Special Issue

SRI Newsletter

System of Rice Intensification

ICRISAT

WWF

Issue 6 Apr. - May 2009

Editorial

Dear All,

SRI was introduced to India in the year 2000, about two decades after it was developed in Madagascar. SRI methods of cultivation involve the same basic agronomic operations as farmers use around the world: having a nursery, transplanting, irrigation, weeding and soil nutrient amendments, but each of these is practiced in a different way. The changes provide the rice plants with a growing environment which is more favourable to express their potential.

The practices benefit farmers by enhancing their income as costs are diminished at the same time that yields are increased. This has been seen again and again in research experiments and in farmers' fields in India, but also in many other rice-growing countries. The efforts of Fr. de Laulanié to bring improvement in the lives of rice farmers through SRI have not only helped the farmers of Madagascar but also the rice farmers in 35 other countries already.

While we have been taking several initiatives to scale up the adoption of SRI in India, we have also been digging into the history of rice cultivation in our country, to know how the cultivation practices have changed over time. While web searching for documents on earlier rice management, a statement found in one document published in 1928 on 'single seedling planting' initiated our curiosity due its apparent similarity to SRI. We never anticipated that rice cultivation practices very similar to SRI were experimented with and adopted by farmers of Tamil Nadu about a century ago.

A Tamil monthly magazine described such methods and numbers of articles were published as long ago as 1911, and the information contained in these articles impressed us because of its relevance and importance even today. We felt that the contents of these articles should be made known to the SRI community in India and abroad. Further search turned up more supportive references to the adoption of single-seedling planting and also to wider spacing of plants in square or rectangular arrangement; also to less water application. We discuss these innovations in this issue's main article and include also translations of the original articles. These articles reflect how the farmers of early twentieth century applied their minds in a scientific way and developed innovative agronomic practices for rice cultivation whose significance is now becoming more widely appreciated.

The interest generated by the articles made us want to find out about the authors of the Tamil articles. We were lucky to trace the descendents of the authors in their home villages and were able to collect details about the authors and their background. This fieldwork turned out to be very interesting and hence its findings are included in this newsletter.

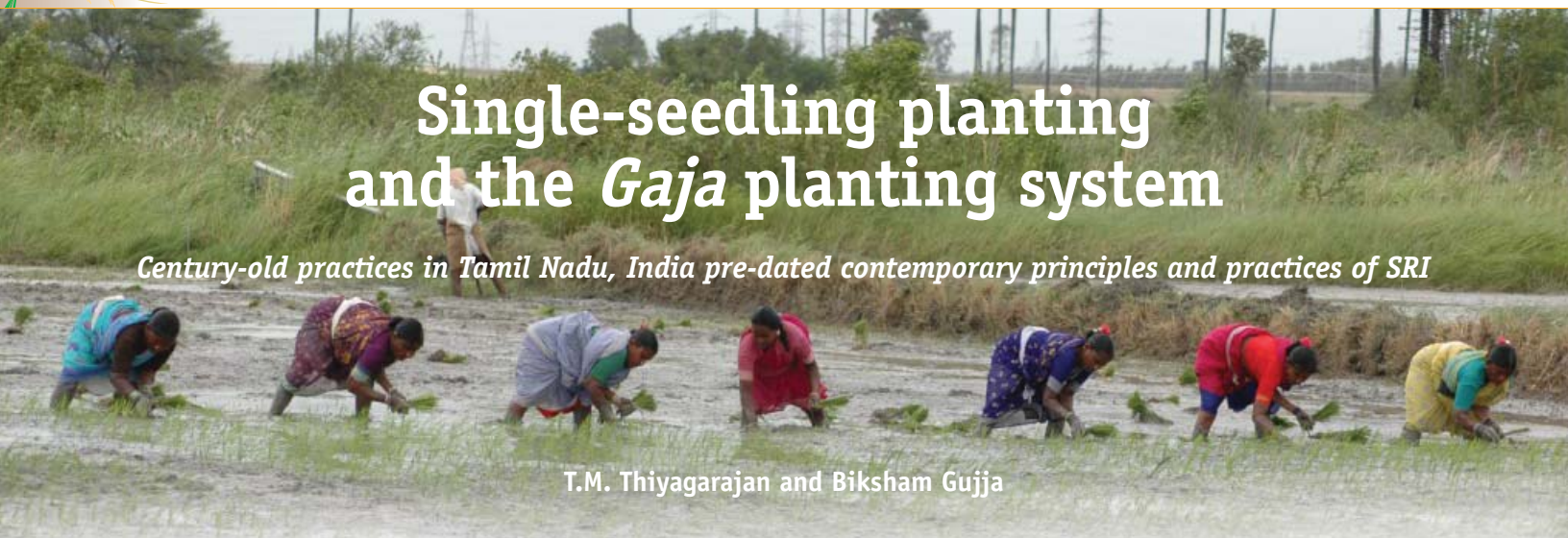
It is surprising and impressive to learn that row planting was introduced in India long before the Green Revolution and that major principles of SRI were appreciated by rice farmers of India decades before SRI was developed in Madagascar.

We recognize that the contribution of Fr.Henry de Laulanie in developing SRI is unique. Our intention in publishing these old documents is not to argue that SRI principles were 'invented' in India. Rather, bringing out these historical innovations documents that innovations by farmers have contributed immensely in shaping the agriculture of our country as they have around the world. We encourage further research and debate on farmers' contribution and innovations in agriculture.

We invite you to travel hundred years back and enjoy the journey!

Biksham Gujja

inside pages



Single-seedling planting and the *Gaja* planting system

Century-old practices in Tamil Nadu, India pre-dated contemporary principles and practices of SRI

T.M. Thiyagarajan and Biksham Gujja

Agricultural practices that were evolved over the many centuries before agricultural science was ascendant derived mostly from farmers' observations and experimentation. Much before there were agricultural research programs, farmers selected superior crops, designed better cultivation methods, domesticated animals, and found ways to make their farming systems more productive. However, after the establishment of scientific research institutions, agricultural advancement was gradually taken out of the hands of farmers, and they started looking to these institutions to fix their problems. While this evolution of scientific leadership has contributed to substantial agricultural development the world over, farmers' experiments and innovations have gotten less recognition and reporting. Sometimes, indeed, innovations made by farmers have been appropriated by researchers and then handed back to them.

Rice, the world's most widely grown and eaten cereal crop, was domesticated as many as 11,000 years ago, as seen from recent archaeological findings in China. Since then, farmers in many agro-climatic zones have experimented with different varieties, have tried alternative methods of cultivation, and have disseminated various practices. In spite of the fact that rice is cultivated under diverse agro-ecological conditions in about 110 countries, contemporary irrigated rice cultivation has become quite uniform with a standard set of practices, viz., establishing a nursery, transplanting seedlings, applying nutrients to enhance soil fertility, weeding, irrigation, and plant protection, with minor variations across regions.

The Green Revolution starting in the 1970s popularized the use of high-yielding varieties in order to rapidly increase food grain production to meet the growing demand. But this came with a price – the sidelining of traditional varieties, many of which had desirable characteristics, and greater reliance on chemical fertilizers. Utilization of organic sources of plant nutrition was diminished, and farmers became increasingly dependent on purchased inputs: seeds, fertilizers and pesticides, looking to formal research and extension services for guidance.

In spite of massive investments, rice-growing farmers the world over are facing serious problems of decreasing profits with the production remaining stagnant while the input costs are increasing and access to water and natural resources are becoming major limiting factors for cultivation of rice. This requires a whole new approach to rice cultivation in particular and agriculture in general, and has in a way forced some to look at non-conventional and out-of-the-box thinking and approaches in order to increase productivity of rice cultivation with less inputs; some of them originating from 'nonscientific' institutions and one such being, the very popular System of Rice Intensification, known as SRI.

By the end of the 20th century, increasing awareness of the problems of environmental degradation and of the dangers of over-use of chemicals in agriculture led to a revival of interest in organic agricultural production to some extent. Simultaneously, industrial development, burgeoning populations, and changing climatic conditions made it more necessary to use water economically when irrigating crops, especially rice. These and other developments made it imperative for rice research to concentrate on resource-efficient production. The main avenues pursued included hybrid rice, new plant types, biotechnology modifications, and water-saving technologies, etc.

Some of the new approaches have originated from outside the realm of formal research institutions, one innovation being the increasingly popular System of Rice Intensification, known as SRI. This originated in Madagascar in the 1980s through the observations and experimentation of Father Henry de Laulanié, and subsequently it has been popularized by the sustained and committed efforts of Dr. Norman Uphoff

and many other scientists and civil-society leaders over the past decade. Today SRI methods have been validated in three dozen countries, and they are spreading rapidly in countries that produce two-thirds of the world's rice – China, India, Indonesia, Vietnam, and Cambodia. In the last five years, SRI has become a dynamic movement in India joined by farmers, civil society organizations, universities, research institutions, government agencies, foundations and private sector.

SRI is quite different from the approach of the Green Revolution in that: a) it is not a seed-based approach, b) it makes reductions in inputs - seeds, water, fertilizers, and labor – yet gives more yield, and c) it originated outside of the established scientific institutions. SRI has come as a boon to rice farmers, with drastic reduction in seed rate (by 80% or more), reduced water requirements (by 30–40%), frequent reductions in labor, and yet increased yield of grain and straw (by 20 – 70%, and sometimes more).

Today, SRI has been accepted by hundreds of thousands of farmers in India, spreading from farmer to farmer when there is no support of agricultural extension. Several state governments have initiated special programs to promote SRI. The Government of Tamil Nadu reports for the 2008-09 cropping year that it had achieved 5.38 lakh hectares under SRI management out of a target of 7.5 lakh hectares. This suggests that about 27% of the state's area under rice cultivation is cultivated with SRI methods. Similarly, the state of Tripura which has supported a major program for SRI dissemination reports that in this past year, SRI methods were used by 197,450 farmers on 16.7% of its paddy area. Three years ago, the number of farmers in Tripura using SRI methods was 880.

The purpose of this article is not to report or assess the spread and merits of SRI,

SRI is now part of the National Food Security Mission (NFSM), and has become a national phenomenon and is giving good results to improve the productivity and also profits to the farmers while reducing the water input to rice cultivation. However, its full potential has not yet been realized.

however. Rather we want to pursue some questions that have interested us as they surely occurred also to others. How is it that such productive practices -- which do not depend upon 'modern' inputs, but rather on how plants, soil, water and nutrients are managed -- could have been undiscovered for so many years? With all of the millions of farmers who grew rice in India, and elsewhere, over so many centuries, why weren't these opportunities to use land, labor and water more productively recognized? We were curious whether there might be some precursors of SRI in the Indian past which would attest to the innovative capabilities of farmers and also confirm the inherent biological underpinnings of SRI.

We are gratified to be able to report in this article on some farmer innovations made in rice production in Tamil Nadu about a century ago. These foreshadowed the SRI management system and indeed achieved the same kind of productivity gains. It turns out that SRI principles and practices have long-standing roots in India, at least in Tamil Nadu state, although having learned this raises another question: Why did the use of these practices die out?

Our curiosity prompted research into this matter of previous innovations in rice production practices, and with some digging as well as a bit of luck we can share with readers some very interesting, even inspiring history of agricultural development. Today, SRI is known to many rice farmers of Tamil Nadu as *'Ottrai Natru Nadavu'* (single seedling planting). Here we document that single-seedling planting was known and practiced 100 years ago in Tamil Nadu. Also, other practices and principles associated with SRI were being advocated.

Starting From a 1928 Government Publication

This story begins with our discovery of a publication of the *Royal Commission on Agriculture in India*.[1] Its Abridged Report contained the following statement, which launched our ensuing investigation:

…In Madras, 120,000 copies of a leaflet on the single-seedling planting of paddy have been issued… the leaflets circulated in that Presidency, as in other provinces, are of little real value, unless they are issued in connection with a definite demonstration of their subject matter. The results of leaflets advocating the single-seedling planting of paddy are likely to prove very disappointing, unless the cultivators to whom they are given are provided with ample opportunities of seeing for themselves the advantages arising from the adoption of this practice… (pages 154-155).

This was a reference to a single-seedling planting system for rice that was being promoted at the time in British India's Madras Presidency, which included parts of the present states of Tamil Nadu, Andhra Pradesh, Karnataka and Kerala. The Commission's emphasis on the value of demonstrations of the practice is worth noting.

This publication showed us that: a) there was a rice-production method in use in the 1920s based on 'single seedlings', b) this method was seen as offering advantages over the conventional method of planting several seedlings together in a clump (or

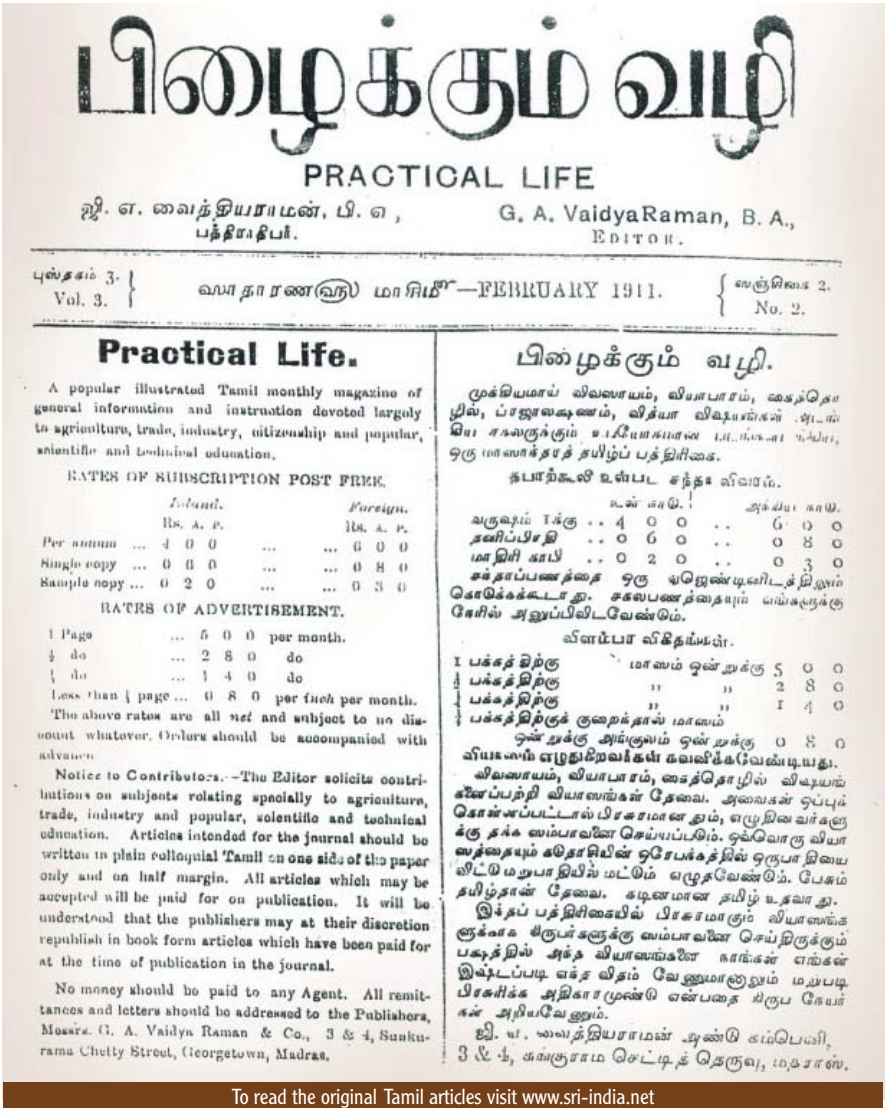
[1] Madan, J.A., and F.W.H. Smith. 1928. *Royal Commission on Agriculture in India*. Government Central Press. Bombay. 754p.

hill), and c) authorities were convinced that this single-seedling method needed wide publicity and demonstrations to convince farmers to follow it. As part of this dissemination strategy, a manual on the new method was printed. This is the first published reference that we came across on the use of single seedlings, and it led to the 'excavation' of an interesting story.

