

# Rich Harvest

## The System of Rice Intensification



A success story from Cambodia

*In the present context of globalisation, the Cambodian Center for Study and Development in Agriculture (CEDAC) and the Church Development Service (EED) have decided to maintain its strategy of supporting more grassroots programmes for rural development and small-scale site-appropriate agriculture. Even now the majority of the world's poor are small farmers. In pursuing this policy, CEDAC and EED aim to do more than simply reach the poorest of the poor. Its support is bound up with the conviction that even in the ever-changing context, small-scale site-appropriate agriculture is not only viable and worthy of development but also has the potential to combat hunger and poverty on a broad scale. Embedded in an integrated approach to rural development, it also promotes food sovereignty, thus ensuring a sustainable impact in the area of poverty reduction. In many respects – social, ecological, economic and cultural – this approach is actually superior to modern agricultural practices organised on an industrial scale and targeting remote markets. Beyond this, it is important to establish networks between development projects at the local level and the political actors on the regional, national and international levels. Influencing the political and legal framework conditions in favour of the rural poor is a matter of great importance, for instance when it comes to protecting ancestral rights of access to land and water.*

*The project in Cambodia presented here is highlighted to exemplify how support can tangibly improve the livelihoods and incomes of poor small-scale farmers.*

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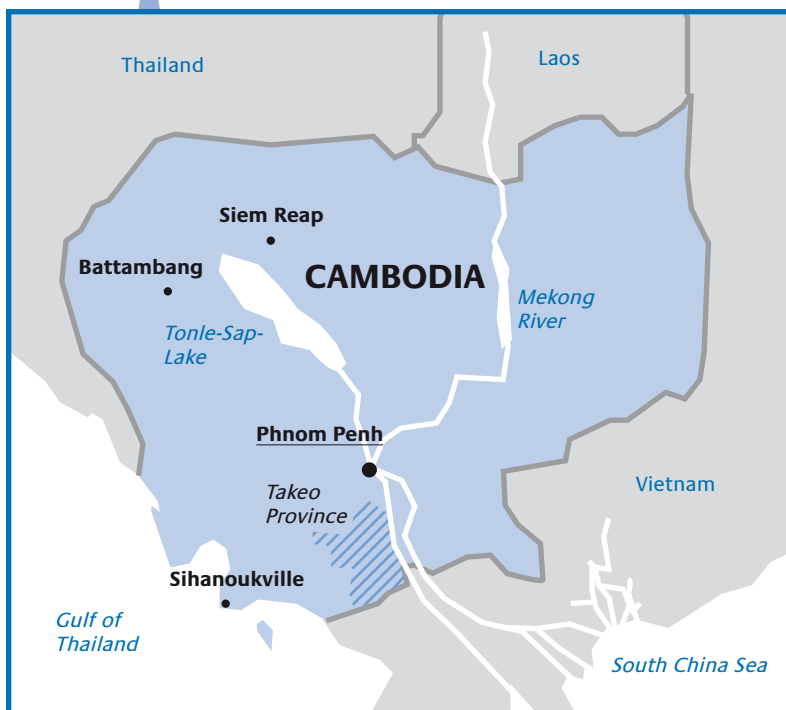
CEDAC (cover, p.3, 4, 5, 6, 9, cover back), Uwe Hoering ( p.2, 8, 10, 11, 12, 13, 15),  
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Enter “System of Rice Intensification” (SRI) into Google and with a few mouse clicks you are right in the middle of a heated, controversial and polemic debate between development practitioners on one side and scientists from the established rice research community on the other. Proponents of SRI praise it – sometimes with an almost missionary enthusiasm – for its potential for higher yields (with some claiming increases of tenfold over conventional practices), saving water and saving fertilizer. They see it as the solution for the problems faced by millions of rice growing farmers worldwide. Some observers are already envisioning another “rice revolution”, but an organic one this time, unlike the so called “Green Revolution” in the 1960s and 1970s with its high and costly use of inorganic fertilizer, pesticides and herbicides. The opponents,

among them agronomists from the International Rice Research Institute (IRRI) in the Philippines, and from US universities and research organizations, respond with equal zeal and hard-hitting criticism. They condemn SRI as unscientific, useless and even harmful, claiming that it diverts attention away from “tried and true” techniques and other “more promising approaches” to increase yields such as genetic engineering and improved photosynthesis. Some even warn that the spread of SRI could lead to increased hunger.

If it weren’t about such an important issue, namely rice, the debate would be just another academic dispute. But rice is the staple food for half of the world’s population and as an agricultural crop, secures the livelihoods of millions of families worldwide. Low market prices and high costs of chemically-dependent cultivation practices are making commercial rice cultivation in the developing world financially and environmentally unsustainable. A controversy about the future of rice cultivation and the ways in which to improve it and increase productivity should be taken seriously. One way to find out about the merits or myths of SRI is to examine the experiences of the farmers themselves.



## About Cambodia

95 percent of the 14.5 million inhabitants of Cambodia are Buddhists. To this day, the kingdom’s identity is imbued with the rich cultural heritage of Buddhism and Cambodia’s history as a powerful empire between the rival powers of Thailand and Vietnam. The modern population is ever-mindful of the centuries-old Khmer culture, chiselled in the stones of the temple city of Angkor.

In the 1970s the country was drawn into the Vietnam War and showered with bombs by the USA. Unexploded ordnance from that period is still a danger to life and limb. Under the Khmer Rouge regime from 1975 to 1979, Cambodia’s leaders were determined to take the country back to a Stone Age version of communism. The result was genocide and years of civil war, a trauma from which Cambodia is struggling to recover.

Following intervention by the United Nations in 1994/95 the country rejoined the international community. Since then it has seen an economic upturn and growth has escalated in recent years. Nevertheless, as the World Bank confirms, distribution of the country’s growing wealth is very unequal. The reign of terror under the Khmer Rouge, the Vietnamese occupation and the civil war between the government and the Khmer Rouge have left a lingering aftermath: even now, the state has yet to establish the principles of the rule of law, the scale of domestic violence is horrifying and landmines are as much of a danger as ever. At the Khmer Rouge tribunal the country is making painstaking efforts to deal with its history and hold the surviving leaders to account.



