the nutritional tables published by National Institute of Nutrition – please see Chapter – IV Section C of this publication for details.

ADUKKUNEL 1



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

140 days crop, average height 122 cms and maximum height 135 cms, lodging variety.

EARHEAD

142 grains per earhead

CHARACTERISTICS OF THE GRAIN

White in colour, medium rice, weight of 1000 grains is 37.0 gms

YIELD PER ACRE

1000 kgs of grain and 1800 kgs of straw

NUTRITIONAL PROPERTIES

High in total ash and protein. Very high in fat. In terms of minerals, it is high in potassium, iron, magnesium, zinc and phosphorus and very high in calcium.

AMBEMOHAR 2



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

135 days crop, average height 85 cms and maximum height 97 cms, lodging variety.

EARHEAD

60 grains per earhead

CHARACTERISTICS OF THE GRAIN

White in colour, medium rice, weight of 1000 grains is 17.0 gms

YIELD PER ACRE

600 kgs of grain and 1800 kgs of straw

NUTRITIONAL PROPERTIES

High in total ash, protein, and fat. In terms of minerals, it is high in potassium, magnesium, zinc and very high in calcium, iron and phosphorus.

OTHER INFORMATION

Ambemohar is from Maharashtra. It was very popular among the Maratha rulers.

GARUDAN SAMBA 3



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

130 days crop, average height 118 cms and maximum height 135 cms, lodging variety.

EARHEAD

89 grains per earhead

CHARACTERISTICS OF THE GRAIN

White in colour, fine rice, weight of 1000 grains is 26.0 gms

YIELD PER ACRE

900 kgs of grain and 1300 kgs of straw

NAME

The appearance of the grains is like the neck of the brahmini kite (Garudan) - ie. it has a white ring and hence the name.

NUTRITIONAL PROPERTIES

High in total ash and protein. Very high in fat. In terms of minerals, it is high in potassium, zinc, phosphorus and very high in calcium, iron and magnesium.

COOKING / DISHES

This variety is highly suitable for South Indian meal. It is suitable for making a specialty dish called *Puttu* of South India.

ILUPPAI POO SAMBA 4



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

120 days crop, average height 110 cms and maximum height 118 cms, lodging variety.

EARHEAD

135 grains per earhead

CHARACTERISTICS OF THE GRAIN

White in colour, fine rice, weight of 1000 grains is 19.0 gms

YIELD PER ACRE

700 kgs of grain and 1200 kgs of straw

NAME

The grain has a fragrance like Madhuca flower (*Iluppai Poo* in Tamil). Samba is the cultivation season.

NUTRITIONAL PROPERTIES

It is high in protein and fat. In terms of minerals, it is high in iron, calcium and zinc.

COOKING / DISHES

Ideal for making Kheer.

OTHER INFORMATION

Relatively resistant to pests and a hardy variety said to be useful for diabetes and knee pain. The *Kanji* is said to be helpful for *Pakshavatha* (a kind of paralysis that effects one side / part of the limbs)

IRAVAIPANDI 5



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

120 days crop, average height 145 cms and maximum height 167 cms, lodging variety.



EARHEAD

148 grains per earhead

CHARACTERISTICS OF THE GRAIN

Rice is white in colour, grain is pale yellow in colour, medium rice, weight of 1000 grains is 22.0 gms

YIELD PER ACRE

1350 kgs of grain and 1800 kgs of straw

NUTRITIONAL PROPERTIES

High in total ash and protein. In terms of minerals, it is high in potassium, iron, magnesium, zinc and very high in calcium and phosphorus.

COOKING / DISHES

It is suitable for the preparation of South Indian meals.

JEERAGASALAE 6



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

150 days crop, average height 98 cms and maximum height 110 cms, lodging variety.

EARHEAD

127 grains per earhead

CHARACTERISTICS OF THE GRAIN

White in colour, fine rice, weight of 1000 grains is 23.0 gms

YIELD PER ACRE

650 kgs of grain and 980 kgs of straw

NUTRITIONAL PROPERTIES

High in protein. In terms of minerals, it is high in iron, magnesium and zinc.

KADAIKAZHUTHAN 7



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

170 days crop, average height 135 cms and maximum height 150 cms, lodging variety.

EARHEAD

160 grains per earhead

CHARACTERISTICS OF THE GRAIN

Grain is red in colour, rice is white in colour, fine rice, weight of 1000 grains is 27.0 gms

YIELD PER ACRE

1350 kgs of grain and 1200 kgs of straw

NAME

As per one view, it is identical to 'Garudan samba'. The appearance of the grains is like the neck of the brahmini kite (Garudan) - ie. it has a white ring and hence the name.

NUTRITIONAL PROPERTIES

High in total ash and protein. Very high in fat. In terms of minerals, it is high in potassium, iron, magnesium, zinc, and phosphorus. Very high in calcium.

COOKING / DISHES

The rice of the variety is highly suitable for the South Indian meal. It is suitable for making a specialty dish called *Puttu* of South India.

OTHER INFORMATION

Grows well in areas which has good drainage facilities

KAIVARI SAMBA 8



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

130 days crop, average height 145 cms and maximum height 158 cms, lodging variety.

EARHEAD

147 grains per earhead

CHARACTERISTICS OF THE GRAIN

Red in colour, bold rice, weight of 1000 grains is 28.0 gms

YIELD PER ACRE

650 kgs of grain and 1300 kgs of straw

NUTRITIONAL PROPERTIES

High in total ash and protein. Very high in fat. In terms of minerals, it is high in magnesium, zinc, and phosphorus. Very high in potassium, iron and calcium. Rich in folic acid which is required for the growth of the foetus.

COOKING / DISHES

This variety is suitable for table rice, idly, dosa, *idiyappam* and aval/ poha.

OTHER INFORMATION

Resistant to pest and diseases. Resistant to both drought and water logging.

KALANAMAK 9



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

120 days crop, average height 107 cms and maximum height 125 cms, lodging variety.

Highly Susceptible to pests and diseases

EARHEAD

78 grains per earhead

CHARACTERISTICS OF THE GRAIN

White in colour, fine rice, weight of 1000 grains is 23.0 gms

YIELD PER ACRE

640 kgs of grain and 1960 kgs of straw

NAME

The name is derived from the Black (Kala) husk and the mildly salty (*Namak*) taste. The term *namak* may also indicate that it can grow any saline soil.

NUTRITIONAL PROPERTIES

It is very high in protein and high in fat. In terms of minerals, it is high in iron, calcium and zinc.

COOKING / DISHES

An aromatic table rice. Can be used for pulav and variety rices (Coconut rice, lemon rice etc.). Suitable for making kheer (*Payasam*) also. A very good alternative to Basmati.

OTHER INFORMATION

The rice originates in U.P. and has a GI Tag.

ROLE IN DISASTER MANAGEMENT

It grows in saline soil and could be used for the restoration of tsunami affected lands in Nagapattinam district.

KALARPALAI 10



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

130 days crop, average height 105 cms and maximum height 120 cms, lodging variety.

EARHEAD

120 grains per earhead

CHARACTERISTICS OF THE GRAIN

Dull white in colour, bold rice, weight of 1000 grains is 32.0 gms

YIELD PER ACRE

550 kgs of grain and 1110 kgs of straw

NUTRITIONAL PROPERTIES

High in protein. In terms of minerals, it is high in iron, calcium, and zinc.



OTHER INFORMATION

Relatively resistant to pests and diseases. Yield of straw and grains will be less.

AREA OF CULTIVATION

In the alkaline soils of Tamil Nadu, Kalarpalai alone can be cultivated.

ROLE IN DISASTER MANAGEMENT

Kalarpalai grows well in saline soil. In the tsunami affected coastal region of Nagapattinam district which were immersed under sea water for various periods ranging from 20 to 120 minutes. Therefore the saline water became unfit for the cultivation of several modern and hybrid paddy varieties.

KALIYAN SAMBA 11



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

160 days crop, average height 124 cms and maximum height 150 cms, lodging variety.

EARHEAD

148 grains per earhead



CHARACTERISTICS OF THE GRAIN

Grain is yellow in colour, rice is red in colour, bold rice, weight of 1000 grains is 30.0 gms

YIELD PER ACRE

1200 kgs of grain and 1550 kgs of straw

NUTRITIONAL PROPERTIES

High in total ash, protein and fat. In terms of minerals, it is high in potassium, iron, magnesium, zinc, and phosphorus. Very high in calcium.

COOKING / DISHES

Ideal for making *idly* and *dosa*.