Farmer Contributions to a Tamil Journal on 'Practical Life'

When we tried to track down a copy of the leaflet mentioned by the Royal Commission on Agriculture, we could not trace the exact publication mentioned. However, in the library we did come across a Tamil journal titled *Pizhaikkum Vazhi* (Practical Life) published in 1911 which provided extensive evidence of farmer innovation consistent with our present SRI understanding of how to improve rice production. This journal had published a series of articles which reflected the experiences of farmers practicing single-seedling planting – and more.

A simple thought and a bit of luck has led to a major breakthrough in documenting an approach known to Tamil farmers a century ago. Today SRI is known to many rice farmers of Tamil Nadu as *'Ottrai Natru Nadavu'* (single seedling planting). This recognition has come through SRI. But, to our surprise, we find that single seedling planting was known 100 years ago in Tamil Nadu.



பிழைக்கும் வழி

PRACTICAL LIFE

ஜி. எ. வைத்தியராமன், பி. ஏ., பத்திராதிபர்.

G. A. VaidyaRaman, B. A., Editor.

புஸ்தகம் 3. Vol. 3. | வியாசாரணவரு மாசிமீ—FEBRUARY 1911. | வெளியீடு 2. No. 2.

Practical Life.

A popular illustrated Tamil monthly magazine of general information and instruction devoted largely to agriculture, trade, industry, citizenship and popular, scientific and technical education.

RATES OF SUBSCRIPTION POST FREE.

	Inland. Rs. A. P.	Foreign. Rs. A. P.
Per annum ...	4 0 0 ...	... 6 0 0
Single copy ...	0 6 0 ...	... 0 8 0
Sample copy ...	0 2 0 ...	... 0 3 0

RATES OF ADVERTISEMENT.

1 Page	... 5 0 0	per month.
½ do	... 2 8 0	do
¼ do	... 1 4 0	do
Less than ¼ page	... 0 8 0	per inch per month.

The above rates are all *net* and subject to no discount whatever. Orders should be accompanied with advance.

Notice to Contributors.—The Editor solicits contributions on subjects relating specially to agriculture, trade, industry and popular, scientific and technical education. Articles intended for the journal should be written in plain colloquial Tamil on one side of the paper only and on half margin. All articles which may be accepted will be paid for on publication. It will be understood that the publishers may at their discretion republish in book form articles which have been paid for at the time of publication in the journal.

No money should be paid to any Agent. All remittances and letters should be addressed to the Publishers, Messrs. G. A. Vaidya Raman & Co., 3 & 4, Sunkurama Chetty Street, Georgetown, Madras.

பிழைக்கும் வழி.

முக்கியமாய் விவசாயம், வியாபாரம், கைத்தொழில், பிரஜாலக்ஷணம், வித்யா விஷயங்கள் ஆகிய சகலருக்கும் உபயோகமான பாடங்களை உள்ள, ஒரு மாஸாந்தரத் தமிழ்ப் பத்திரிகை.

சுபாற்கூலி உள்பட சந்தா விவரம்.

	உள் நாடு.	அக்கிய நாடு.
வருஷம் ஒன்றுக்கு	.. 4 0 0 ..	6 0 0
தனிப்பிரதி	.. 0 6 0 ..	0 8 0
மாதிரி காபி	.. 0 2 0 ..	0 3 0

சந்தாப்பணத்தை ஒரு ஏஜெண்டிடத்திலும் கொடுக்கக்கூடாது. சகலபணத்தையும் எங்களுக்கு நேரில் அனுப்பிவிடவேண்டும்.

விளம்பர விதிதங்கள்.

1 பக்கத்திற்கு	மாஸம் ஒன்றுக்கு	5 0 0
½ பக்கத்திற்கு	,, ,,	2 8 0
¼ பக்கத்திற்கு	,, ,,	1 4 0
¼ பக்கத்திற்குக் குறைத்தால் மாஸம் ஒன்றுக்கு அங்குலம் ஒன்றுக்கு		0 8 0

வியாஸம் எழுதுகிறவர்கள் கவனிக்கவேண்டியது.

விவசாயம், வியாபாரம், கைத்தொழில் விஷயங்களைப்பற்றி வியாஸங்கள் தேவை. அவைகள் ஒப்புக் கொண்டப்பட்டால் பிரசுரமானதும், எழுதினவர்களுக்கு தக்க பம்பாவனை செய்யப்படும். ஒவ்வொரு வியாஸத்தையும் கதாசியின் ஒரேபக்கத்தில் ஒருபாதியை விட்டு மறுபாதியில் மட்டும் எழுதவேண்டும். பேசும் தமிழ்தான் தேவை. சுத்தமான தமிழ் உதவாது.

இந்தப் பத்திரிகையில் பிரசுரமாகும் வியாஸங்களுக்காக சிருப்களுக்கு பம்பாவனை செய்திருக்கும் பக்ஷத்தில் அந்த வியாஸங்களை நாங்கள் எங்கள் இஷ்டப்படி எந்த விதம் வேணுமானாலும் மறுபடி பிரசுரிக்க அதிகாரமுண்டு என்பதை சிருப கேயர்கள் அறியவேணும்.

ஜி. ஏ. வைத்தியராமன் அண்டு கம்பெனி, 3 & 4, சுங்குராம செட்டித் தெரு, மதராஸ்.

To read the original Tamil articles visit www.sri-india.net

The articles, translations of which are printed in the later pages of this newsletter, noted that the single-seedling planting technique was already known for some years before the articles were published. Probably this innovation dates from 1906-07. The documentation indicated that the innovation had begun spreading in the region. Thus, although we could not track down the publication mentioned in the Commission report of 1928, we could establish that there had been a practice referred to as the 'single-seedling planting technique,' that it was beneficial, and that it was utilized in some parts of India more than 100 years ago!

The articles in the Tamil journal *Practical Life* showcased not only single-seedling planting, but also another method of cultivation, referred to as the *Gaja* method. This was very similar to the SRI cultivation presently advocated in Tamil Nadu. To give the readers a better sense of the innovations themselves as well as of the innovative farmers' thinking – and to show the close correlation with contemporary SRI of the old/new practices and reasons given for them, we provide translations of the several articles following this article. Some of the now-archaic weights and measures appearing in the article have been converted to modern units (Table 1).

Three articles were published in 1911 in Volume 3 of this monthly journal, which was edited by G.A.Vaidya Raman, B.A., and published by G.A. Vaidya Raman and Co., 3&4, Sunkurama Chetty Street, George Town, Madras (presently Chennai). We

would like to compare the practices described in these articles (published in 1911) with others published a few years before (1906) in the Tanjore District Gazetteer.

The first *Practical Life* article is a narration of the experiences of the farmer, Kulandai Veludaiyar, with the single-seedling planting method during the previous year.[2] The location of his community, Mudiyanur, reported to be in Kallakurichi *taluk* at that time, is in what is presently Villupuram district of Tamil Nadu.

The second article is a conversation between an unnamed farmer who is a member of the District Agricultural Association (identified as 'Member') and another farmer named 'Reddiar'.[3] Although the article did not say who 'Member' was, we inferred that he was Kulandai Veludaiyar, the author of the first article. This was confirmed on our visit to the concerned village (read article on this visit). The discussion took place in what was then South Arcot district (the exact location not known). It appears that direct seeding was the prevailing practice in this area, and 'Member' was comparing the advantages of transplanting single seedlings with direct seeding.

The resistance and disbelief of 'Reddiar' to the new idea which 'Member' proposed is reminiscent of what is heard said about SRI at the present time. The article shows that single-seedling planting had already been practiced in all of the wetlands of the Government Farm at Palur, now the Vegetable Research Station under Tamil Nadu Agricultural University; and it was the Farm Manager (Subramania Iyer) who educated Kulandai Veludaiyar about it. We also find that the single-seedling planting method had been discussed in the District Agricultural Association meeting convened by the District Collector, so the innovation had institutional recognition and support.

The publications in the Tamil Journal not only showcased single seedling planting, but also a method of cultivation very similar to the SRI cultivation that is being presently advocated in Tamil Nadu. The contents of these publications highlight the innovations of rice farmers of Tamil Nadu 100 years ago.

In the third article, Vaidyalingam Pillai proposed a very interesting package of practices which he called *Gaja* planting.[4] He said that he first tried *Gaja* planting on 50 *kulis* (i.e., one-sixth of an acre) in Kalathur-Melkarai village of Nannilam *Taluk* of Thanjavur district, and from this experience he supported and wanted to promote this package of practices known as *Gaja* planting. This article showed that *Gaja* planting was being advocated by the Government Farm Manager (C. Narayanasamy Iyer). Several innovative ideas on nutrient management were recommended by Vaidyalingam Pillai, and he described a rice-rice relay cropping cultivation method which is discussed in the later pages of this newsletter.

Single-seedling cultivation appears to have been developed by Mr. Aparanam Pillai (location not known) during 1905-06 season, and the *Gaja* planting method, which also included single-seedling planting, was apparently developed by Mr. T.S. Narayanasamy Iyer of Thirukkaruhavur in 1911. It is clear that single-seedling planting was promoted by the government and was adopted in government farms, and that the Farm Managers were involved in the promotion of this practice.

Table 1 Measures of area and weight cited in articles

1 *Kuli*	144 sq.feet
100 *kulis*	1 *maa*
3 *maas*	1 acre
1 cent (1/100th of acre)	40 m^2
2.47 acres	1 hectare
1 *Pattanam padi*	1.135 kg
1 *kalam*	27.2 kg
1 lb (pound)	0.454 kg

Recommended Practices

Varieties used

Kulandai Veludaiyar reportedly used *Garudan Samba* and *Perunsamba* varieties, long-duration varieties generally grown as a single rice crop and sown in August-September. In the second paper, the varieties Garudan Samba, *Perunsamba* and *Sadai Samba* were mentioned. Vaidyalingam Pillai did not mention the variety that he used when he tried row planting for the first time. But for a rice-rice (relay cropping) cultivation, he recommended *Paangu, Kuruvai, Poonkaar* and *Swarnavaari* varieties for the first planting, and *Vellai Sirumanian* and *Sembaalai* for inter-row planting.

Seed rate

Kulandai Veludaiyar used a seed rate of 1 *padi*[5] (1.135 kg) per cent of nursery,

[2] Kulandai Veludaiyar. 1911. Experiments in single planting of paddy. *Practical Life.* 3 (2): 84 – 86.

[3] Anonymous. 1911. Single planting of paddy. *Practical Life.* 3 (5) : 249 - 252

[4] Vaidyalingam Pillai. 1911. Row planting. *Practical Life.* 3 (7) : 347 – 349.

[5] *Padi* was a volumetric measure with two different versions: a smaller one, and a bigger one that was called *'pattanam padi'* which is twice that of small *padi*. A *marakkal* was 4 *padis* or 2 *pattanam padis* and it weighed 2.27 kg of paddy grain. 12 *marakkals* constituted 1 *kalam* (27.2 kg). There could be other variations, but this norm has been used in this article based on the data given in page 188 of *A Note Book of Agricultural Facts and Figures*, third edition, published by the Madras Agricultural Department in 1920. Even today, the *kalam* is used in Thanjavur district to express yield.

seeding 10 cents with *Garudan Samba*, and another 10 cents with *Perunsamba*, with the intention of planting in 3 acres. Actually, he was able to plant 5 acres with the seedlings of both varieties. This would mean that 5.15 kg seeds per acre were used (12.73 kg ha-[1]). The farmer said that after this experience, he stored only 5 *kalams* (136 kg) of seed paddy instead of the usual 50 *kalams* (1,360 kg). He also mentioned that other farmers used to sow 60 padi per *kaani* (1.33 acre), which is about 51.2 kg acre-[1] (126.5 kg ha-[1]). This means his reduction in seed was as much as 90%, as with SRI.

In the second paper, Kulandai Veludaiyar recommended 8 *padi* of seeds to be sown on 8 cents to plant 1 *kaani* (1.33 acre). This would be a seed rate of 16.87 kg per ha. Vaidyalingam Pillai recommended 1 *padi* of seeds to be sown on 3 cents for planting 1 acre (i.e., only 1.135 kg per acre, or 2.8 kg ha-[1]) because planting density was so much less with the *Gaja* method, where seedlings were quite sparsely sown, with a seed rate even lower than that recommended now for SRI (5-7.5 kg ha-[1]).