## No rice? Poor Germans!

It comes as no surprise that the farmers in Trapaing Veag, a village in Takeo Province some 70 miles from the Cambodian capital of Phnom Penh, know nothing about the raging debate. What they do know is that SRI is producing good yields, meaning more than before. To prove this the farmer Keb Chon jumps up and rushes to his paddy field not far from his wooden farm house, where the rice is standing almost shoulder-high, ready for harvesting. He measures out a square meter and cuts the bushels with a small sickle. Then he returns to his house where he threshes the rice and weighs the grains on a small market scale. Proudly he presents the results. The scale shows 600 grams of rice harvested from just one square meter. This translates into approximately six tons per hectare. Even after drying, the yield could still be well above four tons per hectare, much more

than what he got before he introduced SRI and more than double the national average in Cambodia, which is officially around two tons per hectare and very low compared with other countries in the region such as Vietnam and Thailand.

Although the improvised yield estimate done by the farmer Keb Chon is not scientifically founded, it is a rough indicator – and a real one. The other farmers agree that after the introduction of SRI the yields from their tiny plots of 0.3 to 1.5 ha have definitely increased. “We can now even sell some rice, unlike before when we had to buy rice to feed the family for a gap of two, three or four months,” says Chim Thuy, who uses SRI on the 0.5 ha of land she owns.

Members of the farmers’ association along with some boys from the “young farmer group” have gathered beneath a typical Cambodian wooden village house on stilts. Half of them are women – and they are the most outspoken ones. Upstairs there is a small veranda with pictures of the Royal family, fashion photos from magazines and family pictures pinned to the wall and the sleeping rooms. The open space below the house is a meeting place, living room, storage and kitchen all in one. There are colorful mats covering the mud floor, several hammocks, some wooden furniture and a small TV set in a corner run by a car battery (like in many villages, Trapaing Veag has no electricity). There are farm implements (such as a weeder), jute bags and chicken picking at the grains left from threshing. In one corner is the small



Keb Chon is one of the first farmer, who tried the new farming system after being trained four years ago by CEDAC. Convinced by higher yields, today almost the whole village of Trapaing Veag has switched to the alternative method.

## About CEDAC

The Cambodian Centre for Study and Development in Agriculture (CEDAC) was established in August 1997 as a national Cambodian non-profit NGO specializing in ecological agriculture and rural development. The center was created with initial support from the French non-government organization GRET (Group for Research and Exchange of Technology). CEDAC envisions a Cambodian society where small farming households enjoy good living conditions and strong mutual cooperation, with the right and power to determine their own destiny as well as playing an important role in supplying healthy food for the whole society. To achieve this vision CEDAC is committed to working for an improvement in the lives of small farmers and other rural poor by enabling them to increase food production and income, while ensuring environmental sustainability and maintaining strong social cooperation. CEDAC currently provides assistance to around 75,000 farming families in 2,000 villages throughout Cambodia (as of February 2008).

shrine for the spirits who protect the house, a pond with lotus flowers and water lilies in front of the house, some palm trees, flowers in empty cans and plastic bottles cut in half and bushes with red and white flowers. Behind the house Keb Chon proudly presents his chicken breeding pen, an enormous brood-sow and a stall for two cows.

Around the house there are rice fields as far as one can see, crisscrossed by bunds that function as footpaths between the other houses, looking like islands in the vast sea of yellow paddy fields. The village lies in the fertile plains along the Mekong River with a long tradition of rice growing. There are 1.7 million rice-farming households in Cambodia. More than 70 per cent of Cambodia's workforce depends on agriculture. Rice is the basis of their livelihood and their lives, structuring the course of the year. And when they learn that in Germany there is neither rice growing nor the habit of eating rice three times a day, they shake their heads in disbelief. Yi Em, a female farmer keenly interested in German agriculture, asks, "Are you so poor that you can't afford it?"



Field visit: Transplanting fewer seedlings and leaving more space in between increases yields. The new method has been proven in practice to be successful, but sceptics still stick to their objections.



## Fewer seeds, water, and costs – but more labor?

Yi Em was one of the first to try the new system of rice cultivation when it was introduced four years ago to the people in Trapaing Veag by the Cambodian development organization CEDAC. She and her husband own just 0.3 hectare of land, split into three different plots. Like the other families, they got it in 1986, after the Khmer Rouge regime and the civil war had come to an end. They have no cow for plowing and no irrigation, so like most farmers in this area they are tied to rainfed agriculture. They cannot afford to buy modern seed, so again like most farmers in the area, they take grain from the last harvest to plant their paddies. And they hardly use commercial fertilizer because they cannot afford to do so. Their biggest asset is their own labor, which is split between working their own land, stints of paid labor during transplanting and harvesting times, looking after the cattle, cultivating the vegetable garden, and performing household chores.

The agricultural season normally starts around April or May. Yi Em's husband prepares the nursery and the fields. "Under SRI this is more work than before," she says. After the early or "small" rains they start transplanting in June. This is mainly women's work. Some farmers plant different varieties on different plots – early maturing rice, varieties with a specific taste or rice for special occasions. Normally there is a dry period of several weeks, during which the farmers try to keep the fields flooded to control weeds. There is always the risk of drought before the heavy rains start in September. These bring relief but there is always the risk of flooding. October is a relatively relaxed period for the farmers. The really hard, work-intensive period begins in early November, lasting until December. This is when harvesting, threshing and storing take place. Only the Water Festival in early November with its boat races, celebrated as a thanksgiving to the Mekong River for providing the country with

## The System of Rice Intensification

SRI was developed in the highlands of Madagascar in the 1980s by a Jesuit priest, Father Henri de Laulanié, who worked for over 20 years with small farmers, observing and experimenting. According to Norman Uphoff, one of the leading experts on SRI, it comprises a set of management practices which can be applied flexibly:

- shallow (1-2 cm) transplanting of strong, young seedlings without delay after uprooting from a moist but not flooded seedbed,
- transplanting of 1-2 seedlings per mound at wider spacing (between 25x25 cm and 50x50 cm) and ideally in a square pattern or in rows to facilitate weeding,



Activity	Traditional Method	SRI Method
<b>Plant and germinate</b>	Plant densely in seed bed	Plant sparsely (5-10% of traditional method)
<b>Water in seed bed</b>	Continuously flooded	Minimal water – just keep moist
<b>Time to transplant</b>	One month or more after planting	Less than 15 days after planting
<b>Cut tops of seedlings</b>	Yes	No
<b>Care in extracting seedling for planting</b>	Shake dirt off roots – results in root damage	Carefully remove seedling – avoid root damage
<b>Depth of water at transplant</b>	~10 cm	1-2 cm
<b>How many seedlings?</b>	~20 weak and strong plants	1 or 2 only vigorous seedlings
<b>Planting depth</b>	~10 cm	Place lightly on surface
<b>Arrangement of plants</b>	Random, close together	Straight rows about 20 cm apart
<b>Weeding</b>	Late, infrequent and irregular	Early and often to improve soil aeration
<b>Fertilization</b>	Farmyard manure and commercial fertilizer	Liquid or solid compost
<b>Insecticide</b>	Yes	No

- alternation of flooding and drying of the field during vegetative growth,
- early and frequent mechanical weeding to control weeds and to aerate the soil,
- adding nutrients to the soil preferably in organic form.



fertile land and abundant fish, provides a respite from the hard work, explains Yi Em.

She recalls that in the beginning, the most unusual principle of the SRI method was transplanting just one seedling per clump from the nursery to the field. They were used to transplanting six or eight plants. The idea is that a single seedling, when given more space to produce stronger roots, will grow more tillers and each tiller more panicles, meaning more grains of rice. Even now, after using the method for a few years, most of the farmers do not fully trust it. They still transplant two or three seedlings in case one fails. To further minimize the risk, they started using SRI principles only on one part of their land, to see whether the method would yield results. Still, with the reduction in seedlings and transplanting at wider spaces of at least 25 by 25 cm, the farmers are able to save considerably on seed, dramatically reducing their seed rate from 90 kg per hectare to 30 kg or less.

They also save on labor. SRI recommends not only planting fewer rice plants – 12 per square meter or less. It also maintains that transplanting should take place when the seedlings are just two weeks old and not five to six weeks, as conventional practice dictates. At such a young stage the roots are still small and not as deep, making the process of uprooting and transplanting less time-consuming. But again, many farmers do not fully trust this new method, so they reduce the time span for transplanting by just by a week to two.

Furthermore, SRI reduces the amount of water needed, which is less important for Yi Em and her husband doing rainfed agriculture, but an important aspect for irrigation agriculture which is increasingly under pressure to use water more efficiently. “Rice is not an aquatic plant” that has to be kept submerged as it is done in the conventional method, maintains the SRI philosophy. Instead, moisture is enough or even better for the plants. Flooding weakens the roots, the growth, the strength of the stalks, and therefore the yields – obviously a fundamental heresy against centuries of rice growing.

The other side of the coin, however, is that implementation of this principle demands proper water management and the draining of surplus water. Even more important: Flooding controls weeds and therefore in the conventional method the paddy fields do not demand

much attention. But without water standing in the fields weeds flourish, sometimes growing faster than the rice plants, stealing light and nutrients. And since weeding normally is women’s work their burden would increase.

This leads back to one of the most contentious issues of the controversy. Some opponents claim that SRI is more labor for the farmers, especially for the women, making it an obstacle for them to take it up. Or is it less labor, as the transplanting process suggests? The answer comes from Yi Em. “Transplanting is next to harvesting the peak season with high labour demand. But with SRI we can handle the work load ourselves and don’t have to pay additional laborers.” This reduction in labor demand, associated with fewer costs, compensates easily for some additional labor during summer for additional weeding or other requirements like draining or organic manure. And since they followed another principle and planted in lines, her husband can now use the mechanical weeder, which looks like a medieval torture instrument. So overall, there is not more labor required for SRI, she says. It is more evenly spread over the season.

The example demonstrates that small farmers make their own cost-benefit analysis, and their results are quite different from the critics’. Often enough, it is “Advantage SRI”. Saving on seeds and paid labor, which they otherwise have



## Can plants be “traumatized”?

“SRI begins with a philosophy that rice plants are to be respected and supported as living creatures,” writes Norman Uphoff, former Director of the International Institute for Food, Agriculture, and Development (CIIFAD) at Cornell University, USA. The methods, when employed, allow the plants to unfold their natural potential and produce a lot of tillers and grain. This is otherwise suppressed or ignored by conventional management practices. “We don’t treat them like little machines to be manipulated and forced to do things that are not natural for them to do.”

Under SRI, for example, care is taken that the plant does not experience shock. Therefore, transplanting is done as quickly as possible to minimize trauma to the roots, placing seedlings shallow and “gently” into the wet soil. This is very different from the traditional practice of uprooting seedlings later, after they have developed strong, long roots. To remove the soil they are beaten on the ground or against a leg, and then tied together in bundles with a seedling as a string. Transport from the nursery to the field often takes a long time, so the plants are often without moisture, sometimes for several days, and roots begin to dry out. In the field the seedlings are pressed into the soil so that the roots are “J-shaped”, i.e. with the tips facing upwards. Requiring time to recover from this harsh, rude treatment, the seedlings end up losing valuable time for growth and strength.