OTHER INFORMATION

Highly resistant to pest and disease. Resistant to water logging.

KAMBAN SAMBA 12



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

140 days crop, average height 110 cms and maximum height 118 cms, lodging variety.

EARHEAD

171 grains per earhead

CHARACTERISTICS OF THE GRAIN

Dull white in colour, Medium rice, weight of 1000 grains is 20.0 gms

YIELD PER ACRE

1300 kgs of grain and 1950 kgs of straw

NUTRITIONAL PROPERTIES

High in protein. In terms of minerals, it is high in iron, calcium and zinc.

COOKING / DISHES

Ideal for making *pongal*.

KAPPAKAR 13



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

150 days crop, average height 123 cms and maximum height 130 cms, medium lodging variety.

EARHEAD

180 grains per earhead

CHARACTERISTICS OF THE GRAIN

Grain is dark brown in colour, rice is brown in colour, bold rice, weight of 1000 grains is 28.0 gms

YIELD PER ACRE

1350 kgs of grain and 1800 kgs of straw

NUTRITIONAL PROPERTIES

High in total ash, protein and fat. Very high in fat. In terms of minerals, it is high in potassium and zinc. Very high in iron, calcium, magnesium and phosphorus.



COOKING / DISHES

This variety is highly suitable for making *idly*, *dosa* and *Aval* (flattened rice).

OTHER INFORMATION

Kappakar is tolerant to drought, flood, pest and diseases. This variety is grown in dry land areas and can survive and produce yields even under extreme dry conditions where no other rice cultivars can survive.

AREAS OF CULTIVATION

In Tamil Nadu a large number of farmers preferred to cultivate *Kappakar* in the clayey soils of Madurai rather than High yielding varieties.

CULTURAL PRACTICES

This variety is used in the feast given during several rituals like "*Seemantham*" (a ritual conducted during pregnancy).

KARUNGKURUVAI 14



CULTIVATION ASPECTS

Navarai and Kuruvai season

AGRONOMICAL ASPECTS

125 days crop, average height 95 cms and maximum height 101 cms, lodging variety.

EARHEAD

85 grains per earhead

CHARACTERISTICS OF THE GRAIN

Grain is black in colour, rice is dark brown in colour, bold rice, weight of 1000 grains is 25.48 gms

YIELD PER ACRE

825 kgs of grain and 1200 kgs of straw

NUTRITIONAL PROPERTIES

High in total ash, protein and fat. In terms of minerals, it is high in potassium and magnesium. Very high in iron, calcium, zinc and phosphorus.

COOKING / DISHES

It is ideal for making *idly*, *dosa*

OTHER INFORMATION

This is highly valued by the Siddha physicians, who use it for the treatment of Filariasis.

GI OF KARUNGKURUVAI

The Glycemic index (GI) of *karungkuruvai* is in the range of 50 -55 which is low in GI when compared to market varieties such as white ponna.

KARUPPUKOWNI 15



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

130 days crop, average height 120 cms and maximum height 144 cms, lodging variety.

EARHEAD

170 grains per earhead

CHARACTERISTICS OF THE GRAIN

Dark brown in colour, bold rice, weight of 1000 grains is 42.0 gms

YIELD PER ACRE

800 kgs of grain and 1200 kgs of straw

NUTRITIONAL PROPERTIES

High in protein and fat. Very high in ash. In terms of minerals, it is high in potassium, magnesium, and zinc. Very high in iron, calcium and phosphorus.

COOKING / DISHES

Ideal for making *idly, dosa* and dessert.

OTHER INFORMATION

Said to be useful in the treatment of poisons / poisonous bites. Highly value by the *Chettiar* community of Tamil Nadu who offer dishes from this variety on special occasions and for honoured guests.



KAATUYANAM 16



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

150 days crop, average height 160 cms and maximum height 180 cms, lodging variety.

EARHEAD

110 grains per earhead

CHARACTERISTICS OF THE GRAIN

Red in colour, bold rice, weight of 1000 grains is 29.0 gms

YIELD PER ACRE

900 kgs of grain and 1400 kgs of straw

NUTRITIONAL PROPERTIES

High in protein and fat. In terms of minerals, it is very high in potassium, iron, calcium, magnesium, zinc and phosphorus.

COOKING / DISHES

Ideal for making *idly*, *dosa*, *idiyappam* and *kheer*. Suitable for table rice.

OTHER INFORMATION

Resistant to pest and diseases. The straw mixed with amirthakaraisal is a good food for the microbes present in the soil. It is said to grow very tall - to the height of an elephant according to the folklore.

KITCHILI SAMBA 17



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

140 days crop, average height 102 cms and maximum height 120 cms, lodging variety.

EARHEAD

130 grains per earhead

CHARACTERISTICS OF THE GRAIN

White in colour, fine rice, weight of 1000 grains is 17.0 gms

YIELD PER ACRE

1125 kgs of grain and 1050 kgs of straw

NUTRITIONAL PROPERTIES

Raw *Kitchili samba* is high in protein and very high in iron. Calcium, magnesium and zinc are high in minerals. Boiled *Kitchili samba* is high in protein and fat. High in iron, magnesium and zinc.

COOKING / DISHES

This variety is suitable for the South Indian meal and also used for making a special dish called 'briyani'.

OTHER INFORMATION

Resistant to pests and diseases. Suitable for dry sowing.



KOOMVAZHAI 18



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

130 days crop, average height 135 cms and maximum height 142 cms, lodging variety.

EARHEAD

220 grains per earhead

CHARACTERISTICS OF THE GRAIN

Grain is yellow in colour, rice is brown in colour, bold rice, weight of 1000 grains is 28.0 gms

YIELD PER ACRE

1350 kgs of grain and 1800 kgs of straw

NAME

Koomvazhai is also called as *koompaalai* and *Koomvaalai*.

NUTRITIONAL PROPERTIES

High in total ash and protein. In terms of minerals, it is high in potassium, and iron. Very high in calcium, magnesium, zinc, and phosphorus.

COOKING / DISHES

The rice is highly suitable for making dishes such as *idly* and *dosa*.

OTHER INFORMATION

This variety is suitable for sandy soil and also areas prone to water logging. Consumption of this rice regularly during pregnancy period, will reduce the pain at the time of delivery.

USE OF STRAW

As a roofing material

KOTHAMALLI SAMBA 19



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

135 days crop, average height 108 cms and maximum height 117 cms, lodging variety.

EARHEAD

132 grains per earhead

CHARACTERISTICS OF THE GRAIN

Grain is in straw colour, rice is in dull white colour, medium bold rice, weight of 1000 grains is 32.0 gms

YIELD PER ACRE

1000 kgs of grain and 1900 kgs of straw

NUTRITIONAL PROPERTIES

High in protein and fat. In terms of minerals, it is high in iron, calcium, zinc and phosphorus.

NAME

The grains resemble Coriander (*Kothamalli* in Tamil) and hence the name.

KOTTARA SAMBA 20



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

130 days crop, average height 124 cms and maximum height 140 cms, lodging variety.

EARHEAD

74 grains per earhead

CHARACTERISTICS OF THE GRAIN

Red in colour, bold rice, weight of 1000 grains is 22.0 gms

YIELD PER ACRE

700 kgs of grain and 1300 kgs of straw

NUTRITIONAL PROPERTIES

High in total ash and protein. Very high in fat. In terms of minerals, it is high in iron, magnesium, and phosphorus. Very high in zinc.

KUDAIVAZHAI 21



CULTIVATION ASPECTS

Late Samba season

AGRONOMICAL ASPECTS

130 days crop, average height 135 cms and maximum height 152 cms, lodging variety. This variety is highly suitable for areas where there is water logging. Since this is a short duration variety it can even be cultivated thrice a year.

EARHEAD

230 grains per earhead

CHARACTERISTICS OF THE GRAIN

Grain is straw in colour, rice is red in colour, bold rice, weight of 1000 grains is 32.0 gms

YIELD PER ACRE

1600 kgs of grain and 1800 kgs of straw

NAME

The earheads of this variety appear like open umbrellas and hence the name 'Kudaivazhai' (*Kudai* = Umbrella).

NUTRITIONAL PROPERTIES

High in total ash and protein. Very high in fat. In terms of minerals, it is high in potassium. Very high in iron, calcium, zinc, magnesium and phosphorus. Has a low Glycemic Index.

COOKING / DISHES

The rice of this variety is highly suitable for making dishes such as *Idly* and *Dosa*.