These rates can be compared with the recommended seed rates published (Table 2) in the Tanjore Gazetteer of the Madras Presidency (1906).[6] The present Thanjavur district was part of the Tanjore district of Madras Presidency. The seed rate given for planting 1 acre was higher for *Kuruvai* varieties (1½ to 3 *kalams* = 41 to 82 kg per acre, i.e., 101 to 202 kg ha-[1]) than the *samba* varieties (1½ *kalams* = 41 kg).

In another publication of 1920, we find this statement: *20 lb. from 7 cents of land will plant up to one acre (22.4 kg to plant 1 ha). But this seed-rate is usually very largely exceeded, up to 150 lb. per acre (168.3 kg per ha) being used.*[7]

From these reports and calculations, we can make some comparisons. The seed rate

To better understand the contents of the Tamil articles, the carefully translated versions (without losing the meanings) are appended after this article. The single seedling cultivation appears to have been developed by Mr. Aparanam Pillai (location not known) during 1905-06 itself, and the *Gaja* planting (which also advocates single seedling planting) was developed by Mr. T.S. Narayanasamy Iyer of Thirukkaruhavur in 1911.

used by Kulandai Veludaiyar and Vaidyalingam Pillai ranged from 2.8 to 16.87 kg per ha, while the normal seed rate used during that period was 101 to 168 kg per ha. So, there were some farmers of the early 20th century who recommended reducing the seed rate drastically, by 90% or more. Meanwhile, the Agricultural Department publication (1920) recommended *22.4 kg seed rate to plant 1 ha.* Even today, while the recommended seed rate in Tamil Nadu is 20 kg per ha, farmers are using much higher seed rates of 75 kg per ha, while for SRI, only 7.5 kg is required per ha.

Kulandai Veludaiyar reported that the sparsely distributed seedlings in his nursery escaped disease attack, while the conventional nurseries of other farmers were seriously affected. Besides, dense planting affected adversely the seedlings' capacity to establish immediately after transplanting. He described the state of the seedlings in a thickly-sown nursery in detail in the second article.[8] The concept of low seed rates and thinly sown nurseries was thus introduced 100 years ago. Farmers also recognized a benefit of sparsely-placed seedlings in terms of plant protection. Current research on SRI nurseries by TNAU researchers has also reported less pest and disease attack.

Main field preparation

The Tanjore District Gazetteer describes recommended field preparation as follows:

The fields are well manured either by penning cattle on them or by spreading over them the dung of sheep and cattle, ashes or town sweepings, and then watered to the depth of two or three inches. Four to six ploughings are done. When procurable, green leaves are given as additional manure, either between the first and last ploughing or after all ploughings are over. The ploughing is also supplemented with the use of manvetti (spade). The field is smoothed by pulling a plank over it just before transplantation.

Vaidyalingam Pillai emphasized proper leveling and stated that the size of each paddy should be not more than half an acre, to permit better field leveling and give more control over water levels. He stated that the mud should be deep, dark and nice. The field where he tried row planting was dug up with a *manvetti,* then leveled and ploughed three times, with sufficient *jatropha* leaves applied. The field was then again ploughed three times to get the required soil conditions. The importance of good leveling of the field, now emphasized in SRI, was also well recognized by Kulandai Veludaiyar.

Seedling age

According to the Tanjore District Gazetteer published in 1906:

The seedlings are allowed to remain in the beds for varying periods according to the

[6] Hemingway, F.R. 1906. Agriculture and Irrigation (Chapter IV). *Madras District Gazetteers: Tanjore.* Government Press, Madras, pp. 91-113.

[7] Cecil Wood, R. 1920. *A Note Book of Agricultural Facts and Figures.* 3rd edition. Government Press, Madras, page 58.

[8] This has been evaluated scientifically by Mishra, A. and V.M. Salokhe, "Seedling characteristics and early growth of transplanted rice under different water regimes," *Experimental Agriculture*, 44:1, 1-19 (2008).

Table 2 Details of varieties, nursery period and seed rate in Tanjore district (1906)

Genus	Species	Important sub-species	Number of days taken in seed-beds	Total number of months taken to mature	Number of *Kalams* of seed required for an acre	Remarks
Kuruvai	*Kadappu*	....	30	4	1¾	Grown in Mannargudi, Tiruturaippundi and Shiyali
	Kuruvai	1. *Muttai Kuruvai* 2. *Karuppu Kuruvai*	15 to 25	3	2 to 3	Cultivated nearly everywhere. In Pattukottai *taluk* grown as second crop in December or January
	Kár	1. *Kár* 2. *Púngar* 3. *Sittirai Kár* 4. *Karutta Kár* 5. *Sandi Kár*	25 to 35	4 5	1½ to 2½	Sown everywhere except in Nannilam, Tirutturaipundi, and the Tanjore uplands
Sambá	*Sambá*	1. *Sembalai* 2. *Segappu Sirumaniyam* 3. *Vellai Sirumaniyam* 4. *Nilam Samba* 5. *Kuttalai*	40	6½	Generally 1½	The first three are the most common but are not found in the non-deltaic parts. Nos.(4) and (5) are generally sown and not transplanted
	Pisánam	1. *Ottadai* 2. *Kumbálai*	45 to 55	8	Generally 1½	No. (1) is very common in the less fertile deltaic tracts and often mistaken with a *Kár* crop. No.(2) is generally sown and not transplanted

kind of paddy sown. Generally it may be said that the Kuruvai varieties of paddy should not be transplanted before the lapse of 15 to 25 days, the kar varieties before the lapse of 25 to 35 days, and the samba varieties before the 40th to 55th day. A traditional rule is that the seedlings should be left in the seed bed/beds for one-fourth of the period that the crop requires to mature.

For *Kuruvai* varieties (3-5 months duration), the seedling age ranged from 15 to 35 days, and for the *samba* varieties (6½-8 months duration), it was from 40 to 55 days (Table 2). While Kulandai Veludaiyar used 25 day-old seedlings, Vaidyalingam Pillai recommended 30-32 day-old seedlings. Obviously, the young seedling concept which is given much prominence with SRI, was not known by farmers during this earlier period.

The young seedling concept in SRI is aimed at exploiting the early vigor of the seedlings in terms of tillering. But there is always some hesitation on the part of farmers, especially the laborers, to handle young seedlings of only 12-15 days age. We also see some farmers using 20-day-old seedlings in SRI when they have difficulty in raising seedlings in time, due to lack of irrigation water.

Treatment of seedlings

When pulling seedlings from the nursery, beating the roots on a wooden stick to remove the adhering soil is a common practice in conventional cultivation, even today. This practice was criticized by Kulandai Veludaiyar, and he stated that the roots were instead to be rinsed in water. As seen in the translation of his article, he emphasized the retention of good vigor by the seedlings by this method. There was no mention about handling of seedlings by Vaidyalingam Pillai.

Reducing the trauma to the seedlings before transplanting is one of the recommendations in SRI. This was partially recognized 100 years ago by recommending avoidance of the normal rough treatment given to seedlings.

Planting

The row spacing adopted by Kulandai Veludaiyar was ¾ feet (22.5 cm), but we could not discern what spacing he used within the row. Vaidyalingam Pillai, on the other hand, has given more specific detail. He mentions the use of ropes for row planting, with inter-row spacing of 1 ½ feet (45 cm), and within the row, spacing was 1 foot (30 cm). This spacing was for the situation of a single rice crop.

For rice-rice relay cropping (a new method of rice cultivation described by Vaidyalingam Pillai), row spacing for the first crop was 2 ½ feet (75 cm), and then the relay crop is planted in the middle of these rows when

The major difference between *Gaja* planting and SRI is the age of seedling

the first crop was at flowering stage. With 45 x 30 cm spacing, the number of seedlings (single seedling per hill) would be 7-8 plants per square meter. We note that with SRI, optimum spacing can be up to 50 x 50 cm (4 plants per sq.m) for very fertile soils. Best spacing is a function of soil fertility.

In all three rice-growing methods reported by these farmers, single seedlings were planted. Also, it was noted that laborers expressed the opinion that with single seedlings, the crop will never come up. But their skepticism was subsequently shown to be misplaced.

Less labor requirement for single-seedling planting in rows was reported by Kulandai Veludaiyar. He stated that for one *kaani* of land, 10 laborers would be enough (19 laborers per ha) instead of the normal requirement of 15-16 per *kaani* (28-30 laborers per ha). This represents a reduction in labor requirements of about 35%.

The data given by the Madras Agricultural Department[7] showed that it took 12-15 women to plant 1 acre (30 to 37 per ha). One of the major concerns with SRI has been higher labor requirement for planting. However, like the farmers of 1911 doing single-seedling planting, many farmers in Tamil Nadu now have reported 30-40 % reduction in labor for SRI planting.

Kulandai Veludaiyar recognized that the sparsely distributed seedlings in his nursery escaped disease attack.

Kulandai Veludaiyar recognized that hand weeding was easier because of row planting. Vaidyalingam Pillai said that Thanjavur farmers who planted seedlings in bunches should pay attention to how much space is required for each hill. This showed his awareness of the advantages of lower plant density.

Row planting

It is fascinating to see that row planting was introduced in Tamil Nadu 100 years ago along with single-seedling planting. It has been thought that row planting first came here with introduction of the Japanese method of rice cultivation, and then reinforced with the promotion of IR8 in the 1970s. But farmers in Tamil Nadu started this practice a century ago, making an important conceptual advance in rice cultivation. Not only row planting, but also wider spacing between the hills and within the row was advocated by Vaidyalingam Pillai. This is similar to SRI, where we recommend square planting at 25 cm spacing as the starting distance, adjusting this according to soil fertility levels.

In SRI, 50 cm spacing has been reported to be advantageous in Madagascar after soil organic matter has been built up through SRI practices over a number of years. Vaidyalingam Pillai recommended spacing of 45 x 30 cm already in 1911.

The currently prevailing conventional planting method entails about 200 seedlings per sq. m, compared with the SRI recommendation of 16 plants. Vaidyalingam Pillai considered 7-8 plants per sq. m.

sufficient. The rice-rice relay cropping that he proposed is another fascinating invention by a farmer, one not yet pursued in modern rice cultivation.

Nutrient management

A century ago, farmers used only organic sources for soil nutrient amendments. The Tanjore District Gazetteer shows that the silt brought by the water of the Cauvery River was well supplied with nutrients, so the alluvial soils of Tanjore did not require manuring. However, construction of check dams interfered with this. The manures ordinarily used were the dung of sheep and cattle, ashes, town refuse, leaves, oil refuse, and the silt from dry tank-beds. Examples of their cost are given in Table 3.

Kulandai Veludaiyar did not discuss manures, but Vaidyalingam Pillai describes innovative approaches for manuring the crop. He said that he did not place one *sirangai* (handful) of sand and one *sirangai* of FYM at the planting site of each seedling as done in Thirukkarugavur (recommended by Mr. T.S. Narayanasamy Iyer) and as instructed by the Farm Manager when trying *Gaja* planting for the first time. Also, oil cake was not placed on the hills while weeding. He thought that application of *jatropha* leaves (quantity not mentioned) was the best manure. When he described the package of practices, he advocated the following:

- At the location for planting each seedling, place 1 *sirangai* of sand and 1 *sirangai* of manure and mix well with the soil around. The seedling should be placed over it.

- 20 days after planting, dig the inter-row space superficially with a *manvetti* (spade) and incorporate whatever green leaves are available.

- 40-45 days after planting, dig around each hill, place a mixture of oil cake @ 2.3 kg/cent with manure around each hill and close it with soil.

In SRI, 50 cm spacing is reported in Madagascar. Vaidyalingam Pillai has recommended 45 x 30 cm spacing in 1911 itself. The rice-rice relay cropping advocated by him is yet another fascinating invention.

- In the rice-rice relay crop, harvest only the tops of the first crop; cut the straw and incorporate it as green manure. (This again is an innovative recycling of crop residues).

We have no idea whether the nutrient management practices advocated by Vaidyalingam Pillai were followed by others or not. But the concepts of Vaidyalingam Pillai have no place in the modern nutrient management strategies for rice, which favor inorganic fertilization.

Placement of manure below the seedling is an innovative idea like the nutrient briquettes/super granules of modern nutrient management. Since the number of hills in *Gaja* planting was only about 7-8 per sq.m., this practice of attending to each hill might have been possible.

Incorporating green leaves in the inter-row space 20 days after transplanting was thought of in 1911 already. We note the recommendation from Tamil Nadu Agricultural University about 10 years ago, to grow *Sesbania rostrata* as intercrop with rice (both sown by drum seeder) and to incorporate the *Sesbania* in the soil 30-35 days after sowing. Growing a relay rice-rice crop and incorporating the straw of first crop is yet another innovative concept of recycling crop residues.

Water management

We found stated in the Tanjore Gazetteer: *… after transplantation, the field is kept in a half-dry condition (resembling recently burst boil) for several days, until the crop recovers from the sickly appearance consequent on transplantation (i.e., from transplanting shock) and becomes green, and then it is regularly supplied with water. In some places (e.g., Sirkazhi), it is considered necessary to change the water every week, and even to allow the earth to get for a short time into a certain 'waxy' condition, which is considered very beneficial. Ordinarily, however, the water is not changed. The depth admitted is generally two inches at first, and rises with the crop till, at the time the ears are forming, it is about 8 inches (20 cm). Up to this stage it is generally believed that (for the samba crop at any rate) the more water there is standing in the field without submerging the plants, the better the crop will be. After this period, most ryots prefer to leave the field dry, though some think a small flooding of about two inches of water is beneficial.*

The mention of 'half-dry' condition during the early days after planting is quite similar to what is prescribed now for SRI. Irrigation practices followed were not mentioned in

Table 3 Cost of manures in Tanjore District 100 years ago

Particulars	Range of cost
Penning 100 sheep for a night	3 annas to 1 rupee and 3 annas
Penning 100 head of cattle	5 annas to 2 rupees
A cartload of dung or ashes	4 annas to 1 rupee
A cart-load of leaves	8 annas to 2 rupee
A cart-load of sweepings	6 pies to 6 annas
Oil cake per candy (20 maunds)	12 annas to 1 rupee

1 Rupee = 16 annas, 1 anna = 12 pies, 1 maund = 25 lbs (11.3 kg)

the first two articles. But Vaidyalingam Pillai recommended shallow flooding of 2.5 cm during the first week after planting, 4 cm during the next 2-3 weeks, and 5 cm afterwards. More than 5 cm flooding was not approved of. The fields were irrigated every 4-5 days.