## Low external input agriculture (LEIA)

There are various concepts of farming methods aimed at reducing the dependence on external inputs such as fertilizer, seeds, agrochemicals and machinery, making a virtue of necessity. In many countries such methods are increasingly popular among farmers with limited assets of land, marketable surplus and cash income since they mean lower costs and increased productivity. Numerous studies, such as that conducted by the UN's Food and Agriculture Organization (FAO), have shown that with such methods small farms can be more productive than large ones, producing more food per hectare with less capital. Additionally, there is the benefit of greater ecological sustainability. Because of such advantages, low external input agriculture enjoys wider acceptance and support from governments, NGOs and development organizations. This in turn benefits the expansion of the System of Rice Intensification.

to employ during peak season, is essential and for many the main reason why they decide to adopt SRI. It also reduces the economic risk of complete investment loss when crops fail due to drought, floods or pests. The cost advantage is even greater if they make the switch to organic fertilizer as recommended by CEDAC, saving on additional expenses. Therefore, the SRI recommendations of fewer seedlings, earlier transplanting, wider spacing and composting are the principles farmers adopt easily – despite of the warnings and criticism from agronomists.

## *SRI-ventional* farmers

**I**t is difficult to find any non-SRI farmer in this area,” claims Sim Samoeun, CEDAC Program Director, who began as a field worker in this region after returning from his studies in Germany. Since the development NGO began advocating the intensification of rice cultivation seven or eight years ago, the number of farmers implementing SRI has shot up every year. According to CEDAC, by 2006 around 60,000 farmers had adopted SRI methods and the number is expected to have increased further to more than 80,000 in 2007. Other NGOs include the approach in their activities in the rural areas as do bilateral development organizations such as the German organization GTZ.

Nevertheless, it is difficult to find many farmers who have adopted the program in full. Most have taken up just some of the principles, such as transplanting fewer seedlings and transplanting earlier. Some have begun to opt out of commercial fertilizer and use manure and organic fertilizers instead. Lower costs and higher yields are clear advantages. But planting in rows to allow for mechanical weeding proves to be difficult for the farmers to accept. Equally slow on the uptake are proper water management practices, such as drainage. Principles like these demand extra labor or are complicated to implement (such as planting in rows with exact spacing). That is why farmers tend to relax on

these requirements, planting crisscross in the “orthodox” way or keeping their paddies submerged in water. They often practice the conventional and the new side by side and devote only parts of their land to SRI. “So the full potential of SRI is not yet being used,” says Samoeun. It is too early to say whether this reluctance is simply part of their risk management, more of a general mistrust vis-à-vis new, unconventional methods, or a result of real constraints such as labor availability or unsuitable soil and water conditions. And it is unclear whether time and experience will change it.

The farmers’ pragmatic approach does not seem to concern Sim Samoeun. After talking to him and looking at the selective approach of the farmers, one gets the impression that the “System of Rice Intensification” is anything but a “system”. SRI is a “flexible” and “soft” technology, Samoeun explains, and “it is new every year,” depending on what the farmers pick out from the set of principles. Rather than presenting SRI as a blueprint that must be followed to the letter, CEDAC introduces the SRI method to the farmers as a kind of toolbox with many parts and pieces that can be combined. Farmers don’t have to adopt the whole package of “text-book SRI” at once to get results, but can choose depending on their conditions and risk preparedness, gradually extending the implementation of the different principles. Let the farmer’s

## "Everything is possible"



In the beginning, after returning to Cambodia in 1999, Sim Samoeun, Program Director of CEDAC in charge of the development programs, really missed German bratwurst. He had spent the 1990s studying forestry and environmental sciences in Dresden and had returned with the support of EED. German sausages have since arrived in Cambodia, introduced by fellow wurst-loving returnees. Samoeun can now get bratwurst in Phnom Penh.

Samoeun, who is soft-spoken and still mixes English and German, joined CEDAC as a researcher and rural extension worker when he returned to Cambodia from Germany. He then began climbing the organizational ladder, taking up numerous positions such as project coordinator for sustainable rice-based livelihoods of small farmers. Like every manager at CEDAC, he has extensive field experience in many of Cambodia's provinces. He has lived in the villages and driven around by motorbike. "So I know about their life and about the hardships they face," he says. He can imagine becoming a farmer himself and practicing integrated agriculture – he has even purchased land outside of Phnom Penh.

In the beginning, there were only a handful of people and staff at CEDAC, but the organization grew quickly. It now has 200 employees. And the organization is quick to take up new ideas and innovative programs. "Our strategy for the next year is basically outdated as soon as it has been decided due to the rapid rate of development," Samoeun says, smiling. Samoeun sees his work as a process of life-long learning. He sees interactions and teamwork as an effective way to improve his own capacities and those of the organization. So is the sky the limit? "Everything is possible in Cambodia," is one of his favorite things to say – as long as it doesn't involve having to confront the government.

find out themselves what is good for them, Samoeun says, understanding their need to experiment, reject, improve, and discuss among themselves in the farmer's associations.

Aside from being a flexible technology, SRI is also very much about "behavior" and a "change of attitude" among farmers, adds Dr. Yang Saing Koma, President of CEDAC. "The farmers must act instead of react." Instead of complaining about their difficulties, they should be motivated to try the new method and to experiment with it. They should reflect on how "to help the rice" with its growth. Success not only depends on natural or external conditions but on the farmers themselves. It would be a mistake to reduce SRI to a question of technology, Koma says, like some development NGOs and agronomists criticizing it tend to do – it is "an idea". Does he feel that SRI is too complicated for the farmers? His answer is "No". Too much work? "Maybe". But what is most important is for farmers to approach rice cultivation with attention, care and sensitivity, like a mother.

## Scientists and UFOs

Thomas R. Sinclair, a plant physiologist at the U.S. Department of Agriculture's Agricultural Research Service, once called yield increases attributed to SRI by NGOs, researchers and farmers, "UFOs" – "unconfirmed field observations". Others wiped such reports off the table as "likely to be the consequence of

error". From a scientific point of view, it is simply impossible to have greater yield with fewer seedlings, early transplanting and soil aeration (instead of flooding). CEDAC President Koma recalls that the director of Cambodian Agricultural Research and Development Institute (CARDI), which cooperates closely with IRRI, used to say that it would be risky and difficult for small farmers to use very young seedlings and to transplant them without water. Research institutions have conducted their own field trials with SRI reporting that the method failed to show any impressive yield increases. As it would seem, SRI did not pass the scientific litmus test.