OTHER INFORMATION

Straw is used as roofing material

KUZHIADICHAN 22



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

120 days crop, average height 80 cms and maximum height 97 cms, lodging variety.

EARHEAD

110 grains per earhead

CHARACTERISTICS OF THE GRAIN

Grain is yellow with black stripes in colour, rice is brown in colour, bold rice, weight of 1000 grains is 33.0 gms

YIELD PER ACRE

975 kgs of grain and 900 kgs of straw

NAME

It is also called *Kulikulichan*.

NUTRITIONAL PROPERTIES

High in total ash and protein. Very high in fat. In terms of minerals, it is high in potassium, zinc, and phosphorus. Very high in iron, calcium and magnesium.

Recommended for lactating mothers, since it is said to increase the milk flow.

COOKING / DISHES

It is highly suitable for making dishes such as *idly* and *dosa*.

OTHER INFORMATION

Suitable for saline soil and land which has good drainage facility. Highly drought resistant. Resistant to pests and diseases.

KULLAKAR 23



CULTIVATION ASPECTS

Sornavari, navarai season

AGRONOMICAL ASPECTS

120 days crop, average height 87 cms and maximum height 100 cms, lodging variety.

EARHEAD

100 grains per earhead

CHARACTERISTICS OF THE GRAIN

Grain is straw in colour, rice is red in colour, bold rice, weight of 1000 grains is 30.0 gms

YIELD PER ACRE

1500 kgs of grain and 1500 kgs of straw

NUTRITIONAL PROPERTIES

High in total ash and protein. Very high in fat. In terms of minerals, it is high in potassium. Very high in iron, calcium, magnesium, zinc and phosphorus. The Glycemic Index is low.



COOKING / DISHES

This variety is highly suitable for preparing the *idly* and *dosa*. It is also used in the preparation of porridge

OTHER INFORMATION

Resistant to pest and disease. Highly drought resistant. Since it is a short duration variety it can be grown in all the three seasons. Straw is used as a roofing material.

MAPILLAI SAMBA 24



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

160 days crop, average height 137 cms and maximum height 147 cms, lodging variety.

EARHEAD

135 grains per earhead

CHARACTERISTICS OF THE GRAIN

Red in colour, bold rice, weight of 1000 grains is 31.0 gms

YIELD PER ACRE

750 kgs of grain and 1600 kgs of straw

NAME

The word '*mapillai*' means 'bridegroom'. It is said that the *Kanji* was good to impart strength and stamina and hence was sought after by young men seeking brides !

NUTRITIONAL PROPERTIES

Very high in fat. In terms of minerals, it is very high in potassium, iron, magnesium and phosphorus.

COOKING / DISHES

Table rice for boiled rice lovers. Can be mixed with aval (Poha) and *aval aappam* can be made. Also good for *dosa* and *idly*.

OTHER INFORMATION

It is recommended for strength and stamina.

GLYCEMIC INDEX

GI of *Mapillai Samba* is low compared to market varieties such as *White Ponni*. GI of *mapillai samba* are in the range of 66 – 70.

MOZHIKARUPPU SAMBA 25



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

120 days crop, average height 125 cms and maximum height 135 cms, lodging variety.

EARHEAD

220 grains per earhead

CHARACTERISTICS OF THE GRAIN

Red in colour, bold rice, weight of 1000 grains is 36.0 gms

YIELD PER ACRE

600 kgs of grain and 1600 kgs of straw

NUTRITIONAL PROPERTIES

High in total ash. Very high in fat. In terms of minerals, it is high in iron and zinc.

MULLAN KAIMA 26



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

150 days crop, average height 82 cms and maximum height 103 cms, lodging variety.

CHARACTERISTICS OF THE GRAIN

White in colour, medium rice.

NUTRITIONAL PROPERTIES

High in total ash. Very high in fat. In terms of minerals, it is high in iron, calcium, and zinc.

COOKING / DISHES

Suitable for Table rice. Most suited exotic rice for making all types of *biryani*. Delicious Kheer (*Payasam*) can be made.

AREA OF CULTIVATION

Grown by tribal communities in the Wayanad area of Kerala has been awarded a GI tag.

NAVARA 27



CULTIVATION ASPECTS

Navarai season

AGRONOMICAL ASPECTS

90 days crop, average height 108 cms and maximum height 115 cms, lodging variety.

EARHEAD

110 grains per earhead

CHARACTERISTICS OF THE GRAIN

Red in colour, medium rice, weight of 1000 grains is 39.0 gms

YIELD PER ACRE

700 kgs of grain and 1087 kgs of straw

NUTRITIONAL PROPERTIES

High in protein. Very high in fat. In terms of minerals, it is very high in potassium, magnesium, iron, zinc, calcium and phosphorus.

COOKING / DISHES

Suitable for table rice. Ideal weaning food for children. Good for Kerala *nei payasam*. Suitable for tasty porridge.

AREA OF CULTIVATION

Navara is a Kerala rice. It is still being cultivated in restricted pockets of Kerala on a small scale for its medicinal properties.

MEDICINAL USE

Navara rice is used for the specialty treatment from Kerala - *Panchakarma* therapy. Said to cure *Tridoshas*. Can be given to children as a weaning food.

NEELAM SAMBA 28



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

180 days crop, average height 132 cms and maximum height 155 cms, lodging variety.

EARHEAD

185 grains per earhead

CHARACTERISTICS OF THE GRAIN

Grain is yellow with black in colour, rice is red in colour, bold rice, weight of 1000 grains is 29.0 gms

YIELD PER ACRE

1500 kgs of grain and 1800 kgs of straw

NUTRITIONAL PROPERTIES

High in total ash. Very high in fat. In terms of minerals, it is high in potassium, iron, zinc, and phosphorus. Very high in magnesium and calcium. The Glycemic Index is low. Traditionally it is considered as very good for lactating mothers, since it increases the milk flow.

COOKING / DISHES

Suitable for table rice. Used for making delicious *idlies*, ideal for nutritious porridge for breakfast.

OTHER INFORMATION

A highly suitable variety for areas which are prone to water logging. Resistant to brown plant hopper and earhead bug. The straw is used as roofing material.

OTTADAI 29



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

150 days crop, average height 128 cms and maximum height 153 cms, lodging variety.

EARHEAD

147 grains per earhead

CHARACTERISTICS OF THE GRAIN

White in colour, medium rice, weight of 1000 grains is 41.0 gms

YIELD PER ACRE

1000 kgs of grain and 1800 kgs of straw

NUTRITIONAL PROPERTIES

High in total ash and protein. Very high in fat. In terms of minerals, it is high in potassium, iron, magnesium, zinc, and phosphorus

AREA OF CULTIVATION

It is cultivated in Tanjore district.



PAL KUDAIVAZHAI 30



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

130 days crop, average height 132 cms and maximum height 140 cms, lodging variety.

EARHEAD

89 grains per earhead

CHARACTERISTICS OF THE GRAIN

Red in colour, bold rice, weight of 1000 grains is 20.0 gms

YIELD PER ACRE

600 kgs of grain and 1300 kgs of straw

NUTRITIONAL PROPERTIES

High in total ash. Very high in fat. In terms of minerals, it is high in iron, magnesium and zinc.

PISINI 31



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

130 days crop, average height 102 cms and maximum height 111 cms, lodging variety.

EARHEAD

160 grains per earhead

CHARACTERISTICS OF THE GRAIN

Grain is black with yellow stripes in colour, red in colour, bold rice, weight of 1000 grains is 19.0 gms

YIELD PER ACRE

1350 kgs of grain and 1500 kgs of straw

NUTRITIONAL PROPERTIES

High in total ash and protein. Very high in fat. In terms of minerals, it is high in iron, calcium, and magnesium.

COOKING / DISHES

Extremely suitable for making *dosa* and porridge. Also suitable for making '*Aval*' (flattened rice).

OTHER INFORMATION

Highly drought resistant. Since the earheads are found with awn it is important to take extra care while removing the grains. If there is excess mist during the milky stage the grains become chaffy. It helps to reduce hip pain and usually young girls are fed with this rice variety after attaining puberty. This helps to get rid of hip pain associated with menstruation. It can also be given for a pain free delivery.

POOMPALAI 32



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

150 days crop, average height 130 cms and maximum height 147 cms, lodging variety.

EARHEAD

150 grains per earhead

CHARACTERISTICS OF THE GRAIN

Red in colour, bold rice, weight of 1000 grains is 40.0 gms

YIELD PER ACRE

1100 kgs of grain and 1800 kgs of straw

NUTRITIONAL PROPERTIES

High in total ash. Very high in fat. In terms of minerals, it is high in potassium, iron, calcium, magnesium, zinc, and phosphorus.