Vaidyalingam Pillai says that the *Gaja* planting irrigation method contradicts the common adage: *neeruyara nelluyarum,* meaning 'paddy yield will increase in accordance with flood water depth' and he noted Tanjore district farmers' habit of flooding their fields up to bund level. He felt that more flooding lowered tillering. But he deferred to the fact that 'experienced people' believe more water will increase the yield, and he invited the opinion of experts on this matter.

That Vaidyalingam Pillai even questioned the continuous flooding of rice paddies and took exception to high water levels is a conceptual advance. There were at the time no conflicts about sharing river water, and less water scarcity than today. The general assumption was: the more flood water in fields, the higher the yields. Even today, when we have so much pressure on availability of water for irrigating rice, and conventional flooding is still practiced, we see a farmer in 1911 advocating less flooding for rice production. The current recommendation in conventional rice cultivation is to irrigate to 5 cm depth one day after the disappearance of ponded water. But farmers rarely adopt this recommendation and keep their fields flooded continuously unless their water supply is limited.

The innovative farmer view on tillering and water depth is also noteworthy in light of the ongoing scientific debate over SRI. Sinclair (2004) has stated, for example, that "ample" water, implying continuous flooding, maximizes rice yields.[9] The popular myth of more water being good for the plant thus still exists. But the current experience of SRI farmers and experimental evidence show this to be a myth, as was realized by Vaidyalingam Pillai a century ago. The *Gaja* planting irrigation method augurs well with the water-saving concept of SRI. It is remarkable that a farmer was thinking about reducing the water use for rice a hundred years ago.

It is fascinating that row planting was introduced in Tamil Nadu 100 years ago along with single seedling planting. Row planting, it was thought, came along with the Japanese method of rice cultivation and IR8 in the 1970s.

Weeding and intercultivation

The Tanjore District Gazetteer states: *Weeding is invariably done by hand. It is sometimes done only once, sometimes as many as three times. The first weeding never takes place before the fifteenth day after transplantation, and the last not later than two months from that time.*

There is no specific discussion of weeding in the three Tamil articles, but Vaidyalingam Pillai advocated shallow digging of the inter-row spaces with a *manvetti* 20 days after transplanting and again at 40-45 days after transplanting, removing soil around each hill to place manure. For his first crop of *Gaja* planting, each hill was pressed with the foot.

The shallow digging of inter-row spaces and pressing each hill with the foot are a conceptual advance as it aimed not only at the weed control but was an activity disturbing the soil – similar to the intercultivation with a mechanical weeder that is recommended in SRI today. These practices indicate some understanding on the farmer's part that disturbance to the soil around the hills had beneficial effects. No modern rice cultivation methodology seems to have this concept except SRI, which underscores the importance of active soil aeration. The weeder use recommended with the Japanese method of cultivation was aimed at weed control only.

Criticisms on Single-Seedling Planting

The criticisms faced by farmers who practiced single-seedling planting in 1911 were little different from what has been happening for SRI farmers planting single seedlings today. Since the single-seedling field at first did not look like a planted field, the laborers of Kulandai Veludaiyar pressured him to plant two seedlings in the other fields. Seeing the fast growth of the single-seedling planted crop, however, other farmers concluded that the crop growth was good although they attributed this to good fertility of the field rather than to the methods used.

In the conversation between the farmer and Kulandai Veludaiyar ('Member'), the farmer thinks that the single-seedling results depend on a new variety and wants to see the seeds. This kind of concern, reluctance and non-acceptance (please see the translation of this conversation) is often experienced by those promoting SRI now. Vaidyalingam Pillai comments on the mockery of people who saw the single-seedling planted field initially. This experience is reported many times these days by farmers who have taken up SRI cultivation, and who have had to deal with the objections and criticisms of family members and neighbors.

Vaidyalingam Pillai focused on another point in adopting new methods of cultivation. He said that even if articles and experiences on improved techniques like *Gaja* planting are published every month in the journal (Pizhaikkum Vazhi) and on every

[9] T. Sinclair, Agronomic UFO's waste valuable scientific resources, Rice Today, 2004: 3, p. 44.

Table 4 **Grain yield obtained by adopting single-seedling technique by farmers**

S.No	Name of Farmer	Location : Village (District)	Area	Total yield with single seedlings	Normal yield with conventional methods	Yield with single seedling (kg ha-1)	Typical average yield[b] (kg ha-1)
1	Kulandai Veludaiyar	Mudiyanur (Villupuram)	5 acres	225 *kalams* (= 6120 kg)	27 *kalams*/acre (= 1815 kg ha-1)	3024	2366 (for South Arcot in 1911)
2	Vaidyalingam Pillai	Kalathur-Melkarai village (Tiruvarur)	0.5 maa	13.5 *kalams* (= 405 kg)	5 *kalams* (= 136 kg)	6004	1492 – 1693 (for Tanjore district in 1911)
3	T.S. Narayanasamy Iyer	Thirukkarugavur (Thanjavur)	-	1522 *padis* per acre	-	4268[a]	

[a] based on report by Vaidyalingam Pillai. [b] Reported during the corresponding period [10, 11]

page, they will not be sufficient to achieve public awareness and acceptance. Everyone who has tried the new method should publish their experiences, he advised. The difficulty of achieving change was a slow process then as it is now. Adoption of SRI by farmers is slow in many places, and many scientists still refuse to acknowledge the benefits of SRI. But as noted in the introduction, acceptance has become accelerated where there is strong and consistent institutional support.

Growth and Grain Yield

The quick establishment of single-seedling practice and the early commencement of tillering was mentioned in the Tamil articles. Kulandai Veludaiyar reported 10, 15, even 20 tillers in 2-3 weeks' time. Vaidyalingam Pillai applied his mind in a scientific way to compare the length of the panicles, number of grains per panicle, and the grain weight.

- Tillering started from 12 days after planting, with profuse and thick tillering following, reaching 70-120 tillers.
- All the panicles were noted to be well-filled and uniform, as seen with SRI.
- Average panicle length was 37.5 cm long, and there were more grains per panicle for any given length, presumably because of more branching. Pillai reported *Gaja* panicles having 95 more grains compared with equal-length panicles from conventional crop methods.
- Number of grains per rupee weight was less by 24 (meaning single-grain weight was higher).

These observations show the scientific attentiveness of a farmer hundred years ago, at the same time the Madras agricultural college was being established at Coimbatore.

Yield levels were not quoted in the Tanjore District Gazetteer to know what were typical yields with standard methods. The grain yields reported in the Tamil articles are summarized in Table 4.

The yield obtained by Vaidyalingam Pillai from *Gaja* planting was 6,004 kg ha-1, which is computed from his statement that he obtained 324 padis from 0.5 maa. The farmer also says that he harvested only 5 *kalams* (2,206 kg ha-1) from the same field the previous year using bunch planting. These are precise statements on area and measurement. The farmer compared his yield with the yield reported by Narayanasamy Iyer at Thirukkaruhavur (1,522 padis per acre, i.e. 4,268 kg ha-1) and stated that higher yield could have been obtained if manures were applied as done in Thirukkaruhavur.

The yields obtained by Tanjore farmers adopting *Gaja* seedling as reported in 1911 was considerably higher than the average yield of the district.

Vaidyalingam Pillai harvested 2.7 times more grain yield by *Gaja* planting method when compared to the yield obtained from the same field the previous year when bunch planting was adopted. Average rice yield during 1911 in Tanjore district was 1,006 pounds per acre (1,128 kg ha-1 rice, i.e., 1,693 kg paddy ha-1) as per crop-cutting experiments.[10] Average yield during 1911-1915[11] was 1,492 kg ha-1 according to Sivasubramanian (1961). Thus, the yields obtained by Tanjore farmers adopting *Gaja* seedling as reported in 1911 was considerably higher than the average yield of the district. Vaidyalingam Pillai obtained 3.5 to 4 times more than the average yield reported for the period,

[10] Yanagisawa H. 1996. *A Century of Change: Caste and Irrigated Lands in Tamilnadu, 1860s-1970s,* Delhi, 291pp.

[11] Sivasubramanian T. 1961. Agricultural trends in Tanjore district. *Madras Agric.* J. 48: 255-258.

and Narayanasamy Iyer obtained 2.5 to 2.9 times higher yield.

Indeed, the yield reported by Vaidyalingam Pillai in 1911 was 17 % higher than our contemporary Tamil Nadu state average yield of 5,135 kg ha-[1] (2006-07). The yield obtained by Narayanasamy Iyer (4,268 kg ha-[1]) almost 100 years ago was close to the current state average for the decade 1997-98 to 2006-07 of 4,528 kg ha-[1].

The grain yield obtained by Kulandai Veludaiyar from his single-seedling planting was 8.3 times more than the maximum yield previously obtained by him. The yield for single-seedling planting was 27.8 % more than the average yield of South Arcot district in 1911[10]. It is remarkable that such high yields could be obtained by farmers by their own innovations a century ago.

Other Benefits of Single-Seedling Planting

Kulandai Veludaiyar reported several other benefits of single-seedling planting which should be considered, because these are things that rural household appreciate in addition to yield:

- No disease attack
- Earlier maturity by 20 days
- Higher straw yield
- Hand weeding was easier due to line planting
- No rat damage
- All tillers became productive
- Less expenditure needed and more profit obtained
- No damage in flood-prone fields because establishment was faster.
- Since the stems are thicker, there is more resistance to drought.

All these are benefits also realized with SRI practices at present. It is noteworthy that Kulandai Veludaiyar found single-seedling planting to be the best way to deal with flood-prone fields.

Madras Presidency-1936

Continuance of Single-Seedling Planting in Madras Presidency

With all of these benefits, the question naturally arises why these practices did not persist, and why they are needing to be reintroduced today under the aegis of SRI. Unfortunately, we do not have a good answer to this question. This is a question which the agricultural science community as well as NGOs and others should be considering. We have come across several other documents that showed single-seedling planting was recommended and practiced for quite some years in the Madras Presidency. It was evolved under the label "Economic Planting of Rice".

Raghavachari (1915) reported that the system of planting single seedlings was coming into vogue in Thanjavur district.[12] Single-seedling planting was reported in 1918 in Eruvellipet village (near Villupuram, i.e., near Kulandai Veludaiyar's Mudiyanur), seven years after his article was published, according to Slater (1918), who was at the time Professor of Indian Economics in the University of Madras. Slater stated that *"the village of Eruvellipet has generally adopted the system of 'single transplantation' of paddy recommended by the Agricultural Department." It is noteworthy to see that "experiment has proved that if each seedling is separately planted and all are evenly spaced, there is a considerable saving of seed and a heavier crop. The new method is spreading, but as yet very slowly. Unless the grains are sown thinly in the seed-bed, single transplantation takes more time and labor, and if this is not realized, disappointment follows. The poor ryot, moreover, naturally and properly, refuses to experiment, as he cannot afford a failure, and waits to see with his own eyes that a new method is an improvement before he adopts it. Richer ryots, who can afford to experiment, also can afford to employ hired labor, and they find that the coolies they employ will not change their methods unless compelled to do so by strict supervision. They want to do their work in the semi-automatic manner attained by unchanging habit, and not to tax their brains and think about what they are doing."* [13]

In a 1920 publication of the Madras Agricultural Department[14], there is a statement: *"If the planting is done singly, when the women become accustomed to it, they will plant more quickly."* Probably the 22.4 kg seed rate per ha applies to single-seedling planting. There are, however, no more details of single seedling planting in this publication. The Royal Commission on Agriculture in India's Abridged Report 3 shows that single-seedling planting was recommended at least up through 1928.

Other publications show that what was called "Economic planting of rice" was

[12] Raghavachari, K. 1915. Paddy cultivation in the Madras Presidency and the lines on which it can be improved with special reference to the Tanjore district. *Madras Agric.* J. 3: 234-242.

[13] Slater, G. 1918. *Some South Indian Villages.* Oxford University Press, London.

[14] Cecil Wood, R. 1920. *A Note Book of Agricultural Facts and Figures*, 3rd edition. Government Press, Madras, p. 40.

recommended and practiced in Madras Presidency at this time. We do not know details of this method, but it is clear that less seeds were used and single seedlings were planted. In a paper presented at the Indian Science Congress of Madras (5 June 1929) on the topic 'Recent agricultural development in Madras', the then Director of Agriculture, R.D. Anstead stated: *"cultural improvement such as the economic planting of paddy from thinly sown nurseries have been adopted over a wider area as a result of demonstration and propaganda. By economic planting, by green manuring, and by using selected strains, the department has demonstrated to ryots that it is possible to increase the yield of paddy very considerably."* [15]

In a much-later note on this topic[16] , it is reported that "*crop raised from thin-sown nursery always gave increased yield ranging from 6 to 15 percent compared to the crop raised from thick-sown nursery*." It is interesting to find that by "*saving at least 25 lbs of seeds per acre by reduced rate over the 10 million acres of paddy in the Province (Madras), there will be a saving of nearly a lakh tons of paddy seed. In Tanjore district alone this saving will feed its population for 3 weeks.*"

Summary and Conclusions

We have seen that the single-seedling concept of present-day SRI method of cultivation was developed by farmers of Tamil Nadu about 100 years ago and was made known through a Tamil monthly journal, *Pizhaikkum Vazhi* (Practical Life). The concept included line planting. Another farmer-devised version of single-seedling practice, called *Gaja* planting, which involved a detailed package of practices reported in this Tamil journal, specified wider spacing between and within rows so that plant population was only 7-8 plants per sq. m., with improved results.

The single-seedling planting method appears to have been followed in Government Farms, so this was evidently accepted by the agricultural establishment. A Government publication of 1928 mentions single-seedling planting favorably and endorses the need for demonstrations to convince farmers. This indicates that the method was in vogue for more than 20 years. But how long it lasted and why it disappeared we just do not know. Ironically, now in 2008 we are talking (again) about single-seedling planting through SRI. The description of *Gaja* planting matches the principles of SRI in many respects, viz., single seedlings, fewer number of plants per sq.m, shallow irrigation, and intercultivation. The use of younger seedlings which SRI promotes is the missing element in *Gaja* planting for highest gains in productivity.