In the meantime, however, "the critics' objections have changed – from first denying that SRI "works", to then saying that it offers "nothing new", to then saying it is only applicable on a small scale," observes Uphoff. At least more and more agree "SRI may serve the important needs of resource-poor farmers in areas with poor soil," as Achim Dobermann from the University of Nebraska-Lincoln puts it, due to low external inputs. Others generously concede that SRI contributed positively to "increased discussion over optimal rice cultivation practices" between development practitioners and the established rice research community.

SRI does indeed contradict several established scientific truths, decades of research, and generations of irrigation rice farming in so many rice growing countries. And it competes with the proposals developed by official and established research institutions such as "best management practices", or with research lines, for example from IRRI, where scientists are working on breeding new varieties and genetically modified plants, which promise farmers lower fertilizer inputs and higher yields through more efficient photosynthesis.

### How SRI came to Cambodia



"Nothing works without rice," says Dr. Koma, and he is convinced. Farmers in Cambodia cultivate rice primarily in monoculture. Improvements must therefore start from there, while other concepts like permaculture, which would demand more fundamental changes, ignore the interests and possibilities of the farmers.

In the 1990s, the International Rice Research Institute (IRRI), influential in the modernization of rice cultivation all over Asia ("Green Revolution"), in collaboration with Australian development aid introduced a large scale government program based on "modern" commercial seed and fertilizer. But rice production stagnated. So Dr. Koma started to look for alternatives. In one of the issues of the LEISA magazine, published by the Centre for Information on Low External Input and Sustainable Agriculture (ILEIA), he found an article about SRI and immediately thought, "My goodness, that's easy!" Additional information came, for example, from CIIFAD, the International Institute for Food, Agriculture, and Development at Cornell University, USA, one of the most active disseminators of SRI.

When Dr. Koma spoke to the farmers he realized that they had observed some of the principles of SRI already. Single seedlings with less water, for example, produced more tillers. But under the influence of government extension services and tradition, they didn't dare to implement this. After Dr. Koma made a trial run himself in 2000, which was "nearly 100 percent SRI" and successful, CEDAC convinced 28 farmers in four different provinces to try SRI on small plots. In spite of insufficient rains, the yields were good. Under good conditions, 5 t/ha and more can easily be achieved with SRI, Dr. Koma says, while under normal conditions the average yield of SRI farmers is around 3.5 t/ha. But Dr. Koma is convinced that there is potential for further yield increases if farmers adopted more of the SRI principles than they currently do.



Torn Sorn explains another the benefit of the alternative method. Because fewer seeds are needing for planting, women can hand-select the most promising seeds, thus contributing to breeding and to preserving the diversity of rice varieties.

But there is an increasing body of research evidence demonstrating the benefits of SRI. Scientists from the Agricultural University ANGRAU in the Indian state of Hyderabad or from the International Water Management Institute (IWMI) in Colombo have published studies and reports confirming the potential of SRI. At the Royal University for Agriculture on the outskirts of Phnom Penh, Chuong Sophal, Dean of the Faculty of Agronomy, can show from a comparison in Kampot Province that advanced SRI farmers indeed have higher yields than conventional farmers. Still, further research is needed. “Right now we can’t say that SRI is the best,” says Chuong Sophal, “because farmers can’t apply all the principles.” What he can say is that management in the paddy field, such as timely weed control, is a very important factor for higher yields. “If we can define best SRI management practices, it might be easier for farmers to adopt them.”

The Department of Agronomy has its own trial fields located on the beautiful and vast university campus. Graduate students currently conduct trials to better understand crucial issues such as flooding (“to flood or not to flood”), which impacts the potential of saving water. Others explore the question of when to

transplant, an area where there is considerable disparity between text book SRI recommendations, conventional methods and the practice of SRI farmers. “Maybe the farmers are right not to follow every SRI principle to the letter but adapt it flexibly,” says Dean Chuon Sophal.

Farmer Som Phang at Ta Phok initiated his own field experiment. He wanted to find out whether “less is more”, i.e. whether one seed is sufficient to get high yields as claimed by SRI. This notion contradicts the conventional logic, that three chickens, for example, give more eggs than just one. So he divided one part of his field into six subplots of the same size. On three of them, he planted seedlings from big seeds selected from the last harvest – single seedlings per mound in the first plot, and two and three per mound respectively in the other two. As a “control sample”, the remaining plots were planted with unselected seeds as conventionally done – with single seedlings in the first plot, and so on.

Now, six months later and just before the harvest, the preliminary assessment by the “barefoot scientist” indicates that rice plants indeed have their own logic. According to Som Phang’s calculations, the yield from the plot with single seedlings from selected seeds will



## Seed selection

Like most of post-harvest processing, seed production is mainly the work of women. “To get the seeds we don’t thresh the grains because that could spoil them,” explains Ton Sorn, a woman farmer from the village of Kaheng (see photo of meeting). Instead, the women rub them carefully with their feet. Then they put the seeds aside for the next harvest. With SRI reducing the number of seedlings required for transplanting, they have begun to select the seeds more carefully, choosing big seeds with the promise of higher yields. This would not have been possible under the conventional method, which requires large quantities of seed. The women farmers have since started a simple

breeding and seed improvement program to increase the yields from indigenous varieties. The conscious move away from “modern” rice varieties helps conserve the country’s rice biodiversity. They exchange “good” seeds for “food” grains from the neighbors, not charging for the extra seed quality. “Some have already started their own small businesses with seed selection,” says Sim Samoeun.



Keb Chon and his wife Meach Sarim thrash a sample of rice brought from their field to prove that the yield is much higher now than before.

be the highest. Whereas “chickens can go everywhere to find feed,” several seedlings must “compete” for the same nutrients and oxygen, he explains. Therefore, unlike the chicken analogy, more plants mean less yield. Like the improvised yield estimate done by Keb Chon in the village of Trapaing Veag, this field trial does not represent scientific proof. But again,

it is another indicator confirming the claims by SRI that farmers can have high yields with less input.

