Climate Smart Agriculture (CSA) Technology Portfolios for Rice-Based Systems

(Saline, Upland, and Lowland Ecosystems)

This project contributes to IIRR's initiative to deepen the global knowledge-base on the role that local, participatory platforms can play in facilitating community-based adaptation and resilience-building. IIRR maintains a network of Climate Smart Villages (CSVs) in Cambodia, Philippines, Myanmar and Laos where knowledge and experience are derived, through community level action research. This is undertaken in partnership with local governments and civil society organizations, and with support from the Asian Development Bank (ADB), the CGIAR Climate Change Agriculture and Food Security Programme (CCAFS), International Development Research Center (IDRC), and World Food Programme (WFP).

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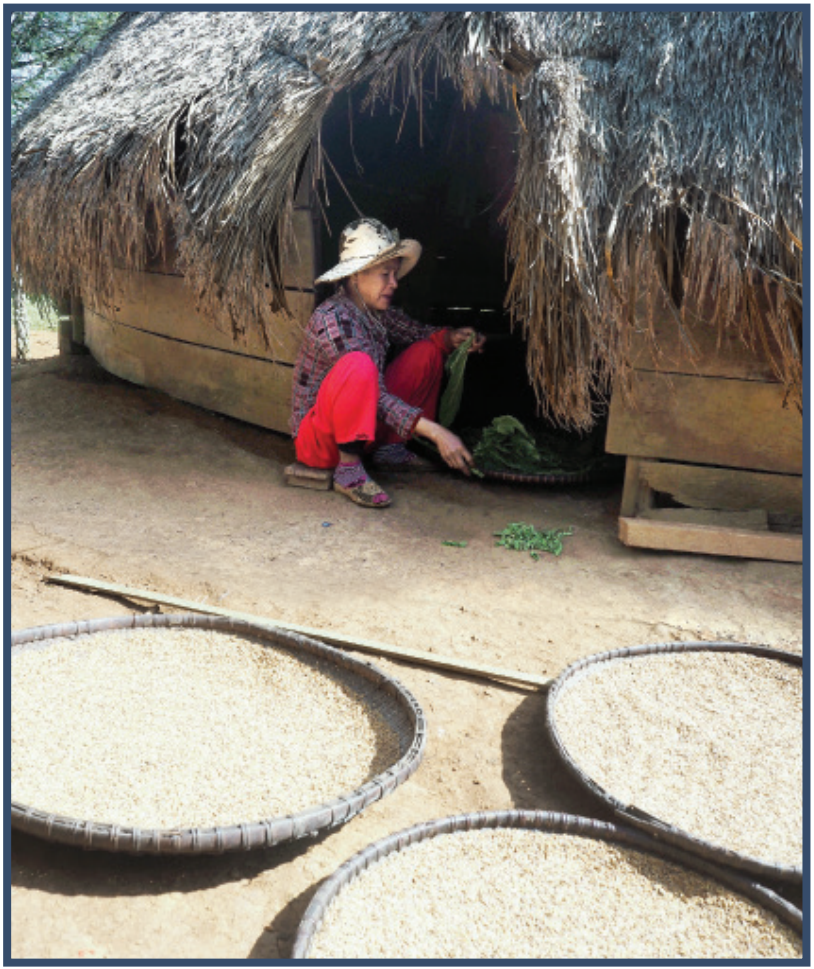
Cambodia has been ranked as one of the most climate vulnerable countries in the world. In Modulkiri and Koh Kong farmers are already trying to cope with variability in rainfall patterns: delayed rains or long drought periods and, at other times, intense rainfall that result in flash floods. There is already a shift in the onset of the wet season. An increase in precipitation (rain) is projected. Dry seasons are expected to be longer. Overall uncertainty exists over the timing of seasons and the distribution of rain.

Farmers in these provinces grow 3-4 varieties in a village or, sometimes even on a single farm. Typically farming households have 1-3 hectares of lowlands and/or 1-2 hectares of upland areas (Chamkar). In rainfed lowlands, this is a mix of traditional and modern varieties and in the uplands, mostly traditional varieties are grown. This is an important local risk management strategy for dealing with climate uncertainty and variability and for managing labor requirements, especially at harvest time.