The rice cultivation practices generally followed in Thanjavur district at the beginning of the 20th century are documented in the Tanjore District Gazetteer published in 1906. This helped us compare standard results with those from the single-seedling planting method. The discussion of 'half dry' field condition during the first days after transplanting, mentioned in the Gazetteer, and the advice of 'not more than 5 cm irrigation' associated with *Gaja* planting shows that already a century ago some persons did not consider high water levels and continuous flooding necessary. The innovative nutrient placement and recycling of straw in rice-rice cropping system described by Vaidyalingam Pillai shows the creativity of farmer-experimenters. Kulandai Veludaiyar carried out his own research on the suitability of single-seedling planting and reported that it was successful in low-lying sodic soils, sandy soils, flood-prone saline soils, and marshy soils.

The publications of Rao Saheb Kulandai Veludaiyar and Sri Vaidyalingam Pillai in 1911 showed innovative, scientifically-valid approaches towards rice cultivation that are applicable still today. Credit for single-seedling planting and row planting should go to these Tamil Nadu farmers, and we should note the merits of *Gaja* planting proposed by Vaidyalingam Pillai which has many similarities with SRI.

SRI is certainly a major breakthrough in the conceptualization and practice of rice cultivation. More than its specific practices, it has contributed to making people think differently in order to get more production and higher resource productivity. It challenges the conventional approach of expecting that only high input-oriented agriculture can get more production. This reverses the logic of much current thinking on agriculture.

This paper has shown how similar approaches were tried out in India a hundred years ago. Seeing these historic 'echoes' could make it relatively easier to promote SRI today. The intention of this paper is not to suggest that SRI originated in India. Rather we wanted to document that many of its practices have been utilized in India long ago, and farmers were able to use them quite successfully. This paper does not diminish the importance of SRI but rather shows that it is grounded in biological potentials and realities that have existed in the rice genome for millennia.

T.M. Thiyagarajan
Consultant, ICRISAT-WWF Project, and former Director, Centre for Soil and Crop Management Studies, Tamil Nadu Agricultural University, Coimbatore, India

Biksham Gujja
Team leader, ICRISAT-WWF Project, and Senior Policy Adviser, WWF International, Gland, Switzerland

[15] *Year Book 1928*. Madras Agricultural Department, pp. 41-54.

[16] Economic planting of rice. *Madras Agric.* J. 36:538 (1949)

EXPERIMENTS IN SINGLE PLANTING OF PADDY.

நெல் ஒற்றை நாற்று நடுகையின் அநுபவக் குறிப்பு.

கள்ளக்குறிச்சி தாலூகா முடியனூர் மிராசுதார் வேலுசாமி ரெட்டியவர்கள் சென்ற வருஷத்தில் என் பண்ணையில் ஒற்றை நாற்றுப் பயிர் செய்த அநுபவத்தின் குணங்களை சகலருந் தெரிந்து அதன் நன்மைகளை யடையும் பொருட்டு இதனால் தெரிவிக்கிறேன்.

சென்ற வருஷம் ஆவணி மாதம் 15-ம் தேதி 10 படி கொறுக்கன் சம்பா நெல் 10 சென்டிலும், இருவாரம் கழித்து 10 படி பெருஞ் சம்பா நெல் 10 சென்டிலும் 2 நாற்றங்கால் நாற்று விடப்பட்டது; அந்த நாற்றங்கால்களுக்கு வழக்கம்போல் தழையெரு போடப்பட்டது. முதலில் நிலத்தைச் சமமாகப் பரம்படித்தேன்; இந்த நாற்றங்கால்கள் விதைப்பு நிலங்களைப் போல் ஜலம் பாய்ச்சப்பட்டு வந்தன. இந்தப் பயிருக்கு யாதொரு களை முதலிய வேலைகள் செய்யப்படவில்லை.

இந்த நாற்று 3 ஏகர் நஞ்செய் நடக்கூடும் என்று உத்தேசித்து, நடவுக்கு நிலம் தயார் செய்து வைத்திருந்தேன்; 25 நாள் கழிந்தவுடன் நாற்றுகளைப் பிடுங்கினேன்; நாற்றுப் பிடுங்குவதற்கு வழக்கமாக நாற்றின் வேர்களில் பற்றுதலாகப் பிடித்திருக்கும் மண்களை அடித்துக் கழுவுவதற்காகவே நாற்றைப் பிடுங்குபவர்கள் ஒவ்வொருவரும் முளைக் கழி ஒன்று ஊன்றிவைத்து அதில் அடித்து முடிகட்டுகிற வழக்கப்படி, இந்த நாற்றை முளைக்கழியில் அடிக்காமல் ஜலத்தில் வேர்களை அலம்புவதனாலேயே மண்கள் கழிந்து போய்விட்டன. இதனால் அந்த நாற்றுகள் நலுங்காமல் பசுமையோடு நடுவதற்குத் தகுந்த செழிப்பாயிருந்தன.

அந்த நாற்றை ஒரு ஏகர் அதாவது 33 சென்டில் ஒவ்வொரு நாற்றாக ¾ அடிக்குச் சாலை சாலையாக நடும்படிச் செய்து முடிந்தவுடன், அந்தப் பயிர் நட்ட நிலம் நடவு நட்டதைப் போலப் பார்வையில்லாமல் இருந்ததால், என் பண்ணை ஆட்கள் எல்லாரும் இந்தப் பயிர் கூடியே வராதென்று ஆக்ஷேபித்தார்கள்; அவர்களின் கட்டாயத்திற்காக இனி நடும் நாற்றுகள் 2 பயிர் சேர்த்து நடும்படித் திட்டம் செய்தேன்.

இப்படி நட்டதில் முந்திவிட்ட 10 படி நெல் நாற்று 2½ ஏகர் நட்டுவிட்டது; அதன் மேல் மிச்சின நாற்றுகளுக்கு வேறு இடத்தில் 2 ஏகர் தயார் செய்து முன் தயார் செய்திருந்த 3 ஏகரும் சேர்த்து ஆக 5 ஏகர் நடப்பட்டன. வழக்கமாகக் காணி ஒன்றுக்கு 16 ஆள் நட வேண்டியதற்கு 10 ஆட்கள் சுலபமாய் நட்டார்கள். முந்தி நடப்பட்ட நாற்றுகள் ஒரு வாரத்திற் கெல்லாம் கிளைப்பதற்குத் தொடங்கி 2, 3 வாரத்தில் 10, 15, 20 கிளைகள் கிளைத்துக் கறுத்துப் பார்வைக்கு அழகாய் வளர்ந்து வருவதைப்பார்த்து மற்றக் குடித்தனக்காரர்கள் அந்த ஒற்றை நாற்று நட்ட நிலம் நல்ல வளமுள்ளதென்றும், அந்த நிலத்தின் கொழுமையால் இப்படிச் செழித்து வருகிறதென்றும் சொல்லிக்கொண்டார்கள். அதற்காகப் பிந்தி நடவேண்டிய நாற்றைக் கொஞ்சம் களர் உள்ள பள்ளக்கால் நிலத்தில் நடும்படி செய்தேன்; அந்த நிலங்களிலும் யாதொரு குறைவின்றிச் செழிப்புடன் வளர்ந்தது. இந்தப்பயிர் நட்ட காலம் நெல் பயிருக்கு வேண்டிய அதிக மழை பெய்யாதிருந்தும் அந்தப் பயிர்கள் பால் கறக்காமல் ஊட்டி வளரும் பசுங்கன்றுகள் செழித்து வளர்வதைப் போல ஒரே சீரான மேனியாக வளர்ந்து வந்தன. இந்தப் பயிரில் மற்ற நெல் பயிர்களில் படும் நோய் முதலியவைகளும்

Translation from the journal Practical Life. 3(2): 84-86 (Feb. 1911)

Experiments in single planting of paddy

by Kulandai Veludaiyar

I, Kulandai Veludaiyar of Mudiyanur, Kallakurichi *Taluk*, inform through this the experience that I have gained by single-seedling cultivation in my farm, for others to know and derive the benefits.

Last year, I raised nursery two times, one with 10 measures of *Garudan Samba* in 10 cents in the month of Avani (August-September) and the other one week after that with 10 measures of *Perunsamba* in 10 cents. As usual, green manure was applied to the nursery. First I leveled the field. These nurseries were irrigated in the same way as direct-sown fields. No weeding work was done to this crop (nursery).

I expected to plant these seedlings in 3 acres and had the main field prepared; the seedlings were pulled after 25 days; the usual method of beating the seedlings on a wooden stick to remove the soil adhering to the roots was not done, but the soil was removed by rinsing the roots in water. By doing this, the seedlings remained green and lush for planting without shrinkage.

After planting single seedlings at a row spacing of ¾ feet in a field of 33 cents, the field did not look like a planted one, and my farm laborers objected, saying that the crop will not come up. Because of their pressure, I planned to use two seedlings per hill thereafter.

By planting in this manner, the first nursery seedlings with 10 measures were planted in 2 ½ acres. The second nursery seedlings were planted in 2 acres, and thus in total 5 acres were planted. Instead of the usual 16 laborers required to plant 1 *kaani*, 10 laborers easily finished the job. On seeing that the seedlings planted first had started tillering within a week, and within 2, 3 weeks they had 10, 15, or 20 healthy and beautiful tillers, other farmers said that the single-seedling planted field was very fertile and that was why the plants were growing well.

For this reason, I planted seedlings from the second nursery in a low-lying field with slightly sodic soil. The plants grew well in that field also. Though the required rainfall for this crop was not there since planting, the plants grew very well. The crops were not affected by the usual diseases either. The panicles were healthy and maturing. The plants were ready for harvest 20 days earlier than usual. The crop was harvested and the yield was 225 *kalams* filled with 2 ½ measure marakkal. The straw yield was also higher.

In my experience, this yield level was never obtained before in these lands. The average yield was (previously) never more than 27 *kalams* per acre. When the crop was growing nicely, my farm laborers felt that people will cast their evil eyes on the lush growth, so they put up some symbols in the field to ward off that threat. When comparing the growth of the crop in 33 cents using single seedlings with the other crops planted with 2 seedlings, the growth and panicle number were better in the single-seedling crop. Line planting was

Rao Saheb Kulandai Veludaiyar appears to have studied up to standard 5 only, but rose to the level of "Rao Saheb" by his philanthropic works and social service.

His contributions made a century ago are still benefiting the Mudiyanur village and the farmers of Kallakurichi *taluk*.

It is gratifying to learn about him through his article on single-seedling planting in *Pizhaikkum Vazhi* published in 1911.

helpful for easy hand weeding without trampling the plants. Also there was no rat damage.

By this experience, instead of drying and storing 50 *kalams* of grains as seeds, 5 *kalams* of seed from selected good panicles were dried and stored. When the single-seedling nursery was sown, I had advised other farmers to try it experimentally, but they had raised the usual nursery with thick sowing. Those seedlings were damaged by some worms, but the seedlings in my nursery were not affected by these worms since the seedlings were sparse. These farmers waited for 60 days for their seedlings to recoup and found that seedlings raised at the rate of 60 measures per *kaani* of seeds were insufficient. Finding that those seedlings did not establish well even after 2 weeks, these farmers saw the excellent growth of the single seedlings and the beautiful tillering, and they sought clarifications. After seeing the damaged seedlings of the thickly sown nursery, all

(Re)Search for Rao Saheb Kulandai Veludaiyar of Mudiyanur

An 'expedition' was made to Mudiyanur in Kallakurichi *Taluk* of Villupuram District, Tamil Nadu to find out about Mr. Kulandai Veludaiyar who was the author of the article on "Single Seedling Planting" published in 1911.

Before proceeding to Mudiyanur from Chennai, I verified the details about the location of Mudiyanur on the internet and found out that it was located southeast of Kallakurichi town. Traveling 230 km, I reached the village with a lot of anxiety and uncertainty about the outcome of the trip. Sighting the village name board itself was a first satisfaction.

As soon as I reached the village, I intercepted a villager and asked for Kulandai Veludaiyar, hoping that one of the descendants could carry the name. It was a shocking surprise when I was told where to go and meet Kulandai Veludaiyar. When I reached the house of Kulandai Veludaiyar, with my anxiety mounting, I faced Kulandai Veludaiyar (65 years of age) and told him the purpose of my visit and asked whether the Kulandai Veludaiyar of 1911 was his ancestor. He immediately said that it must be another family of Rao Saheb Kulandai Veludaiyar and took me to the ancestral house of Mr. Kulandai Veludaiyar, now occupied by the third generation family.

The house is occupied by Mr. T. Sathiamurthy (advocate and farmer) and his family. He is the great grandson of Rao Saheb Kulandai Veludaiyar's brother, Mr. Muthusamy Udaiyar. Mr. Sathiamurthy's maternal grandmother was the daughter of Mr. Muthusamy Udaiyar. Rao Saheb Kulandai Veludaiyar and his wife Mrs. Unnamalai did not have any children.

Some of the background concerning Rao Saheb Kulandai Veludaiyar emerged following the discussion with Mr. Sathiamurthy and Mr. Kulandai Veludaiyar:

House of Rao Saheb

Rao Saheb's great-grand son Mr. Sathiamurthy

Mr. Kulandai Veludaiyar, farmer, who shared historical information

Mrs. Kalalichelvi, Special Officer, Cooperative Society, Kallakurichi

the nurseries thereafter were raised as single seedling nurseries.

Realizing these benefits, all the farmers of the village decided to follow the single-seedling method this year. So, I request all farmers to derive the benefits that I have obtained by directly practicing single seedling cultivation. When we think seriously about this, it is known very well that whenever we want to grow any plant or tree using seedlings, we grow them in a suitable space, manage them to grow well, pull them out and plant them singly. But when it comes to the paddy crop, like the milkman who sells his milk in the towns does not allow the calf to suckle the milk from the cow and milches the entire milk, the paddy seedlings are grown thickly in the nursery, and this does not allow the seedlings to grow well and hence losses are realized. So, I request all farmers to take note of the contents here and to practice this profitable and beneficial single-seedling planting method without doubting it and unmindful of the criticisms (they may encounter).