COOKING / DISHES

Suitable for *idly*, *dosa*, poha and puffed rice.

AREA OF CULTIVATION

Thiruvallur district

POOVAN SAMBA 33



CULTIVATION ASPECTS

Navarai season

AGRONOMICAL ASPECTS

145 days crop, average height 125 cms and maximum height 136 cms, lodging variety.

EARHEAD

128 grains per earhead

CHARACTERISTICS OF THE GRAIN

Red in colour, bold rice, weight of 1000 grains is 30.0 gms

YIELD PER ACRE

1400 kgs of grain and 2200 kgs of straw

NUTRITIONAL PROPERTIES

High in total ash and fat. In terms of minerals, it is very high in potassium, iron, calcium, magnesium, zinc and phosphorus.

COOKING / DISHES

Suitable for table rice. Ideal for making *murukku* – a deep fried snack made from rice

RASAKADAM 34



CULTIVATION ASPECTS

Navarai season

AGRONOMICAL ASPECTS

125 days crop, average height 109 cms and maximum height 120 cms, non-lodging variety.

EARHEAD

155 grains per earhead

CHARACTERISTICS OF THE GRAIN

Grain is yellowish red in colour, rice is white in colour, fine rice, weight of 1000 grains is 19.0 gms

YIELD PER ACRE

1125 kgs of grain and 1560 kgs of straw

NUTRITIONAL PROPERTIES

Very high in fat. In terms of minerals, it is high in iron, calcium, magnesium and zinc.

COOKING / DISHES

It is ideal for preparation of South Indian meals.

OTHER INFORMATION

This variety is highly suitable for mountainous regions.

SALEM SAMBA 35



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

135 days crop, average height 104 cms and maximum height 107 cms, lodging variety.

EARHEAD

150 grains per earhead

CHARACTERISTICS OF THE GRAIN

Grain is yellowish red in colour, rice is white in colour, fine rice, weight of 1000 grains is 17.0 gms

YIELD PER ACRE

1200 kgs of grain and 1800 kgs of straw

NUTRITIONAL PROPERTIES

High in total ash and protein. Very high in fat. In terms of minerals, it is high in iron, calcium, magnesium, and zinc.

COOKING / DISHES

It is ideal for preparing South Indian meals

SAMBA MOSANAM 36



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

170 days crop, average height 138 cms and maximum height 152 cms, lodging variety.

EARHEAD

200 grains per earhead

CHARACTERISTICS OF THE GRAIN

Grain is in straw colour, rice is in red colour, bold rice, weight of 1000 grains is 32.0 gms

YIELD PER ACRE

1800 kgs of grain and 1950 kgs of straw

NAME

The word '*mosanam*' means 'low lying area'. The variety is known as *mosanam* as it is suitable to be grown in low – lying fields or flooded conditions. This variety is also called *Puzudikal*, *Eri nel* and *Maduvu muzangi*.

NUTRITIONAL PROPERTIES

High in total ash, protein and fat. In terms of minerals, it is high in iron, magnesium, and zinc. Very high in calcium.

COOKING / DISHES

The variety is good for preparing *aval* (flattened rice), *idly* and *dosa*.

SANNA SAMBA 37



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

140 days crop, average height 144 cms and maximum height 155 cms, lodging variety.

EARHEAD

260 grains per earhead

CHARACTERISTICS OF THE GRAIN

Grain is pale yellow colour, rice is light brown in colour, fine rice, weight of 1000 grains is 27.0 gms

YIELD PER ACRE

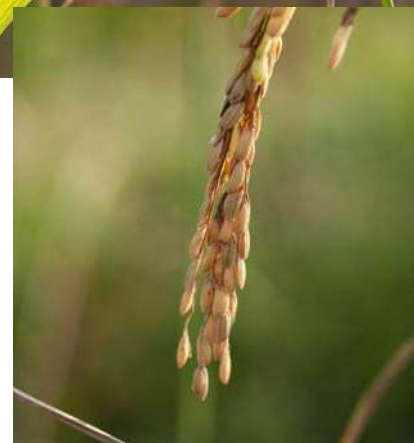
1800 kgs of grain and 2100 kgs of straw

NUTRITIONAL PROPERTIES

High in total ash and protein. Very high in fat. In terms of minerals, it is high in calcium, and zinc.

COOKING / DISHES

The rice of this variety is ideal for preparing *idli*, *dosa*. It is also suited for preparation of South Indian meals.



SEERAGA SAMBA 38



CULTIVATION ASPECTS

Samba and navarai season

AGRONOMICAL ASPECTS

130 days crop, average height 80 cms and maximum height 93 cms, lodging variety.

EARHEAD

170 grains per earhead

CHARACTERISTICS OF THE GRAIN

Grain is straw colour, rice is white in colour, extremely fine and aromatic rice, weight of 1000 grains is 22.0 gms

YIELD PER ACRE

1500 kgs of grain and 1050 kgs of straw

NAME

Since the rice of this variety resembles the shape of a spice *seeragam* it has got the name *Seeraga Samba*.



NUTRITIONAL PROPERTIES

It is high in potassium, iron, magnesium, zinc, and phosphorus.

COOKING / DISHES

The rice is extremely fine and aromatic; hence it is used for making '*Biriyani*'.

OTHER INFORMATION

There should be no water logging in the area where it is cultivated. Since it is aromatic, it fetches the highest price amongst all indigenous paddy varieties of Tamil Nadu

SIVAPPU KOWNI 39



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

130 days crop, average height 145 cms and maximum height 160 cms, lodging variety.

EARHEAD

155 grains per earhead

CHARACTERISTICS OF THE GRAIN

Red in colour, bold rice, weight of 1000 grains is 27.0 gms

YIELD PER ACRE

800 kgs of grain and 1750 kgs of straw

NUTRITIONAL PROPERTIES

High in total ash . Very high in fat. In terms of minerals, it is high in potassium, zinc, and phosphorus. Very high in iron, calcium and magnesium.

COOKING / DISHES

Suitable for table rice. A bit sticky. Suitable for preparing sweet halwa.

SIVAPPU KURUVIKAAR 40



CULTIVATION ASPECTS

Samba and late samba season

AGRONOMICAL ASPECTS

125 days crop, average height 112 cms and maximum height 127 cms, lodging variety.

EARHEAD

120 grains per earhead

CHARACTERISTICS OF THE GRAIN

Grain is yellow in colour, rice is brown in colour, bold rice, weight of 1000 grains is 34.0 gms

YIELD PER ACRE

1050 kgs of grain and 1050 kgs of straw

NUTRITIONAL PROPERTIES

High in total ash. Very high in fat. In terms of minerals, it is very high in potassium, calcium, magnesium, zinc and phosphorus.

COOKING / DISHES

This variety is highly suitable for making *idly* and *dosa*.

OTHER INFORMATION

Resistant to brown plant hopper and case worm. Gives a good yield even when dry sown. Since the weight of the grain is high, it gives good yield. Highly resistant to pest and disease.

SOORAN KURUVAI 41



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

135 days crop, average height 118 cms and maximum height 140 cms, lodging variety.

EARHEAD

100 grains per earhead

CHARACTERISTICS OF THE GRAIN

Grain is yellow with stripes in colour, rice is dark brown in colour, bold rice, weight of 1000 grains is 31.0 gms

YIELD PER ACRE

1200 kgs of grain and 1500 kgs of straw

NAME

Named in memory of great person.

NUTRITIONAL PROPERTIES

High in total ash . Very high in fat. In terms of minerals, it is high in potassium ,iron,magnesium, zinc, and phosphorus. Very high in calcium.

COOKING / DISHES

The rice of this variety is ideal for making *idli* and *dosa*.



THANGA SAMBA 42



CULTIVATION ASPECTS

Samba and late samba season

AGRONOMICAL ASPECTS

165 days crop, average height 122 cms and maximum height 145 cms, lodging variety.

EARHEAD

180 grains per earhead

CHARACTERISTICS OF THE GRAIN

Grain is golden in colour, rice is white in colour, fine rice, weight of 1000 grains is 22.0 gms

YIELD PER ACRE

1500 kgs of grain and 1800 kgs of straw

NAME

The word '*Thangam*' in Tamil means 'Gold'. Since the matured grains are golden in colour the variety is known as '*Thanga Samba*'.