While it is easy to dismiss some reports by SRI enthusiasts announcing yield increases of 600 percent and higher and enormous reductions in water and other inputs as “unscientific,” it can no longer be ignored that SRI (or whatever farmers in Cambodia make out of it) answers to the requirements, capacities and possibilities of small farmers, especially to their need for lower inputs. With lower costs, SRI still secures or even increases yields, even if it does involve additional work. SRI reduces economic risks, dependency and the looming debt trap from increasing input costs and low prices for staple foods like rice. Furthermore, it contributes to the formation of a locally specific body of experience and knowledge, turning farmers into researchers, agro-technicians and seed breeders.

## Rice-based livelihood systems

Unlike life in the villages in Cambodia’s countryside, the capital city of Phnom Penh is booming. There are new big cars on the streets, squeezing out the tuk tuks and the motos, the motorcycle taxis. Additional floors are being added to houses and new five-star hotels are shooting up. The US dollar is as common as the national currency, with 1 US\$ equal to 4,000 Riel. Mobile phone outlets seem to be on every corner, small stores must now compete with shopping arcades and supermarkets and goods from China, Vietnam and Thailand flood the market. Nearly two decades after peace returned to Cambodia, the country has one of the fastest growing economies in Asia. But it is still one of the poorest countries in the region.

“If it continues like in the last years, within ten years this will be a suburb of Phnom Penh,” says Mey Som, one of the first farmers to use SRI in 2000, about his home village of Trapaing Raing. Construction work and land speculation, fueled by foreign investors and domestic black money accumulated by growing corrup-

tion, is eating into the fertile farmland in the low-lying agricultural heartland from Battambang in the Northwest to the Vietnamese border and the Mekong Delta in the Southeast. Large areas around the capital which only until recently had been rice fields are rapidly being converted into housing estates, industrial zones (mainly for new garment factories) and plantations. With more and more roads being built or improved, even the more remote rural and forests areas are beginning to feel the appetite of investors and speculators. Land is a limited resource that is getting scarcer and more valuable by the month.

Several farmers from Trapaing Raing, an hour drive from the city, have already sold land next to the road to city dwellers, says Mey Som. With land prices in some parts of the rural areas of 30, 40 or 50 US dollars, sometimes even up to 200 US dollars per square meter, this is hardly surprising. The temptation to get a share of the economic boom is high, even if the money is spent quickly on a moto, a house, mobile phones and clothing, as Mey Som says.

## The first SRI farmer



The colorful tomb can be seen from afar. It was built by Mey Som, now 68, who set aside part of his one hectare of land for its construction. He wants to be buried on his beloved field. Proudly, he presents his rice fields, the fish pond with its water lilies, the fruit trees, the trees he's planted for fodder and composting and the vegetable garden. "With rice, fish and vegetables, we have a good life," he says. Onions, for example, bring more money than factory work.

Mey Som was one of the first farmers to implement SRI methods in 2000. "First, people thought we were crazy when we started transplanting young seedlings," remembers his daughter, who is now the president of the farmers' association. The neighbors assumed that they would secretly plant more to get their higher yields. Now, 48 out of 60 farmers in the village practice SRI.

Since then Mey Som has become a trainer – and a well-travelled man, sharing his experience with rice farmers in other countries. "In France I fell sick because I got bread all the time and no rice," he recalls. In the Philippines he was most impressed by their practice of seed selection, their irrigation systems and water management, and by the fact that they planted in lines. "We have to change the habits of our farmers," he says.

Despite the importance of rice as a staple food, as in many other countries, most of the farmers growing it remain poor. Most of their farms are small, the soil is often of poor quality and there is no assured water supply. They are dependent on both the climate and money lenders.

The young generation often does not want to continue farming, which in their eyes represents hardship and poverty. Young women in particular try to find jobs in the new garment factories, where they earn around 50 US dollars per month plus 20 US dollars for overtime. With no one to take over the farm, many older farmers have simply sold their plot of land and retired. But the remaining farmers of Trapaing Raing try to resist the sell-out. They take over the land from neighbors who want to give up, "to keep it in our hands", as Mey Som's daughter So Sopha, president of the farmers' association, says.

SRI will not be able to stop this trend of de-peasantisation completely, CEDAC President Koma says. The productive value of farmland cannot compete with the urban or speculative value of land. But SRI could slow down expulsion and allow the farmers to adjust to development. The results of the first few years after introducing SRI are quite promising, giving the participating farmers improved yields, higher incomes and new perspectives. If farmers would adopt all the principles fully, there would be much higher increases and benefits, Dr. Koma says. But in order to use the potential and to resist the pressures to give up, they must become "better farmers".

Backing comes from Cambodia's Ministry of Agriculture. SRI is included in the government's National Development Plans as a major thrust for the agricultural sector. The agriculture minister himself, Chan Sarun, visits SRI farmers regularly, participates in workshops



Food security and poverty reduction are important development objectives in Cambodia. With the new rice growing methods, farmers can be more productive, increase yields and income and slow down the migration into the cities, explains So Sopal, president of the farmers' association in Trapeang Raing.



and lectures, and instructed the administration at the regional level to promote SRI through extension work. He even wrote his doctoral thesis about SRI as a strategy for sustainable rice production in Cambodia and produced field guides for officials and farmers.

For a country like Cambodia, where the majority of people still live as farmers and from rice cultivation, food sufficiency and poverty reduction are politically important development objectives. The interests of the farmers – to have enough food at home – align with those of the government, which is faced with the challenge of stabilizing rice production with less agricultural land and water while resisting dependency on food imports and on costly imported inputs such as fertilizers and pesticides. The Ministry is obviously convinced that SRI does not end in hunger, as some critics have warned, but just the opposite – a sustainable contribution to food security, at both the household and national levels. And while it is still too early to talk of a “victory march” for SRI, academic and political support for it is increasing, putting an end to the times when it was ignored and sidelined in agricultural and development policies. The monopoly of the conventional method is starting to crumble. With the numbers of farmers using at least parts of SRI on the up, CEDAC Director Koma is optimistic that within just a few years' time, Cambodia will be the first “all SRI” rice economy in the world.