- Rao Saheb's family owned about 260 acres of land.
- He initiated an association for his community when he was 18 year old.
- He organized a 'grain storage depot', where about 200 bags of paddy grains were kept. Whoever wanted paddy could borrow some and return the amount with interest (as grain).
- He initiated a cooperative society in 1918 by donating lands. He also donated lands for hospital.
- He started a rice mill at that time, and there is now a modern rice mill at that site.
- Recognizing his services to the society, the then British Government honoured him with the title "Rao Saheb".
- He was a member of the District (then South Arcot) Board.
- He was a member of the Governor's Council of Madras Presidency.
- Through his initiatives with the British Government, a dam (Mudiyanur dam), in between Kurur tank and Mudiyanur tank, was constructed during 1930-35, which serves as a source of irrigation to the village even now.
- The Government gave him a free train pass to travel anywhere in India.
- He had the hope of starting a sugar factory.
- He expired in 1935.

Cooperative bank started by Rao Saheb in 1918

Neither Mr. Sathiyamurthy or Mr. Kulandai Veludaiyar were aware of the single-seedling planting method. SRI is known to them, but they are not practicing it.

I was disappointed that Mr. Sathiamurthy did not have any photograph of Rao Saheb. But on probing more with others, Mr. Kulandai Veludaiyar told me that Rao Saheb's photo was available in the office of the Cooperative Society at Kallakurichi (10 km from Mudiyanur). He volunteered to join me in the search for the photo of Rao Saheb. With mounting curiosity, we went there, only to find that the office was locked (being a Sunday). With the help of Mr. Varadarajan (Secretary of Land Development Bank) of Mudiyanur, we contacted Mrs. R. Kalaichelvi B.A., Special Officer for the Cooperative Society, in whose office the photo of Rao Saheb was available.
Mrs. Kalaichelvi had taken the initiative to recognize the generosity of Rao Saheb in donating lands for the society and had arranged to convert the original B&W photo of Rao Saheb into a colour one. With her permission, I could snap the picture of Rao Saheb.

It was an immense satisfaction to get some background information on such a great rice farmer of 1911.

Our sincere thanks to:
Mr. Sathiyamurthy,
Mr. Kulandai Veludaiyar,
Mr. Varadarajan and
Mrs. Kalaichelvi

— T. M. Thiyagarajan

SELECTIONS.

விசேஷத்திரட்டு.

SINGLE PLANTING OF PADDY.

ஒற்றை நாற்று நடவு.

தென்னார்க்காடு ஜில்லா விவசாயத் தொழில் செய்யும் பிராகுதாரும் விவசாய சங்க மெம்பருமாகிய ஒருவருக்கும், விவசாயத் தொழில் செய்யும் கிராம வாசியாகிய செட்டியாருக்கும் ஒற்றை நாற்றுப் பயிர் செய்யும் விஷயமாய் நடந்த சம்பாஷணை:

மெம்பர்—ஐயா செட்டியாரே, சாகுபடிக்காகத் தழைபோட்டுத் தயார்செய்து வைத்திருக்கும் இந்த நஞ்சை நிலம் உம்முடையதா?

செட்டியார் — ஆமாம், ஏன்?

மெம்பர் — இந்த நிலத்தில் என்ன செய்யப் போகிறீர்?

செட்டியார் — நெல் விதைக்கப் போகிறேன்.

மெம்பர் — (1) இந்த நிலம் எவ்வளவு விஸ்தீரணம்? (2) இதற்கு எவ்வளவு நெல் விதைக்கப் போகிறீர்? (3) நாற்று விட்டால் எவ்வளவு விடுவீர்?

செட்டியார் — (1) இது ஒரு காணி; (2) இதற்குக் கல நெல் அதாவது, 30 பட்டணம் படி விதைக்கப் போகிறேன்; (3) நாற்று விட்டால், 2 கல. அதாவது, 60 பட்டணம் படி செல்லும்.

மெம்பர்—செட்டியாரே, நான் சொல்லும் எனது அனுபவத்தை நம்பி அந்தப்படிச் செய்தீரானால், உமக்கு நல்ல லாபமும் ஜெயக்கியமு மிருக்கிறது. அந்தப்படிச் செய்கிறீரா?

செட்டியார்—லாபமிருந்தால் செய்கிறேன்.

32

மெம்பர்—இந்த நிலத்தில் நெல் விதைப்பதை நிறுத்தி ஒரு தனியில், அதாவது, 8 செண்டு நிலத்தில், 8 படி நெல்லைட்டு நாற்றாக விட்டு 30 நாளைக்குள் ஒவ்வொரு பயிராக வழக்கம்போல் இடம் விட்டு நட்டுவிடும்.

செட்டியார்—என்ன ஐயா, நாங்கள் வழக்கமாய் 30 படி நெல் விதைகளாக விதைத்தும் களை பறிக்கக் கஷ்டமா போட்டாலும், சில வருஷத்தில் பயிர் கரைந்து, காணாமற்போகிறதே, அது எப்படி 7, 8 படி நெல் விதை ஒரு காணிக்குப் போதும்?

மெம்பர்—அது உண்மைதான், அதற்குக் காரணம் சொல்லுகிறேன். ஒரு காணிநிலத்தில் 30 படி நெல்லை விதைத்தால், அந்த நிலம் முழுவதையும் பரம்படித்து நாற்றுவிடும் நிலத்தைப்போலல்லாமல் மேடு பள்ளமாக இருப்பதால், பள்ள நிலத்தில் விழுந்த முளைநெல் அழுகியும், மேட்டில் விழுந்தது காய்ந்து முளையாமல் போயும், சில நெல் பிடிபடாமலிருக்கும் தழையின் மேல் விழுந்து முளையாமலும் அந்த நிலத்தில் விதைப்பதற்குத் தண்ணீர் நிறுத்தி விதைத்தபின் ஜலம் வடியவிடும் காலத்தில் நெல் விதையை ஜலத்தோடு அடித்துக் கொண்டு போயும் இப்படிக்கு நெல் விதைக்கும்போதே நஷ்டமாகிறது. அதாவது, நாற்று விடவேண்டுமானால், அவைகள் ஒன்றோடொன்று சமீபத்தில் முளைத்து அதன் போஷணைகளின் அனுகூலத்தால் பயிர் கெடாமல் நாற்றுப் பலிதமாகும். அப்படியில்லாமல், ஒரு காணியில் 30 படி நெல் விதைப்பதால், அந்த முளைப் பயிருக்கு இவை வெளி அதிகப்பட்டு அதில் களை முளைத்துப் பயிரையும் மூடி, சாரல், காற்றினால், சேர்க்கை கண்டு பயிர் கரைந்தும் கெட்டுப்போய், இப்படிப் பலவித இடைஞ்சல்களினாலும் பயிர் நஷ்டம்

1911 Tamil Article on 'Single Planting of Paddy'

Translation from the journal Practical Life (May 1911)

This article, with no author identified, was in the form of conversation between a farmer-cum-member of the South Arcot District Farmers' Association and a village farmer, Mr. Reddiar, regarding the single-seedling rice cultivation method. It appears, from current investigation, that this was written by the author of the above article, Kulandai Veludaiyar, with himself in the role of Member.

Member: Reddiar Sir, is this field applied with green manure belonging to you?

Reddiar: Yes, why?

Member: What are you going to do in this field?

Reddiar: I am going to sow paddy.

Member: (1) What is the area of this field? (2) How much seed are you going to use? (3) If a nursery is established, what will be the seed rate?

Reddiar: (1) This field is one *kaani* (approx. 1.33 acre) (2) I am going to sow one *kalam*, that is, 30 Madras measures (this could be 30 or 37.5 kg) ; (3) If a nursery is raised, 2 *kalams*, that is, 60 Madras measures, will be required.

Member: Mr. Reddiar, if you believe in my experience and adopt it, you will get good profit and benefit. Will you do it?

Reddiar: I will do it if it is profitable.

Member: Stop sowing in this field; in one thalai, that is in 8 cent land, raise a nursery with 8 measures of paddy; transplant single seedlings within 30 days.

Reddiar: What, sir? Wsually we sow 30 measures of paddy seeds, and in some years when we use a country plough to thin, plants die or are lost. How is it that 7 or 8 measures of paddy seeds will be sufficient for one *kaani*?

Member: That is true. I will explain. When 30 measures of paddy are sown in 1 *kaani* land that is not properly leveled like a nursery field, seeds falling in depressions will decay; those falling on raised soil will dry and will not germinate; some paddy falling over un-incorporated stubble does not germinate; some of the seeds are carried away with the water drained from the field. Thus, seeds are lost while sowing itself. When a nursery is raised, the seeds are close together and germinate well. When 30 measures of seed are sown in 1 *kaani*, the seeds are placed wide apart, weeds grow and smother the seedlings; the seedlings are also affected by drizzling, cloudiness, wind, and diseases. By these problems, the 30-measure seed rate becomes insufficient.

Reddiar: You say that this method of sowing leads to loss, but when we raise a nursery with 60 measures of seed, the seeds are closely placed. Why does it become insufficient for 1 *kaani*?

Member: I will tell you the reason for that too. In the nursery, when you adopt thick sowing with over-seeding rate, the seeds overlap each other; the sprouted coleoptiles entangle themselves; they do not grow well and become thin; the seedlings are not allowed to grow; the nursery is also kept dry for some time; they are allowed in the nursery for 40-50 days; then 10-15 seedlings are pulled out and planted together. That is why 60 measures of paddy become insufficient.

Reddiar: True, we usually plant 10-15 plants together, but get only 7-8 panicles. If we plant a single plant, there will be one or two panicles only.

Member: No, it is not like that. We have not observed that single-plant planting is suitable for us. When we do thinning with a country plough, we usually plant one or two plants. There, we have observed 10-15 panicles. We don't adopt thick sowing, so the plants are strong with thick stems. Growing plants under unfavourable conditions in the nursery [is quite different]; when pulling up the seedlings, they are beaten while rinsing; not allowing them to grow independently, we plant 10, 15 plants together; the roots get entangled and decay; then with available soil fertility, it takes 10, 15 days for them to get established; they grow poorly; with the help of rains and according to soil character plants grow and produce panicles. The plants in the nursery raised for single-seedling planting are not thick; they do not have the problems seen in a direct-seeded crop; they germinate and grow well. The plants are ready to plant within 25 days. If the plants are pulled, are not beaten, are rinsed, and are planted as single plants, they

start to grow from the date of planting, they start tillering soon, and within 10-15 days, 15-20 tillers are found on a single plant. These plants grow without any problem from the beginning, and each tiller produces panicles. When we plant in bunches, there will be many plants without panicles.

Reddiar: To plant single seedlings, more labor will be required. Besides, we have no experience. It will not be possible to do it.

Member: That is not true. Try single planting. Usually it requires 15 laborers for planting 1 *kaani*. Since this single-plant planting is easier for the laborers, it will not take more than 10 laborers.

Reddiar: Direct seeding is also like single planting. Let me sow like that.

Member: I have spoken about the problems one faces when using the direct-seeding method earlier. Barring that, the expenditure for weeding after sowing, thinning with country plough and gap filling is 3 times more than transplanting expenditure. Besides, maintaining an 8-cent nursery is easier than irrigating and taking care of the crop in 1 *kaani* for 30 days. The manures and green leaves applied to the 1 *kaani* field are exhausted in one month. Thus, single-seedling planting is less expensive and gives more income than direct seeding.

Reddiar: Is there no need for weeding in the 8 cent nursery?

Member: Since the nursery is leveled and the seedlings are thickly populated, there will be no weeds. Even if there are some weeds, they may be removed by hand. Even otherwise, while pulling the seedlings they will be left out.

Reddiar: If so, please show me that (variety of) paddy seeds

Member: There is no particular paddy variety for this. Only the varieties that are usually used, such as *Garudan Samba, Sadai Samba,* and *Perun Samba*,are used [with this method].

Reddiar: How is that? Why was this technique not used (with these varieties of seeds) all these days (until now)? It must be a different variety.

Member: I would have told you if it required a different variety; it is only these common varieties (that have been used).

Reddiar: Has anyone tried these varieties with single seedlings?

Member: Yes. In my farm last year, 20 measures of paddy were sown in a nursery for 5 acres, and 225 *kalams* were obtained.

Reddiar: If that is the case, your field must be very fertile; you must have added more leaf manure.

Member: That is not necessary. In 5 acres of my farm, I have tried (the technique) in sandy soil, water-inundated saline soil, marshy soil, etc. It did not fail in any of these soils. The reason for the good growth has already been told.

Reddiar: If the single-seedling planting is done in a flood-prone field, the single seedlings will also be lost. It cannot be done.

Member: Single-seedling planting should be done only in such lands. If a bunch of seedlings are planted in that land, it will take 15, 20 days for establishing. These single seedlings establish on the day of planting itself and start tillering, and hence flood water will not damage them.

Reddiar: Who told you to do like this?

Member: I am a member of the District Agricultural Association which meets during the meeting organized by the Collector at Manjakuppam. From the presentation during the meeting and the clear explanation by the Farm Manager of Palur Government Farm, Mr. Subramania Iyer (I understood that in that farm, all fields were planted with single seedling); and the yields in that farm I understood (to be much improved).

Reddiar: Ok. In that case I need to see for myself. I will plant (in this way) if everyone in my village does so. Otherwise I will not.

Member: Then, in my village, in my farm as well as in the farms of several others who have seen my farm, this technique has been used for planting. You can see and learn.

Reddiar: I don't have time now. Let someone else first go and see and plant. Let me see.

Member: If everyone says like this, who will boldly do this? Only if people like you who are big landlords and knowledgeable persons see and demonstrate to others (will people try it out).

Reddiar: Do all in your village practice by seeing you?

Member: Yes. In my village and in neighbouring villages, people have started doing single-seedling planting.

Reddiar: What is the benefit of this planting?

Member: There will be a saving of Rs 4-5 per acre in seeds alone. The yields obtained depend upon the season. In direct seeding, due to the expenditure on thinning and weeding, the profit is only Rs 4-5. Here, the crop comes to harvest 20 days earlier. Since the crop is thick, it resists moisture stress and disease.

Reddiar: I still have doubt about what you said. I will think about it; and consult the priest in my temple. Since it is new, I will try it next year in a small area.

பத்தி நடவு. 347

ROW PLANTING.

BY

S. VAIDYALINGAM PILLAI.

பத்தி நடவு.

Tamil article contd. on page 22 and 23

1911 Tamil article on 'Row Planting'

By S. Vaidyalingam Pillai

Translation from the journal Practical Life (July 1911)

Vaidyalingam Pillai proposed a very interesting package of practices which he called *Gaja* planting. He said that he first tried *Gaja* planting on 50 *kulis* (i.e., one-sixth of an acre) in Kalathur-Melkarai village of Nannilam *Taluk* of Thanjavur district, and from this experience he supported and wanted to promote this package of practices known as *Gaja* planting.