NUTRITIONAL PROPERTIES

High in total ash and protein. Very high in fat. In terms of minerals, it is high in potassium, iron, magnesium, zinc, and phosphorus. Very high in calcium.

COOKING / DISHES

Since the variety is extremely fine and long it is used for the preparation of special dishes like pulav. It is suitable for the South Indian meal.

OTHER INFORMATION

The earhead of this variety is very long.

THENGAIPOOSAMBA 43



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

120 days crop, average height 120 cms and maximum height 140 cms, lodging variety.

EARHEAD

140 grains per earhead

CHARACTERISTICS OF THE GRAIN

White in colour, fine rice, weight of 1000 grains is 24.0 gms

YIELD PER ACRE

950 kgs of grain and 1600 kgs of straw

NUTRITIONAL PROPERTIES

Boiled *Thenkai poo samba* rice is high in protein and fat. In terms of minerals, it is high in iron, calcium and zinc. Whereas Raw *Thenkaipoo samba* is high in protein, very high in fat. It is high in iron and zinc.

COOKING / DISHES

Suitable for table rice. Can be used to prepare pulav and variety rice.

THOoyAMALLI 44



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

140 days crop, average height 115 cms and maximum height 125 cms, lodging variety.

EARHEAD

140 grains per earhead

CHARACTERISTICS OF THE GRAIN

Grain is straw in colour, rice is white in colour, fine rice, weight of 1000 grains is 27.0 gms

YIELD PER ACRE

1125 kgs of grain and 1050 kgs of straw

NAME

In Tamil '*Thooyamalli*' literally means pure jasmine. Since the rice of this variety is white in colour like that of jasmine it is known by this name.

NUTRITIONAL PROPERTIES

High in protein. Very high in fat. In terms of minerals, it is high in iron, magnesium, and zinc.

COOKING / DISHES

The rice of this variety is highly suitable for the South Indian meal. It is also used for making special dishes like '*Biryani*'.

OTHER INFORMATION

During the flowering stage the earheads look like flowers. Highly resistant to pest and disease. Since this is a fine variety it fetches a good price.

VADAN SAMBA 45



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

160 days crop, average height 127 cms and maximum height 153 cms, lodging variety.

EARHEAD

160 grains per earhead



CHARACTERISTICS OF THE GRAIN

Grain is straw in colour, rice is dull white in colour, bold rice, weight of 1000 grains is 27.0 gms

YIELD PER ACRE

1125 kgs of grain and 1200 kgs of straw

NUTRITIONAL PROPERTIES

High in total ash and protein. Very high in fat. In terms of minerals, it is high in iron, calcium, and magnesium.

COOKING / DISHES

It is highly suitable for preparing the traditional South Indian delicacies such as the *idly* and *dosa*.

OTHER INFORMATION

Since the grains shatter, it is important to harvest them when they are still green. Highly resistant to pest and disease. It is also a highly drought resistant variety.

VAIGUNDA 46



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

160 days crop, average height 121 cms and maximum height 135 cms, lodging variety.

EARHEAD

200 grains per earhead

CHARACTERISTICS OF THE GRAIN

Grain is yellow in colour, rice is red in colour, bold rice, weight of 1000 grains is 24.0 gms

YIELD PER ACRE

1350 kgs of grain and 1800 kgs of straw

NUTRITIONAL PROPERTIES

High in total ash and protein. Very high in fat. In terms of minerals, it is high in iron and magnesium.

COOKING / DISHES

Extremely suitable for making 'Pori' (puffed rice). Also suitable for making *idli*.

OTHER INFORMATION

It can be grown in areas prone to water logging as well as in drought prone areas. This variety grows faster than the weeds in the field.

VELIYAN 47



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

175 days crop, average height 89 cms and maximum height 101 cms, lodging variety.

EARHEAD

81 grains per earhead

CHARACTERISTICS OF THE GRAIN

White in colour, medium rice, weight of 1000 grains is 21.0 gms

YIELD PER ACRE

600 kgs of grain and 1100 kgs of straw

VELLAIMILAGU SAMBA 48



CULTIVATION ASPECTS

Samba season

AGRONOMICAL ASPECTS

165 days crop, average height 108 cms and maximum height 115 cms, lodging variety.

EARHEAD

200 grains per earhead

CHARACTERISTICS OF THE GRAIN

White in colour, medium rice, weight of 1000 grains is 21.0 gms

YIELD PER ACRE

1300 kgs of grain and 1900 kgs of straw

NUTRITIONAL PROPERTIES

High in fat. In terms of minerals, it is high in iron and zinc.

COOKING / DISHES

Suitable for table rice and *pongal*.

CONCLUSION AND THE WAY FORWARD

In this concluding section we would like to share our reflections along the following lines –

- Rice through the ages – we take a larger civilizational perspective on rice and reflect upon how the perceptions, actions and realities have changed through the last several centuries.
- Reflection on what CIKS has attempted and achieved with varying degrees of success during the last 25 years.
- Thoughts about the future and sharing of ideas about CIKS plans and activities.

RICE THROUGH THE AGES

Traditionally rice has played a very important role in our culture, not only in terms of its value as food and its nutritive value but also in terms of its cultural, social and religious value. Rice has been spoken of very highly in the texts of traditional medicine (Ayurveda and Siddha texts) and also in the texts of Dharma Shastras. It occupies a place of pride in every meal and it is one of the few substances that are considered suitable for regular daily consumption by the texts of Ayurveda. It also occupies an important place in several rituals ranging from marriages (Where Akshata or unbroken rice grains indicate auspiciousness) to the Shradha ceremony for the ancestors where it is used extensively. Texts of Yoga prescribe specific dietary regimens for students of yoga listing various do's and don'ts. The well-known yoga texts Hatha Yoga Pradipika lists rice as one of the items of diet approved and it goes on to specify a particular rice variety which matures in 60 days (*Sastika Shali*) as the preferred rice variety.

However during recent times there has been a change in the public perception and attitude

towards rice and also its consumption. There are various reasons that can be attributed to this change. Some of these are the following –

- There has been a sharp decline in the diversity of rice varieties cultivated and used.
- The manner in which rice is cultivated, processed and cooked today is quite different from what was prevailing about a few decades back.
- Modern medical doctors, Nutritionists and Dieticians have taken the view that rice is quite unsuited as the major cereal for a large section of our population, especially those who are diagnosed with Diabetes or are considered as population that is – 'at risk'.

In fact there are public health professionals who have widely publicized the idea that there are three major problems with what we consume – sometimes described as – 'three white poisons', namely – (White) sugar, salt and (White) rice. The result has been that we have seen a shifting of the pattern of consumption of rice which is a significant change with respect to the habits that have prevailed for at least several centuries. This is likely to have serious consequences which need to be understood.

REFLECTIONS ON CIKS ACTIVITIES DURING THE LAST 25 YEARS

CIKS started its activities during the year 1995 and during the course of the last 25 years we have carried out a large number of activities. These have ranged from documentation, research, training to production, scaling up, marketing and value addition. In the process we have also undergone an institutional transition as follows : -

1. We started out as a not for profit trust in the year 1995 and all the activities of the trust were supported (and are still supported) through grants and donations.
 2. During the course of our journey we felt the need to create an institutional structure through which farmers can be involved in trading and marketing. CIKS being a trust could not take this up and we have nurtured and initiated about 12 Producer companies with a shareholder base of about 25000 farmers. We work closely with these producer companies.
 3. Subsequently, we also felt the need to nurture an organization that can attract investments and take up activities such as branding, marketing, value addition etc. which could not be attempted by producer companies at least in the early stages. This led to the formation of a private limited company – “Sempulam Sustainable Solutions”.
- Currently, we are working with a triad of the above three institutions – a non-profit trust, producer companies (which have both business and social objectives) and a private limited company. They work with a certain mutual understanding and synergy even though legal linkages may be restricted because of legal and institutional constraints.
- In Table – 16 we have provided a timeline of CIKS activities relating to traditional rice varieties.