## Land hunger – selling, cheating, stealing

Sim San and Sony Meas will sell their one hectare of land once they are too old to work it. This they have decided already, hoping that the price will continue to rise beyond the current 6 US dollars per square meter. They hope to make enough money for a carefree retirement. Their three sons work in town and have no intentions of taking up farming. Other farmers are lured into selling by speculators who promise jobs in the factories that are to be built on their land. Often enough, these factories are never built.

And as reported in *The Economist* (March 2007), there is an increasing number of cases where farmers find their paddy field with a barbed-wire fence around it. Sometimes soldiers are responsible, claiming the land in the name of military purposes. Sometimes it's the politicians or civil servants. Small farmers usually have no proof that they own their land. This makes it easy for the speculators to work the corrupt legal system to pull the ground out from under the farmers' feet. Sometimes farmers do get compensation, but usually only a pittance. As a result, about one-fifth of rural households are now land-less, and the land snatched away by speculators often sits idle.

## The future has already started

Besides intensification, the future of farming lies in diversification. Known as “multi-purpose farming”, it could offer a viable option for those who want to stay. “With multi-purpose agriculture based on rice, you can have a good life with one hectare,” says Dr. Koma. He hopes that at least 20 to 25 per cent of the young generation will see a future in rice farming and stay.

### EED – CEDAC relations

EED and CEDAC have been working together since 1998. Their cooperation began in the context of the EED reintegration program, which is run by EED for Cambodian students who have studied in the former German Democratic Republic, to help them return to Cambodia and establish a career. Ten students have been assisted so far.

Today almost all of them are working in leadership roles in Cambodian non-governmental organisations (NGOs) and making an important contribution to the country's development. In 2001, cooperation between EED and CEDAC was expanded to include financial support of the rural development program, the framework within which SRI is being put into practice. The rural development program was supported until December 2007 with funding from the German federal government and from Bread for the World. Since January 2008 the EED program has been continued with money from the European Union and funds from the Churches' Development Service. EED also supports CEDAC in an HIV/AIDS program in Prey Veng Province.

CEDAC was one of the first non-governmental organizations to emerge following the democratic elections held in 1995 by the United Nations. It is now renowned as one of the country's pioneering organizations. The work on SRI has generated interest far beyond the organization and the approach is now being embraced by other NGOs. 167 people are employed at CEDAC, 49 of whom are women. The overall goals of CEDAC's work are capacity-building for small farmers, strengthening farmers' organizations, ensuring a reliable food supply for small farmers' families, promoting ecologically adapted agricultural production methods and strengthening the principles of democratic governance. Implementation of the techniques for intensifying rice production is thereby embedded in a comprehensive rural development program and can rely on long-term support from the local farmers' organizations and regional associations that are being established. In villages, CEDAC is providing parallel support for small loan schemes and the establishment of vegetable plots. Growers will also be increasingly encouraged to market their products.

CEDAC sees market integration as yet another precondition for securing the future of rice farming. The farmers should have their own marketing organization and transport facilities to sell their surplus to avoid exploitation through middlemen. They should form cooperatives to buy inputs in bulk at a lower price. They should have storage facilities, so they aren't forced to sell the rice immediately after harvest, when the prices are depressed. “Business” must complement “development”. Already outfitted with a development department, CEDAC has now initiated a business department, which mainly provides marketing and capacity building services to farmers groups and cooperatives. The first enterprises include restaurants, a bookshop, a chicken abattoir and consulting and training services. There are further plans for a community bank, based on savings groups and credit cooperatives, and for agricultural tourism services. SRI alone cannot lead small farmers out of poverty, but it can be the starting point for “sustainable rice-based livelihoods” and for self-reliant development approaches, says Dr. Koma.

SRI also has a comparative advantage. As low input agriculture, most farms in Cambodia are still organic. SRI offers an alternative to high inputs of inorganic fertilizer, pesticides, herbicides and insecticides and to genetically modified plants. CEDAC encourages farmers to try biological pest management and weeding, either by hand or with mechanical weeders. If farmers have cattle, they can easily opt for compost and organic fertilizer. SRI is a “good starting point” for organic agriculture, believes Keo Chandary, who is a program assistant for agriculture at GTZ's Rural Development Program in Kampot Province. One of the first steps in making this advantage economically viable has been the opening of a shop for organic rice and “natural”, i.e. chemical-free agricultural products. The shop is located just around the corner from the CEDAC office on Phnom Penh's busy Kampuchea Krom Street. The growing demand for organic food for export





Farmers in Kaheng benefit already from the upswing thanks to the SRI method: besides rice they grow vegetables and sugar palms; a canal provides them with water all year round and there is a small savings group. Khek Chhan Phal runs the cooperative shop in the village with a wide variety of goods.

and by well-off middle class urban consumers could help SRI, says Jörg Rosenkranz, an inspector for BCS Öko Garantie, a certification company for organic products, who is currently advising CEDAC and the farmers on establishing eco-certification.

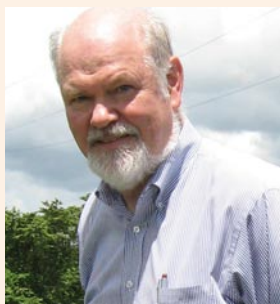
Farmers in the village of Kaheng are already well on their way towards securing the future of rice farming in their area. Thanks to a small canal that brings water to the village during the dry season from January to March, they have two harvests of rice, grow sweet potatoes, maintain vegetable gardens, sugar palms, fruit trees and cattle. “We are true farmers,” boasts So Tith, head of the farmers’ association of Kaheng and a member of the Farmers Network, “not lazy like the conventional farmers.” SRI farmers never stop working, says So Tith, except on New Years, during the Water Festival and for “some sleep after lunch”.