Although readers would have known about this (row planting) from the article written by the Government Farm Manager, Mr. C. Narayanasamy Iyer, published earlier in this journal, the articles, experiences and views that appear here every month and on every page about 'row planting' which is part of the system of '*Gaja* planting' are not yet sufficient for the present need. It will be helpful if all those who have experimented with this technique would publish their experience for others to learn from. I write below about my experience and other related important issues.

Last year, when the transplanting process was about to be completed, the above Manager and some others suggested that I try *Gaja* planting. At that time, there was no other land available except for a small piece of nursery area. It is located in Kalathur-Melkarai village, Nannilam *Taluk*, Thanjavur District. The nursery is just 1 *kuli* (17 cents) of land with good native fertility.

Procedure

- Dig well with a *manvetti* (spade)
- Level the field properly without ups and downs
- Plough three times
- Apply the required amount of *jatropha* leaves
- Again plough three times

The procedure took 14 days to complete, and by then the mud was black, deep and soft.

Planting

With ropes, a spacing of 1.5 feet between rows and 1 foot between each plant in the row was adopted. Although planting was done in lines, the planting will become quicker with experience.

Irrigation

1 inch during the first week after planting; 1.5 inch during 2-3

(Contd. on page 24)

Tamil article contd. from page 21

செய்து மூன்று சால் உழுது வேண்டியமான அளவு ஆடாதொடை தழை போட்டு மிதித்து பின்பு 3. சால் உழப்பட்டது. இவ்வேலைகள் 14 நாள் அளவில் நடந்ததால் சேர் நன்றாகக் கரைந்து ஆழமாகவும் மசிவாகவு மிருந்தது.

நடவு:—16-9-19-10-ல் ஆரம்பிக்கப்பட்டு ஒரு பத்தியிலிருந்து மற்றொரு பத்திக்கு 1½ அடியும் ஒரே பத்தியின் ஒரு நாற்றுக்கும் மற்றொரு நாற்றுக்கும் 1 அடியுமாக நடப்பட்டது. ஒவ்வொரு வரிசையாக கட்டாறும் கூறக்கப்பட்டால் நடவு வேலை மிக துரிதமாகும்.

தண்ணீர் பாய்ச்சுதல்:—நட்ட மூன்றுவாரத்தில் 1. அங்குல அளவும், 2. 3-ஆம் வாரத்தில் 1½ அங்குலமும் அதன் மேல் 2 அங்குலமும் ஜலம் நிறுத்தப்பட்டது. 2 அங்குலத்துக்கு மேல் ஜலம் நிறுத்தப்படவில்லை. 1 அங்குல அளவு ஜலம் நிறுத்தினும் சேர் வைவாகவும் தழையும் ஊர்த்திராய்ப் போடப்பட்டிருந்ததால் 4, 5. நாளைக்குப் பிறகே மறு ஜலம் பாய்ச்சப்பட்டது. அவ்வருஷம் தண்ணீர்த் தட்டில்லை. ஆனாலும், நருக்க காலத்தில் மழை இல்லாதது குறைவேயாகும்.

பின் நடத்தை:—நட்டு 12-வது நாள் முதல் களை கட்ட ஆரம்பித்தது. களை முழுவதும் கட்டி முடிவதற்குள் ஒவ்வொரு முத்துக்குப் பின்னுக்குக் கலந்த எரு வைக்கவேண்டுமென்றிருந்தும் யாதொன்றும் வைக்கப்படவில்லை. ஒவ்வொரு முதலையும் மிதித்துக கொடுத்ததைத் தவிர வேறொன்றும் செய்யப்படவில்லை. ஆனாலும், இப்பாங்கயிலே கொஞ்சம் கொழுமையுள்ள இலமாதலால் 70 முதல் 120 வரையில் களை வெடித்திருந்தது. நாள் அடர்ந்து கட்டியிருந்ததைப் பார்க்க பல்சென்றும் ஆனந்தமாயும் மகிழ்ச்சியாயு மிருந்தது. நடவு கட்ட முதலில் பார்த்துப் பரிகசித்த பக்கத்தவர்கள் ஆச்சர்ய முற்று அடுத்த வருஷம் தாங்களும் செய்வதாக சொல்லிக்கொண்டு அடிக்கடி பார்த்துப் போவார்கள். பின்பு, கதிர் கண்டதாவது, கொத்துக் கொத்தாய் கிளைத்து முதல் ஒன்றுக்கு ஒன்றல்லது இரண்டு கதிரே வாசிப்பாயிருக்கும். இவை அவ்வித பிரமல் ஒன்றைப்போலவே மற்றெல்லாக் கதிருமிருந்தது கவனிக்கத் தக்கது.

மாகுல்:—கொத்தாய் நட்ட முதல் வருஷத்தில் (5 கலம்) 120 பட்டணம் படி கண்டது. செகுநடவு அறுப்பில் (13½ கலம்) 324. படி கண்டது. கதிர் 15 அங்குல நீளமுள்ளதாயும் அதன் நெல் 2½ ரூ இடை உள்ளதாயு மிருந்தது. பக்கத்து வயலில் நன்றுயிருந்த 15 அங்குல நீளமுள்ள கதிரிலிருந்ததைவிட இதில் கதிர் 1க்கு 95 நெல் கூடவும், ஒரு ரூபாய் நிறையில் 24 நெல் குறைவாயு மிருந்தது.

குறிப்பு:—திருக்கருகாவூரில் செய்ததாக ஜெ. மாவேஜரவர்கள் தெரிவித்த படிக்கு நட்டபிறகுள் நாற்று வைக்கு மிடத்தில் ஒரு சிரங்கை மணலுடன் ஒரு சிரங்கை தொழு எருவும் வைக்கப்படவில்லை. பிறகு களைக்கும் சமயத்தில் பின்னுக்கு முதலிய சிகலை வணதுவன) எரு வைக்கப்படவில்லை. ஆயினும் முதலில் போடப்பட்ட ஆடாதொடை தழை ஒருவாறு சிறந்த எருவாகு மென்பது எனதபிப்பிராயம். திருக்கருகாவூரில் கண்டதாக சொல்லப்பட்டது (ஏகருக்கு 1522) பட்டணம் படி எனது பரிசோதனையில் கண்டது 944 படியாகும். திருக்கருகாவூரில் செய்துள்ள படி எரு முதலியவை வைக்கப்பட்டிருந்தால் இன்னம் ஜாஸ்தி மகசூலைப் பார்த்திருக்கலாம். எரு விசேஷ மென்பது நிலத்தின் தன்மையைக் கொற்றதாகும். ஆகவே, இதனுல் தெரிப்பிடு

யாய் விடும் வழக்கமுடைய தஞ்சை ஜில்லாவி ன் முக்கியமாய் அறிய வேண்டியதாவது, ஒரே ஆளுக்கு எவ்வளவு இடம் வேண்டிய தென்பதை கண்டுணர வேண்டுமென்பதே.

கெஜுநடவின் முறை.

1 கெஜு நடவு நடப்படும் நிலம் சிறு சிறு தாக்குகளாயும் மேடு பள்ள மில்லாததாயும் நாலு பக்கமும் சுற்றி வரத்தக்க வரப்புடைய தாயு மிருத்தல் வேண்டும். தாக்கு ஒன்று அரை ஏகராவுக்கு மேற்பட இருத்தலே நலம்.

2. வயலுக்கு ஸமீபத்தில் ஏகருக்கு 25 வண்டி மணலும், 12 வண்டி தொழு எருவும் சேர்த்து வைத்துக்கொள்ளவேண்டும். வயலில் ஜலம் விட்டு கொத்தி உழுது சேறு செய்ய லில் சேர் ஆழமாயும், கருட்டாயும், லேசாயு மிருத்தல் வேண்டும்.

3 ஒரு ஏகர் நட முக்கால் அல்லது ஒரு பட்டணம்படி விதை விடப்பட்ட நாற்றுப் போதுமானதாகும். 1 படி விதையை தருத்த விதம் உரமேற்றப்பட்ட 3 செண்டு நாற்றங் காலில் விட்டு 30, 32 நாளுக்குள் பறித்து விடும் நாற்றே ஏற்றதாகும்.

4. விடும் வயலின் மேல் வரப்பிலிருந்து மேல் வரப்புக்கு நூல் பிடிக்கப்பட்டு பத்திபத்தியாய் கீழேயில் பத்திக்குப் பத்தி 1½ அடி அகலமும், ஒரே பத்தியில் ஒரு நாற்றுக்கும் மற்றொன்றுக் கும் 1 அடி அகலமு மிருத்தல் வேண்டும். நடு முன் முதல் வைக்குமிடத்தில் (முன் சேமித்து வைக்கப்பட்டுள்ளதில்) ஒரு சிரங்கை மண லும், ஒரு சிரங்கை எருவும் வைத்து மண், எரு, மணல் மூன்றையும் சேரும்படி கலந்து கலந்து அதன்மேல் பட்டை உரப்புள்ள ஒரே ஆளுக்கு வைத்தல் வேண்டும். மணல் வைப் பது மண்ணில் இளகுதற்குத் தக்கவாறு வைப் பதே முறையாகும்.

5. நட்ட 20 ம் நாள் இடைவெளியை மண் வெட்டியால் கைத்தாளைலாகக் கொத்தி விடுதலும் அகப்பட்ட களைகளைப் போட்டு மிதித்தும், அதன் 20, 25 நாளில் ஒவ்வொரு முதலேயும் சுற்றிப் பறித்து 1 செண்டுக்கு 9 சேர் பிண்ணாக்கு வீதம் எருவுடன் கலந்து வைத்து பறித்த மேல் மண்ணால் மூடவேண் டும்.

6. ஜலம் பாய்ச்சலில் எக்காரணத்தை முன்னிட்டும் 2, 3 அங்குலத்துக்கு மேல் நிறு த்தக்கூடாது. கொஞ்சம் கொஞ்சமாக இளம் பாய்ச்சுவதே நலம்.

7. 4-வது பாராவில் சொல்லியது ஒரு போக நடவாகும். இருபோகத்துக்கு, சாலு க்கு சால் 2½ அடி விட்டு பாசுரு, குறுவை, பூங்கார், வெள்ளைவாரி முதலிய இருபோகப் பயிரை நட்டு, கதிர் முற்றிவிடத்தவுடன் இடை வெளி வழி பாதியில், வெள்ளைச் சிறுமணியன், செம்பாளை முதலியவைகளை நடவேண்டும். முதலில் நட்டது கதிர் முற்றியவுடன் போதக அறுத்துக்கொண்டு, அடுத்ததை இரண்டாம் போகப் பயிருக்கு பசும் எருவாக வெட்டி மடித்தல் வேண்டும். மற்ற எரு விதை தண்ணீர் பாய்ச்சுவது முதலியவைகள் முற் சொன்னவைகளேயாகும். முதலில் பாசுரு விடுவதே உத்தமமாகத் தெரிகிறது.

"சிறுபாச செல்லுமாரும்" என்ற தமிழ் நாட்டுப் பழமொழிக்கும், வரப்புப் பொழியும் படியாக அளவு ஜலம் கட்டும் தஞ்சை ஜில் லா வழக்கத்திற்கும் இந்த கெஜு நடவு தண்ணீர் பாய்ச்சும் விஷயத்தில் நேர் விரோதமாயிரு க்கிறது. ஜாஸ்தியாக ஜலம் கட்டுவதும் விளை கட்டாது. ஜாஸ்தியாக ஜலம் கட்டுவதும் வாருக்கு அதிகப்படுமென அநுபவசாலிகள் அபிப்பிராயப் படுகிறார்கள். இதில் அறிந்த வர்களின் அபிப்பிராயம் விரும்பத் தக்க தாகும்.

6, 7-வது பாராக்களுக்குள் மு-ா-ா-ஸ்ரீ ஆபா ஸபட்டேலே என்பவரால் ஏற்பட்டு ஆளுக்கு அறு படி விளைந்து நடவடிக்கைப் பரீக்ஷை பல்லே அறிந்து வருகிறது. இப்போது இருக்கருகாவூர் ஸ்ரீமான் டி. என் நாராயண சாமி அய்யரவர்கள் கெஜு நடவைக் கண்டு பிடித்து இதைத் திராத அளவு யாருமே அதிக மாக்கினார். தமிழ் நாட்டுக்கு இவ்விருவரும் உண்மையே பேருபகாரம் செய்த பரோப காரிகளாவார்கள்.

என். வைத்தியலிங்கம் பிள்ளை.

(Contd. from page 21)

weeks, and then 2 inches of water was retained. No more than 2 inches of water was retained at any time. When 1 inch of water was retained, because of the good puddling and green leaf manure application, the next irrigation was done only after 4-5 days. There was no water scarcity that year. But, there were no rains at the appropriate time.

What happened afterwards

- First tiller was seen 12 days after planting
- Although oil cake mixed with manure was recommended to be applied at each hill before completion of tillering, none was applied in this case

(Re)Search for Sri Vaidyalingam Pillai of Kalathur-Melkarai

Vaidyalingam Pillai was the author of the article "row planting" published in 1911 in the Tamil journal *Pizhaikkum Vazhi*. In his article, Vaidyalingam Pillai mentioned the location as Kalathur-Melkarai in Nannilam *Taluk* of Thanjavur district. Through web search, I could find that the village was at present near Koradachery in Tiruvarur district.

Shri. Vaidyalingam Pillai

I reached the village without much difficulty. The village is located on the southern bank of Vennar river. When I asked for Vaidyalingam Pillai, I was told there was no one with that name, but was directed to go to the house where a 'Pillai' was living. I met Mr. Muthaiyan there.

When I explained that I was searching for details of Vaidyalingam Pillai, he sprang a surprise by saying that his father's name was Vaidyalingam Pillai (and the initial 'S' was also the same). He said that his father had died in 1962 at the age of 65. This meant, however, that in 1911 when the article was published, his father would have been around 13 years of age.

This raised doubt about whether he was the person I was looking for. Mr. Muthaiyan agreed that it might not be possible. He thus directed me to meet Mr. Siva Sankar, who was the oldest person living in the village.