Table – 16 :
Timeline of the Activities of CIKS

YEAR	INITIATIVE
1995	<ul style="list-style-type: none"> • CIKS established for objectives including conservation of traditional rice varieties • Land taken on lease in Siruthavoor in Kanchipuram district and later, in Anjur village near Chennai for conserving traditional rice varieties
1999	<ul style="list-style-type: none"> • Arogyam, a marketing initiative, started • Focus: Chennai market; different traditional varieties door delivered to around 40 buyers (including well-wishers) in the city • Varieties included: Thooyamalli, Kitchili Samba, Kappakar, and Kullakar • Sixty varieties of traditional rice sourced for conservation
2002	<ul style="list-style-type: none"> • Conservation work moves to Sukkankollai, near Chengalpattu and Agani, near Sirkazhi • Seeds provided to farmers • Seed bank created
2004-06	<ul style="list-style-type: none"> • Seed conservation grows to a significant number of farmers (720) • Extensive documentation of characteristics of traditional rice varieties starts in 2004
2005	<ul style="list-style-type: none"> • Formed three societies of farmers in Ramanathapuram, Kanchipuram, and Nagapattinam), including: SOFA (Sirkazhi Organic Farmers Association) in Sirkazhi • Training farmers in cultivating traditional rice varieties • Provides services to farmers to get organic certification • Marketing through SOFA to market the organic rice product

YEAR	INITIATIVE
2006-08	<ul style="list-style-type: none"> • Paddy processing started
2006-07	<ul style="list-style-type: none"> • After considering different options to work on marketing, promoted AOPL (Arogyam Organics Private Limited), a private limited company, to market organic foods, including traditional rice varieties
2008	<ul style="list-style-type: none"> • Procurement of rice, including traditional varieties by SOFA, started at 9 tons and went up to 20 tons
2008	<ul style="list-style-type: none"> • Training to women's SHGs, with support from UNDP, to add value to rice and offer products including aval (flattened rice or beaten rice) and rice-based snacks for consumption as crispies
2008-10	<ul style="list-style-type: none"> • Established marketing linkages with new players such as <i>Dhanyam</i> and <i>24 Mantra Organic</i> in the organic-natural-traditional foods market
2012-15	<ul style="list-style-type: none"> • CIKS, with Vrutti as partner, implements a DFID-supported project to reduce poverty through sustainable agriculture • Two large producer companies promoted - Marutham Sustainable Agriculture Producer Company Ltd. (MSAPCL), serving farmers in Tiruvannamalai and Kanchipuram districts and Valanadu Sustainable Agriculture Producer Company Ltd. (VSAPCL), serving farmers in Nagapattinam district
2012-17	<ul style="list-style-type: none"> • A total of 105 traditional varieties are grown in the two locations mentioned earlier – Sukkankollai and Agani
2013	<ul style="list-style-type: none"> • CIKS commissions a study of Physicochemical Properties, Nutrient Analysis, Standardization, Acceptability, and Glycemic Index of organically grown Indigenous Rice Varieties (IRVs)
2005-2015	<p>A decade of experience in:</p> <ul style="list-style-type: none"> • Conservation and documentation of traditional rice varieties • Supplying seed of traditional rice varieties to farmers • Learning from farmers and building capacities of farmers to cultivate traditional varieties • Skilling women in making value-added products • Creating and maintaining marketing linkages • Consumer study • Direct reach to consumer, at small scale
2016-2019	<ul style="list-style-type: none"> • <i>Namma Nellu</i>, a crowdfunding initiative, launched to strengthen conservation. • CIKS designs and implements four projects to increase farm incomes through production, value addition, and marketing of four traditional rice varieties – Mappillai Samba, Seeraga Samba, Kitchili Samba, Kuzhiyadichan; projects supported through Farm Sector Promotion Fund of NABARD. • FPCs promoted and nurtured by CIKS, serving farmers in Dindigul, Kanchipuram, Nagapattinam, Ramanathapuram, and Tiruvannamalai districts explore the production and marketing of different varieties as grain (nellu), rice, and rice-based value-added food products.

WHY SHOULD FARMERS CULTIVATE TRADITIONAL RICE VARIETIES? DISPELLING SOME MYTHS AND MISCONCEPTIONS

The question is sometimes asked about whether the choice of cultivation of traditional varieties makes sense from the point of view of the farmer. One view seems to be that – “since traditional varieties give a low yield the farmer will actually lose out by choosing to go for traditional varieties”. Moreover, it is felt that this amounts to going back to the past and a premodern technology that is no longer relevant. In this connection, we would like to present and analyse the following information.

1. How does the cultivation of traditional varieties compare with modern varieties in terms of benefits for the farmer?

Normally, this question is posed as – “Let us compare the yields”. However, we would like to suggest that for a proper and holistic comparison we have to look at the following : -

- a. Cost of cultivation including all material costs and labour

- b. Income from all sources including grain and straw and
- c. Based on the above we should compare the net income obtained by the farmer

In Table - 17 we have compared the cost of cultivation of one acre of land wherein the farmer can cultivate a traditional variety such as Mappillai samba or a modern variety such as ADT 45. Costs are estimated for all the inputs including labour and materials. Similarly, estimates are made of the total income as well as the net income. The comparison leads to the following conclusion –

1. The cost of cultivation is lower for the traditional variety. There are significant savings in the fertilizer and plant protection expenses which more than compensate for the increased seed costs.
2. For traditional varieties, the yield of grain is lower but it fetches a higher price.
3. The income through straw is slightly more from traditional varieties.
4. Overall it is seen that the net income through the cultivation of traditional varieties is more in comparison to modern varieties. In this particular case there is a gain of Rs. 7950/- per acre for the crop season.



5. While initially traditional seeds may be purchased from the market, during the following crop seasons the farmer can use the seeds saved by him leading to reduce costs.
6. The cost towards plant protection expenses and fertilizer expenses can be further reduced through training support which can enable the farmer to use inputs from in and around his own farm.

Table – 17 :
Cultivation of Traditional and Modern Varieties :
A Comparison of Inputs, Outputs and Income

SL. NO	PARTICULARS	MAPPILLAI SAMBA	ADT 45
1	Nursery preparation	1,100	1,100
2	Seed cost	1,950	1,150
3	Main field preparation – ploughing, bund trimming, plastering and levelling	5,300	5,300
4	Seedling plucking	700	700
5	Seedling transplanting	1,650	1,650
6	Weeding expenses	1,500	1,500
7	Fertilizer expenses	2,500	5,000
8	Plant protection expenses	500	2,000
9	Harvesting expenses	2,200	2,200
10	Winnowing and other processing expenses	2,250	2,250
	Total expenses	19,650	22,850
11	Reduction in cost of cultivation	3,200	
12	Expected yield (Kgs)	1,250	2,250
13	Income through grains sales	37,500	33,750
		(Rs. 30 /Kg)	(Rs. 15/ Kg)
14	Income through straw sales	3,500	2,500
	Total income	41,000	36,250
	Net Income (S. No: 15-11)	21,350	13,400

OVERVIEW OF THE CHANGED SCENARIO

The following are a few of the key changes that we have seen in recent times

A sharp decline in the diversity and variety of rices cultivated and available widely in the market. This has meant that most varieties that were traditionally valued very highly are now cultivated only in scattered areas and in pockets and they do not form the bulk of what can be available to the consumer at large.

In terms of the method of cultivation the last few decades have seen a near total shift from traditional organic methods to modern methods depending entirely on chemical fertilizers and pesticides for cultivation. This has resulted in varied health problems, the dimensions of which are very wide and are just being understood.

Traditionally after harvest paddy was converted to rice by a process of hand pounding due to which several nutrients were retained but in the modern era this has been almost completely replaced by rice that is milled and polished in large scale processes due to which the rice is today stripped of most of these nutrients.

There has also been a change in the way in which rice is being cooked in recent times. Traditionally it was a practise to cook rice with an excess of water and after the cooking the excess water was drained (Filtered or Decanted). The resulting rice was what was consumed on a daily basis. However the advent of the modern – “pressure cooker” has brought about a change due to which in general today the amount of water added to rice is adjusted so that there is no – “excess water” to be discarded. However some Ayurvedic physicians have pointed out that the rice cooked by the traditional method is really more – “*laghu*” (i.e light to digest) while



the widespread present day method of cooking rice results in a product which is more – “*guru*” (i.e Heavy to digest). In fact currently we have in the market a type of pressure cooker which is being marketed as a – “Diet cooker”. This is in fact an arrangement by which the excess water can be drained out conveniently using a container with a perforated bottom.

Conclusion

There is a need for us to revisit and reassess the value that was attributed traditionally to rice and ensure that we have a correct time balanced assessment of its nutritional value. Some of the tasks that definitely need to be taken up are the following –

There has to be an enhancement of the variety and diversity of rice varieties cultivated from various

viewpoints including nutritional and ecological considerations.

The consumer must be able to access from the large basket of traditional rice varieties which have a great nutritional and therapeutic value.