One of the village women now runs the small cooperative shop, selling soap, vegetable oil, salt, coffee, tea, and other basic necessities plus some small luxuries like sweets and

biscuits. To add to his farming income So Tith works as an SRI trainer. Ton Sorn, one of the female members of the farmers’ association, gets some 15 US dollars per month as an adviser to savings groups. Most of the members of the farmers’ association do not consider themselves “poor”. They have enough rice to eat, new houses on concrete stilts with wooden walls instead of palm mats, a motorcycle and some farm implements. There are fish in the fields and in the small ponds, fruits and vegetables, chicken, pork and beef. And they don’t have to work as day laborers, they say. Listening to them one begins to believe that the “System of Rice Intensification” can indeed make a lasting contribution, turning many of Cambodia’s farmers from poor peasants into “true farmers”, living from the land, with the land, in harmony with the environment, self-reliant, proud and happy. A (too) romantic vision of future village life, perhaps?



## Norman Uphoff in response to the critics



**Norman Uphoff, former director of the Cornell International Institute for Food, Agriculture and Development (CIIFAD), USA, and now its program leader for Sustainable Rice Systems, is one of the leading protagonists of SRI. He has been collecting evidence from around the globe about the applicability and advantages of SRI practices as well as about its limitations and the modifications that are being made by farmers since 2000.**

*Some observers praise SRI for its fantastic, if not miraculous results. Would you agree?*

**Uphoff:** “Fantastic” and “miraculous” are words that critics have used sarcastically. We do not make such characterizations, preferring just to report results. Others can evaluate these, preferably after trying the methods out for themselves. Rather than “promoting SRI”, we are promoting the evaluation of SRI.

*Obviously, there are different approaches to solving the stagnation in rice production, increasing productivity, and involving more farmers in the modernization of rice cultivation to increase their income. Some of the critics have claimed that SRI is no improvement compared to existing “best management practices”, for example.*

**Uphoff:** Unfortunately, the “controversy” has been focused by skeptics on whether SRI methods can surpass those which scientists have devised and recommend as “best management practices.” This has hijacked the debate, in a way. SRI proponents are not concerned with whether these methods “surpass” BMP. Our goal was not to achieve highest yields but to help poor farmers meet their food security needs, and then to enhance incomes, not necessarily by growing more rice but by getting higher productivity from their land, labor, capital and especially water. We then want to help them use the productivity gains from SRI to diversify their farming systems.

Few poor farmers can afford to utilize BMP anyway. These methods are too expensive, or simply inaccessible, or very risky. The SRI vs. BMP controversy is irrelevant, distracting attention from the basic and widespread superiority of SRI for most farmers. Because SRI is not a technology, but rather a set of concepts and insights for raising factor productivity that can be adapted to many conditions.

*Sometimes, the controversy about SRI is quite aggressive and negative. One gets the impression that there is a stiff competition between the newcomer ‘David’ (SRI) and the established centers in agricultural research. How do you explain this denial of the benefits of SRI by the critics?*

**Uphoff:** Controversy is nothing new in the history of scientific change. We are involved here in a paradigm shift from a research strategy that is focused on genetic improvements and use of external inputs (SRI involves neither of these) to a focus on how best to manage the plants, the soil, the water and the nutrients so as to give the rice plant an ideal growing environment.

*Still, the expansion of SRI is quite slow, mainly promoted by development NGOs like CEDAC, and there has been resistance from governments and many agricultural departments.*

**Uphoff:** The rate of uptake of SRI has been slow in most countries, as we have to first overcome skepticism, made greater by critics’ poorly founded objections. Once the benefits are demonstrated, the spread can be rapid, like from less than 1,000 SRI users in the Indian state of Tripura in 2005 to over 160,000 in 2008; or an expansion from about 40,000 hectares in the Indian state of Tamil Nadu in 2005 to 420,000 hectares (over 1 million acres) this current season. Why? According to the Minister of Agriculture for the state, farmers are getting 50% more yield with less seed, less water and less manual labor. [The Hindu, 1/1/08]. In Tripura state, agriculture officials have reported that in Rajnagar Subdivision, the average SRI yield was 6.9 tons per hectare compared to the district average of 3.02 tons. In 2005-06 season, the SRI area was 24.5 hectares, whereas in 2006-07, the area under SRI management was expanded to 2,300 hectares. So I think we are getting past the period of resistance. SRI, as I always stress, is “a work in progress.” Not yet finished. Both farmers and scientists are making improvements and will continue to do so.

## Acknowledgement

*When I went to Cambodia in December 2007 to visit CEDAC and observe its SRI activities, I was curious – and a bit skeptical. The controversy around the question of whether the method benefits or harms small farmers had left its mark on my expectations. Fortunately, I had the opportunity to talk to many people from various backgrounds and levels of involvement, many of whom have been mentioned in this study. Most important, of course, were the long talks with farmers groups, which helped me to understand their hopes, perceptions and deliberations regarding SRI. They convinced me that SRI indeed has a promising potential, particularly for small farmers. But what impressed me most was not only its fundamental contribution to increased yields at lower costs, but the dynamism and optimism it had triggered within farmers' associations and development organizations as well as in Cambodia's political and agricultural sciences scene. If properly handled, SRI could indeed become a tool for changing agricultural development – from the paddy fields all the way to national agricultural policy.*

Uwe Hoering  
Bonn, Germany  
June 2008

## Rich Harvest

The System of Rice Intensification

A success story from Cambodia



An increasing number of farmers in Cambodia are turning to the so-called “System of Rice Intensification” (SRI) method for cultivating rice. The SRI method enables farmers to increase their yields while using less seed, less labor and fewer external inputs, helping them attain secure livelihoods. Farmers from Cambodia’s Takeo Province who have adopted this new cultivation method, increasing both production and profit, talk about their experiences with SRI. The method also helps secure adequate food supply and decrease poverty. As a result, rather than migrating to the cities in search for work, many rural families have been able to remain on their lands and continue to farm them.