It was a disappointment that Mr. Siva Sankar was not at home and had left for Koradachery, intending to proceed to Mannargudi. His wife told me that he may be available in their building (shop) at Koradachery. I immediately rushed to Koradachery. Luckily, Mr. M.D.T. Siva Sankar, who is 83 years old, was available. When I showed him a copy of the article written by Vaidyalingam Pillai and spoke to him about my mission, he directed me to meet his son as he was the person looking after the farm. I then went to the business site of his son, Mr. Jaya Sankar, and explained to him the purpose of my visit.

Mr. Jaya Sankar said that his father

Vennar River on northern border of Kalathur-Melakari

- Except for pressing each hill with the foot, nothing else was done
- Even so, since the field had good native fertility, there were 70 to 120 tillers per plant
- The sight of profuse tillering looking green and beautiful was heartening.
- Those who made fun (of my field) after planting were surprised later and said that they would follow this technique the following year, and they often visited the fields to observe them.

Mr. Siva Sankar in front of the house where Vaidyalingam Pillai lived

himself was innovative. He used to keep a urea bag at the mouth of the irrigation channel instead of applying top dressing. Also, he used to hang a plastic bottle containing kerosene with a hole to allow the kerosene to drop into the irrigation water to control stem borer.

He told me that only his father could throw light on Vaidyalingam Pillai and said that his father had hearing problems and thus could not have understood what I was saying. He immediately called his father over the phone and asked him to come over to his place. I sent the car to pick up Mr. Siva Sankar, and when he arrived, Mr. Jaya Sankar explained to him the purpose of my visit. Mr. Siva Sankar then read the article written by Vaidyalingam Pillai.

Mr. Siva Sankar was happy to inform me that during 1970s, he had raised a variety called *Pasangi* in 10 acres, adopting the Japanese method of line planting. The crop was very tall, about 7 feet. Its panicles were huge, with as many as 420 grains. All the panicles had similar numbers of grains uniformly in the 10 acres. His field was visited by several dignitaries including Mr. Gant of Ford Foundation (under PL480 scheme). He used to have 100 visitors every day. Unfortunately, the crop was lost due to blast.

Then came the story of Vaidyalingam Pillai. Vaidyalingam Pillai was the younger brother of Mr. Siva Sankar's grandfather, Duraisamy Pillai. The house where they lived, built in 1884, was still there. Mr. Siva Sankar's father was Sri M.D. Thiyagaraja Pillai, a freedom fighter and ex-MLA of the area.

Vaidyalingam Pillai was the youngest of four brothers in his family. Sri Manikasamy Pillai, Sri Panchanatham Pillai, and Sri Duraisamy Pillai were his elder brothers. Vaidyalingam Pillai had his education in Mannargudi in Finlay School, which had a British Principal at the time. He died when he was around 35 years of age and did not have any children.

When I asked whether any photograph of Vaidyalingam Pillai was available, Sri Siva Sankar said there was a group photo in which all the brothers of Vaidyalingam Pillai were there. Sri Siva Sankar is an extraordinary person himself, having maintained diaries for more than 50 years (I saw one written in 1952). The search for the group photo in his house was a failure, but it was later found in their building at Koradachery. It was a great moment to look at the picture of Sri Vaidyalingam Pillai, who, by the contents of the article could be seen as more than an agricultural scientist.

—T. M. Thiyagarajan

(Re)Search for Sri T. S. Narayanasamy Iyer of Thirukkaruhavur

Sri. Vaidyalingam Pillai in his article on 'row planting' published in the year 1911 in the Tamil journal *Pizhaikkum Vazhi* mentioned that '*Gaja* planting' was developed by Sri T.S. Narayanasamy Iyer of Thirukkaruhavur. This evoked great interest and curiosity in me so I travelled to Thirukkaruhavur village, near Kumbakonam of Thanjavur district.

Sri.T.S. Gopala Iyer

I first met Sri T.K. Vaidyanathan, who could not provide information on the descendants of T.S. Narayanasamy Iyer, but who suggested that I contact Sri T.S. Gopala Iyer, 84 years old, who had lived in Thirukkaruhavur earlier but was now living in Papanasam. I went to meet T.S. Gopala Iyer who informed me that the grandson of Sri T.S. Narayanasamy Iyer, Mr. R. Sreenivasan, was living in Thirukkaruhavur. He also told me that there was one Mr. V. Sreenivasan in Thirukkaruhavur who was practicing single-seedling planting from thinly sown nurseries.

When I went back to Thirukkaruhavur, I met Sri.

Sri.V. Sreenivasan

V. Sreenivasan, now 82 years old. He said that he had had to discontinue his studies and take up farming in 1947 upon the request of his father as his two elder brothers had become lawyers. The village Munsiff, Sri. N. Subbaiyer, told him at that time about the single-seedling planting method practiced by

- Previously, when bunch planting was done, only one or two good panicles were there. But here, all the panicles were uniform.

Yield:

- During the previous year, with bunch planting, my yield was 5 *kalams*/120 Madras Measures (i.e., 150 kg paddy in 17 cents, equal to 882 kg/acre)

- With '*Gaja* planting', the yield was 13.5 *kalams*/324 Madras Measures (i.e., 405 kg from 17 cents, equal to 2,382 kg/acre) (5.95 tons/hectare)

- The panicles were 15 inches long, and the grains were 2.5 'nool' (thread thickness) apart

- When compared with a 15-inch panicle from the adjacent field, this panicle had 90 grains more, and there were 24 grains less for a 1 rupee weight (that means, single grain weight was higher)

Notes:

The Manager had told me to place 1 *sirangai* of sand plus 1 *sirangai* of FYM at the seedling planting location, as done in Thirukkaruhavur, but it was not done here. No manure was applied at the time of weeding. Still, I feel *jatropha* leaf is very good manure. It was informed that the grain yield at Thirukkaruhavur was 1,522 Madras Measures per acre, but my trial showed 1,944 Madras Measures . Still higher yield might have been obtained here if manure had been applied as recommended and done at Thirukkaruhavur. Need for manuring depends on the nature of the field. Thanjavur farmers who plant bunches of seedlings should pay attention to the amount of spacing that is best given between hills.

Procedure for '*Gaja* planting'

The field should have smaller plots of not more than 0.5 acre with no ups and downs and a bund all around to walk.

Keep 25 cartloads/acre of sand and 12 cartloads/acre of FYM by the side of the field. Irrigate the field, dig with a *manvetti* and plough to get a deep, black and soft puddle layer

To plant 1 acre, a nursery of 0.75 or 1 Madras Measure of seeds

T.S. Narayanasamy Iyer. So, he also practiced single-seedling planting, but adopted 9-inch spacing between rows using ropes. He said he could get 20-25% higher yield than others this way. He did single-seedling planting in 30 acres, while in 10 acres of low-lying areas, he did not practice single seedling cultivation.

Mr. V. Sreenivasan also said that people used to say that T.S. Narayanasamy Iyer had cultivated sugarcane and banana (no one else did that in the area). He made jaggery and took the jaggery and banana to Tiruchirapalli in bullock carts for marketing.

Then I met the grandson of Sri. T.S. Narayanasamy Iyer, Mr. R. Sreenivasan, he said that his grandfather had constructed a huge tin drum to store water for irrigation. Narayanasamy Iyer also had used a Persian wheel and was the first to use a diesel engine for pumping water. No doubt Narayanasamy Iyer was very innovative in agriculture and that he had developed *Gaja* planting became more plausible. Narayanasamy Iyer had three elder brothers and was therefore called 'Minor'. His father's name was Subbaiyer.

Mr. R. Sreenivasan in front of the house where Sri.Narayanasamy Iyer lived

Both the Sreenivasans knew about SRI but said they could not adopt it due to labor constraints. It was great to know about Sri.T.S. Narayanasamy Iyer, and it was gratifying to see that his *Gaja* method of planting was remembered from the 1940s.The only disappointment was that no photograph of him was available.

—T. M.Thiyagarajan

(0.9 to 1.25 kg) is enough.The 1 Madras Measure seeds should be sown in a well-manured 3 cent (120 sq.m) nursery. 30-32 day-old seedlings are suitable.

Stretch ropes to keep a row spacing of 1.5 feet (45 cm) and 1 foot (30 cm) between plants within the row. Before planting, at the location of planting of the seedling, mix 1 *sirangai* (weight not known) of sand and 1 *sirangai* of FYM with the soil at the location. Plant single seedlings over that. The proportion of sand should be based on the soil type.

At 25 days after planting, shallow digging of the inter-row space with a *manvetti* has to be done. Available green leaves may also be incorporated. 20-25 days after this, a mixture of 9 seers (~2.5 kg) of oil cake and FYM per acre is buried around each hill.

Irrigation should never be more than 2-3 inches. It is better to irrigate daily in small amounts.

The method of planting mentioned in paragraph 4 above is for the single rice cropping system. For the rice-rice system, two-season rice varieties like *Paangu, Kuruvai,* Poongar or Swarnavari have to be planted at 2.5 feet (75 cm) row spacing. At the time of flowering of this crop, in the middle of the rows, varieties like *Vellai Sirumanian* or Sembalai have to be planted. When the early-planted crop matures, the panicles alone should be harvested, and the stubbles should be incorporated as manure for the second crop. The seed rate, manure and irrigation schedules are as given earlier in this article.

The Tamil adage that 'rice grows in accordance with the water level' and the practice of irrigating up to the bund level in Thanjavur district is quite contradictory to this '*Gaja* planting'. More water reduces tillering. Experienced people feel more water means higher yield. So the opinion of knowledgeable persons is solicited.

The single-seedling cultivation introduced by Mr. Aaparanam Pillai, 6 or 7 years ago, has spread across the country and is giving good benefits. Now, the '*Gaja* planting' method introduced by Sri T.S. Narayanasamy Iyer of Thirukkarahavur is giving unimaginable yields. The two people have done a great help to Tamil Nadu.


Norman Uphoff

'Ancient history' of SRI in India

It is very gratifying to read this report by Dr. T.M. Thiyagarajan and Dr. Biksham Gujja where they uncover some of the 'ancient history' of SRI in India, and indeed, in the world.

Some skeptics have dismissed SRI by making *a priori* arguments, rather than themselves getting involved with its empirical evaluation and demonstration. They have suggested that if rice plants have always had this remarkable productive potential to increase yields with a reduction in inputs, why hasn't this been discovered before? The fact that SRI was not discovered or synthesized before the early 1980s was suggested as 'evidence' that the contemporary SRI experiences and results being reported were (therefore) not correct. Such reasoning, of course, proves or disproves nothing. However, many of us have wondered why there were not earlier demonstrations of the productive potential in the genome of rice (*Oryza sativa*) that we see when SRI practices are used. To be sure, these practices are counter-intuitive according to common beliefs: How can higher yields be obtained from using fewer and smaller plants, even tiny, vulnerable ones? How can reduced applications of water be beneficial for the crop, especially when it is thought to have some nutritive value? How can local, organic sources of nutrients support better plant performance than 'modern,' scientifically-confirmed, inorganic sources?

It is rather improbable that farmers would put together all of these 'strange' practices, to capture the synergistic interaction between plant canopies and root systems, and between those root systems and surrounding soil systems. Still, farmers around the world have grown rice on their fields for literally billions of crop-years. Shouldn't someone have hit upon these modifications on standard practice?

It was gratifying for me to learn in 2003 about a rice production system, known as 3-S, developed in China during the 1990s by Prof. Jin Xueyong at Northeast Agricultural University in Haerbin. This is in Heilongjiong Province which adjoins Manchuria, so the agroecosystem there has very low temperatures. Rice seedlings are started in plastic-covered greenhouses when there is still a foot of snow on the ground! The 3-S system devised by Prof. Jin used single seedlings, 45 days old (which is relatively young in biological if not calendar terms), planted in a square pattern with reduced water and more organic matter. This gave yields of 8 to 9 tons/hectare.

The 3-S system had many similarities with SRI methodology, except for its using herbicides instead of soil-aerating weed control (because of labor shortage). By the time Prof. Jin died in 2006, it was being used on about 50,000 hectares in northern China. He himself appreciated the similarities between SRI and 3-S, which showed the enhanced productivity of relatively young rice seedlings transplanted widely with more aerobic soil conditions and more soil organic matter. His insights derived from studying the performance of the rice plant, much like Fr. de Laulanié did, without any knowledge of the latter's work.

Now, thanks to Dr. Gujja and Dr. Thiyagarajan's sleuthing, we know that SRI-like rice production practices were developed by farmers in Tamil Nadu 100 years ago! This special issue of the ***SRI Newsletter*** tells a fascinating story of farmer innovation and government support which, if it had continued, *would probably have re-written the history of India's agriculture and maybe that of the entire world.*

Understanding why this early innovation 'died out' after 1928 will require still more 'digging' to reveal. But for now we greatly appreciate the insights and knowledge gained from farmer experimentation in cooperation with state agricultural officials and technicians during an earlier era, still under colonial rule. The authors research confirms that the productive potential of *Oryza sativa* has been constrained for many years, even centuries and millennia, by the ***sub-optimal practices*** of crowding plants together and of flooding them, thereby suffocating their roots and also aerobic soil organisms. Transplanting more and older seedlings may give short-term initial aesthetic benefits, but these come with a longer-run cost – reduced health and productivity for rice plants.

SRI in India and elsewhere has been benefiting from further refinement and modification by farmers in many states, and by the kind of collaboration reported here, from 75-100 years ago, between farmers and researchers, officials and civic organizations. SRI concepts and methods are now being extended and extrapolated beneficially to other crops, which should be the focus of a future special issue.

Norman Uphoff, Program Leader for Sustainable Rice Systems, Cornell International Institute for Food, Agriculture and Development (CIIFAD)

Editors: Dr. Biksham Gujja, Manisha Agarwal
Editorial Committee: Dr. C. Shambu Prasad, Dr. Norman Uphoff, Dr. T.M. Thiyagarajan, Dr. V. Vinod Goud
Technical Support: Sraban Dalai Design: Akshakala

For feedback and information contact: Manisha Agarwal, Communication Officer, ICRISAT-WWF Project, ICRISAT, Patancheru, Andhra Pradesh - 502 324
Tel: +91 40 30713766 Fax: +91 40 30713074 / 75
Email: m.agarwal@cgiar.org, manisha.manvi@gmail.com