We need to revisit the cultivation, post-harvest processing, and methods of cooking rice striking a reasonable balance between economic, ecological and nutritional criteria.

We also need a better understanding and appreciation of the knowledge and wisdom about the properties of rice that is available to us from our tradition – this is not only from the texts of traditional medicine but also the wide spread cultural and social practices of our people.



Farmers Group in Tiruvannamalai District

TRADITIONAL RICE VARIETIES BEING CONSERVED BY CENTRE FOR INDIAN KNOWLEDGE SYSTEMS

General Notes

1. There are no standard English rendering of several Tamil names and alternate spellings are prevalent / possible.
2. In some cases names that closely resemble each other are the same variety and in other cases they may be different varieties. However pending a clear understanding and consensus on this matter we have still listed some varieties closely resembling each other as separate entities.
3. In some cases there is a lack of clarity about the identities – for example, as per one view *Garudan Samba* and *Kadai Kazhuthan* are said to be two different names for the same variety. However, in the absence of a clear consensus on this matter, we have listed them separately and also maintained them in our farm as separate varieties.

SL. NO.	NAME OF THE VARIETY	TAMIL NAMES
1.	<i>Aathur kichali</i>	ஆத்தூர் கிச்சலி
2.	<i>Adukku nel</i>	அடுக்கு நெல்
3.	<i>Ambemohar</i>	அம்பேமோஹர்
4.	<i>Anaikomban</i>	ஆனெனகொம்பன்
5.	<i>Anandanoor sanna</i>	அனந்தனூர்சன்னா
6.	<i>Arcot kitchili</i>	ஆற்காடு கிச்சிலி
7.	<i>Arikiravi</i>	அரிக்கிரவி
8.	<i>Arupatham kuruvai</i>	அறுபதாம் குறுவை
9.	<i>Arupatham samba</i>	அறுபதாம் சம்பா
10.	<i>Basmathi</i>	பாஸ்மதி
11.	<i>Bayakundathan</i>	பயகுண்டதான்

12.	<i>Cochin samba</i>	கொச்சின் சம்பா
13.	<i>Cuddalore seeraga samba</i>	கடலூர் சீரக சம்பா
14.	<i>Eravai pandi</i>	இறவை பாண்டி
15.	<i>Garudan samba</i>	கருடன் சம்பா
16.	<i>Ghamgaadale</i>	காங்காடலை
17.	<i>Ghan sal</i>	கன் சால்
18.	<i>Gunaparuva</i>	குணபருவா
19.	<i>Ilupaipoo samba</i>	இலுப்பைப்பூ சம்பா
20.	<i>Iravai Pandi</i>	இறவை பாண்டி
21.	<i>Jawadhu malai nel</i>	ஜவ்வாது மலைநெல்
22.	<i>Jeeraka sala</i>	ஜீரக சாலா
23.	<i>Jil jil vaigunda</i>	ஜில் ஜில் வைகுண்டா
24.	<i>Jiljeera</i>	ஜில் ஜீரா
25.	<i>Kalanamak</i>	காலாநமக்
26.	<i>Kacha koomvazhai</i>	கச்சு கூம்வாழை
27.	<i>Kadaikazhuthan</i>	காடைகழுத்தான்
28.	<i>Kaivara samba</i>	கைவர சம்பா
29.	<i>Kala jeera</i>	காலா ஜீரா
30.	<i>Kalarpalai</i>	களர்பாளை
31.	<i>Kaliyan samba</i>	கலியன் சம்பா
32.	<i>Kallundai</i>	கல்லுண்டை
33.	<i>Kallurundai</i>	கல்லுருண்டை
34.	<i>Kallurundaiyan</i>	கல்லுருண்டையான்
35.	<i>Kamban samba</i>	கம்பன் சம்பா
36.	<i>Kanali</i>	கனலி
37.	<i>Kandasali</i>	கண்டசாலி
38.	<i>Kappakaar</i>	கப்பகார்
39.	<i>Karikalava</i>	கரிகலவா

40.	<i>Karunseeraga samba</i>	கருஞ்சீரக சம்பா
41.	<i>Karungkuruvai</i>	கருங்குறுவை
42.	<i>Karunseeraga samba</i>	கருஞ்சீரக சம்பா
43.	<i>Karuppu kowni</i>	கருப்பு கவுனி
44.	<i>Karuppu seeraga samba</i>	கருப்பு சீரக சம்பா
45.	<i>Karuthakaar</i>	கருத்தகார்
46.	<i>Katcha koomvazhai</i>	கச்ச கூம்வாழை
47.	<i>Katta samba</i>	கட்ட சம்பா
48.	<i>Kattu kuthalam</i>	காட்டு குத்தாலம்
49.	<i>Kattu samba</i>	காட்டு சம்பா
50.	<i>Kattu vanibam</i>	காட்டு வாணிபம்
51.	<i>Kattuyanam</i>	காட்டுயாணம்
52.	<i>Kitchili samba</i>	கிச்சலி சம்பா
53.	<i>Kochin samba</i>	கொச்சின் சம்பா
54.	<i>Kollikaar</i>	கொல்லிக்கார்
55.	<i>Kona kuruvai</i>	கோண குறுவை
56.	<i>Koomvazhai</i>	கூம்வாழை
57.	<i>Kothamalli samba</i>	கொத்தமல்லி சம்பா
58.	<i>Kottara samba</i>	கொட்டார சம்பா
59.	<i>Kottarai samba</i>	கொட்டரை சம்பா
60.	<i>Kowni</i>	கௌனி
61.	<i>Kudaivazhai</i>	குடைவாழை
62.	<i>Kullakaar</i>	குள்ளக்கார்
63.	<i>Kumsala</i>	கும்சாலா
64.	<i>Kunthali</i>	குந்தாலி
65.	<i>Kuruvai</i>	குறுவை
66.	<i>Kuruvai kalangium</i>	குறுவை களஞ்சியம்
67.	<i>Kuruvikar</i>	குருவிக்கார்

68.	<i>Kuzhiyadichan</i>	குழியடிச்சான்
69.	<i>Madumuzhugi</i>	மடுமுழுகி
70.	<i>Mapillai samba</i>	மாப்பிள்ளை சம்பா
71.	<i>Mathimuni</i>	மதிமுனி
72.	<i>Mottakuur</i>	மொட்டக்கூர்
73.	<i>Mozhi karuppu samba</i>	மொழி கருப்பு சம்பா
74.	<i>Mundan kayama</i>	முன்டன் கயாமா
75.	<i>Murkankaar</i>	மூர்க்கன்கார்
76.	<i>Murugakar</i>	முருககார்
77.	<i>Muttakaar</i>	முட்டகார்
78.	<i>Namazhvar kuruvai</i>	நம்மாழ்வார் குறுவை
79.	<i>Navara</i>	நவரா
80.	<i>Neelam samba</i>	நீலம் சம்பா
81.	<i>Norungan</i>	நொறுங்கன்
82.	<i>Ona mattan</i>	ஒன மட்டன்
83.	<i>Orissa vasanai seeraga samba</i>	ஒரிசா வாசனை சீரக சம்பா
84.	<i>Ottadai</i>	ஒட்டடை
85.	<i>Ottu kitchili</i>	ஒட்டு கிச்சிலி
86.	<i>Paal thondi</i>	பால் தொண்டி
87.	<i>Paal veliyan</i>	பால் வேளியன்
88.	<i>Pal kudaivazhi</i>	பால் குடைவாழை
89.	<i>Panankaattu kudaivazhai</i>	பனங்காட்டு குடைவாழை
90.	<i>Patchai perumal</i>	பச்சை பெருமாள்
91.	<i>Pattaraikaar</i>	பட்டரைக்கார்
92.	<i>Perum koomvazhai</i>	பெரும் கூம்வாழை
93.	<i>Perungkaar</i>	பெருங்கார்
94.	<i>Pisini</i>	பிசினி
95.	<i>Podaperunel</i>	போடபெருநெல்

96.	<i>Polinel</i>	போலிநெல்
97.	<i>Poompalai</i>	பூம்பாலை
98.	<i>Poongkaar</i>	பூங்கார்
99.	<i>Poovan samba</i>	பூவன் சம்பா
100.	<i>Puzhuthi samba</i>	புழுதி சம்பா
101.	<i>Puzhuthikal</i>	புழுதிகால்
102.	<i>Raja poga</i>	ராஜபோகா
103.	<i>Rajamanar</i>	ராஜமனார்
104.	<i>Rajamudi</i>	ராஜமுடி
105.	<i>Ramakalli</i>	ராமகல்லி
106.	<i>Rasakadam</i>	ரசகடம்
107.	<i>Sadakaar</i>	சடகார்
108.	<i>Salem samba</i>	சேலம் சம்பா
109.	<i>Salem sanna</i>	சேலம் சன்னா
110.	<i>Samba</i>	சம்பா
111.	<i>Samba mosanam</i>	சம்பா மோசனம்
112.	<i>Sanaki nel</i>	சாணக்கி நெல்
113.	<i>Sandikaar</i>	சண்டிகார்
114.	<i>Sanna samba</i>	சன்ன சம்பா
115.	<i>Seengeni</i>	சீன்ஜெனி
116.	<i>Seeraga samba</i>	சீரக சம்பா
117.	<i>Seeraga sanna</i>	சீரக சன்னா
118.	<i>Selam samba</i>	சேலம் சம்பா
119.	<i>Selam sanna</i>	சேலம் சன்னா
120.	<i>Sempalai</i>	செம்பாளை
121.	<i>Sempeli panni</i>	செம்பிலி பன்னி
122.	<i>Sengini</i>	செங்கிணி
123.	<i>Sigappu germani</i>	சிகப்பு ஜெர்மனி

124.	<i>Sigappu kowni</i>	சிகப்பு கௌனி
125.	<i>Sigappu kuruvikar</i>	சிகப்பு குருவிகார்
126.	<i>Soolai kuruvai</i>	சூலை குறுவை
127.	<i>Sooran kuruvai</i>	சூரன் குறுவை
128.	<i>Sornavari</i>	சொர்ணவாரி
129.	<i>Sulaikuruvai</i>	சூலைகுறுவை
130.	<i>Suran kuruvai</i>	சூரன் குறுவை
131.	<i>Thanga samba</i>	தங்க சம்பா
132.	<i>Thavalaikanna matta</i>	தவளைகன்னமட்டா
133.	<i>Thengaipoo samba</i>	தேங்காய் பூ சம்பா
134.	<i>Thirupathi saram</i>	திருப்பதி சரம்
135.	<i>Thooyamalli</i>	தூயமல்லி
136.	<i>Thulasi vasanai seeraga samba</i>	துளசி வாசனை சீரக சம்பா
137.	<i>Vaadan samba</i>	வாடன் சம்பா
138.	<i>Vaikunda</i>	வைகுண்டா
139.	<i>Valan nel</i>	வாலன் நெல்
140.	<i>Vallarakkan</i>	வல்லரக்கன்
141.	<i>Varappu kudainchan</i>	வரப்பு குடைஞ்சான்
142.	<i>Vasanai seeraga samba</i>	வாசனை சீரக சம்பா
143.	<i>Vasara mundan</i>	வாசர முண்டான்
144.	<i>Veethivadangan</i>	வீதிவடங்கள்
145.	<i>Veliyan</i>	வெளியன்
146.	<i>Vellai kudaivazhai</i>	வெள்ளை குடைவாழை
147.	<i>Vellai kuruvikar</i>	வெள்ளை குருவிக்கார்
148.	<i>Vellai milagu samba</i>	வெள்ளை மிளகு சம்பா
149.	<i>Vellai poongkaar</i>	வெள்ளை பூங்கார்
150.	<i>Vellaikkaar</i>	வெள்ளைக்கார்



BIBLIOGRAPHY OF SOURCES ON TRADITIONAL RICE VARIETIES

Note :

1. This Bibliography is designed for the specific purpose of this book and the sections are organized based on this book's requirement.
2. The focus is on material about rice varieties of Tamil Nadu State.
3. A large number of references have been given in Tamil and Sanskrit and they have not been translated or transliterated except in some specific cases.

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MOP VAISHNAV COLLEGE LIST OF STUDENT THESES

During the year 2009 CIKS entered into a collaborative arrangement with the Department of Food and Nutrition at the MOP Vaishnav College at Chennai. A set of five Traditional Rice Varieties were taken up for studies, namely – *Perungar*, *Kappakar*, *Kowni nel*, *Neelan samba* and *Salem samba*. A set of 19 students carried out a variety of studies with these varieties. They looked at a set of properties ranging from, physico chemical characteristics to nutritional properties as well as their suitability to prepare a set of dishes. The list of 19 theses is given below. This is followed by a table wherein the studies carried out on each of the varieties is listed against the name of the specific rice variety. This table also carries a cross reference to the specific theses which has been identified based on the serial numbers given below.

1. A Study on Milling and Cooking Characteristics of a Selected Rice (*Oryza sativa*) Variety *Kouni Nel* by R. Mohana Priya Dharshini (Dissertation submitted as part of M.Sc., Food Technology and Management Degree, M.O.P. Vaishnav College for Women, Chennai), April 2010.
2. A Study on Physical Characteristics and Nutrient Composition of Organic Rice (*Oryza sativa*) Variety *Perungar* by K. Athira (Dissertation submitted as part of M.Sc., Food Technology and Management Degree, M.O.P. Vaishnav College for Women, Chennai), April 2010.
3. A Study on Physical Characteristics and Nutrient Composition of Selected Rice (*Oryza sativa*) Variety *Kouni Nel* by V. Radhika (Dissertation submitted as part of M.Sc., Food Technology and Management Degree, M.O.P. Vaishnav College for Women, Chennai), April 2010.
4. A Study on Physicochemical Characteristics and Textural Properties of the Organic Rice (*Oryza sativa*) Variety *Perungar* by R. Roopavani (Dissertation submitted as part of M.Sc., Food Technology and Management Degree, M.O.P. Vaishnav College for Women, Chennai), April 2010.
5. A Study on Physicochemical Characteristics and Textural Properties of a Selected Rice (*Oryza sativa*) Variety *Kouni Nel* by S. Lidiya Mercy (Dissertation submitted as part of M.Sc.,

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6. Determination of Milling and Cooking Performances of Indigenous Organic Indian Rice Variety – *Kappakar* by B.K. Jananni (Dissertation submitted as part of M.Sc., Food Technology and Management Degree, M.O.P. Vaishnav College for Women, Chennai), April 2010.
 7. Determination of Milling and Cooking Performances of Indigenous Organic Indian Rice Variety – *Neelam Samba* by Ranjani Madhavan (Dissertation submitted as part of M.Sc., Food Technology and Management Degree, M.O.P. Vaishnav College for Women, Chennai), April 2010.
 8. Determination of Milling and Cooking Qualities of Indigenous Organic Rice Variety *Salem Samba* by S. Raja Rajeshwari (Dissertation submitted as part of M.Sc., Food Technology and Management Degree, M.O.P. Vaishnav College for Women, Chennai), April 2010.
 9. Development of Bakery Products Using Organic Rice Variety *Neelam Samba* by T. Lakshmmi Prabha (Dissertation submitted as part of M.Sc., Food Technology and Management Degree, M.O.P. Vaishnav College for Women, Chennai), April 2010.
 10. Development of Rice Noodles Supplemented with Legume and Vegetable Flours by A. Deepti Panguja (Dissertation submitted as part of M.Sc., Food Technology and Management Degree, M.O.P. Vaishnav College for Women, Chennai), April 2010.
 11. Effect of Milling and Parboiling on Cooking Characteristics and Sensory Evaluation of Organic Rice Variety *Perungar* by M. Aruna (Dissertation submitted as part of M.Sc., Food Technology and Management Degree, M.O.P. Vaishnav College for Women, Chennai), April 2010.
 12. Formulation and Analysis of Organic *Idli* – The Food for Future by S. Aruna (Dissertation submitted as part of M.Sc., Food Technology and Management Degree, M.O.P. Vaishnav College for Women, Chennai), April 2010.
 13. Formulation of Instant *Dosa* mix with Indigenous Organic Rice Variety *Salem Sambha* by V. Sangeetha (Dissertation submitted as part of M.Sc., Food Technology and Management Degree, M.O.P. Vaishnav College for Women, Chennai), April 2010.
 14. Nutrient and Physical Quality Analysis of Organically Grown *Salem Samba* Rice by C. Parimala (Dissertation submitted as part of M.Sc., Food Technology and Management Degree, M.O.P. Vaishnav College for Women, Chennai), April 2010.
 15. Physical Characteristics and Nutrient Composition of Indigenous Organic Rice – *Kappakar* by M.S. Akilandeswari (Dissertation submitted as part of M.Sc., Food Technology and Management Degree, M.O.P. Vaishnav College for Women, Chennai), April 2010.
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