Farming households in these two provinces put an exceptional emphasis on household food security, often prioritizing rice for both home consumption and for markets. This is probably most farmers grow aromatic rice varieties (both traditional and modern). Sometimes farmers grow one variety for market and others for household use. Quality rice is indeed highly valued, by both poor and rich households alike.

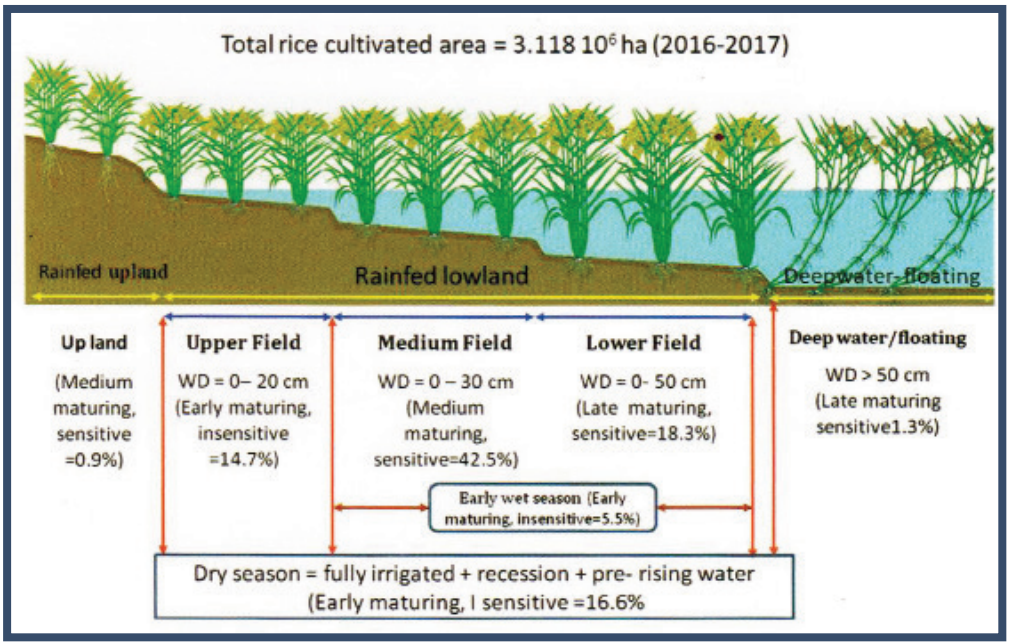


Crop yields are typically low in rainfed lowland areas and is often dropping. This is the result of poor soils or due to the degradation or mining of soils. By default or by design, many of the small holder farmers in these provinces are organic. They are increasingly challenged by reduced availability of animal manure, declining soil fertility and decreasing crop productivity. Climate change could further affect productivity.

In lowland farms such as in Nang Buo village, Nang Khi Lik Commune, Kaoh Nheaek District, Mondulkiri Province, there is a recent trend towards the mechanization of land preparation. The shift from animal tillage to (small) mechanization, using power tillers is extensive. Cattles are sold, and power tillers are purchased. Nearly all the rice farmers in the village of Sra Huy have hand tractors. This trend has reduced labor costs and has helped farmers to expand their crop area. Access to small machines is helping keep farmers in the farming business.

What is urgently needed are ways to improve the productivity of crops by improving the management of soils and crops. The further diversification of varieties, the inclusion of stress-tolerant rice varieties from CARDI, the introduction of the System of Rice Intensification (SRI), the re-introduction of legumes and the management of crop residues and fertilizers are climate smart practices that farmers will have to consider. Climate smart agriculture practices are needed for the upland, rainfed lowlands and saline affected areas.

Modern, new varieties including the ten varieties recommended by the Ministry of Agriculture, Forestry and Fisheries should be considered, but only after location-specific testing by farmers. Stress tolerant rice varieties (recommended by CARDI and/or IRRI) are already available and may be considered for the BCC ADB sites. We need to remember that there are different agro-ecological "niches" for rice production (see diagram) and there are different varieties for each unique location.



Rice Ecosystems and growing conditions in Cambodia. (Ouk, 2011).

For the upland areas (Chamkars) there is a strong likelihood that the traditional varieties will continue to be grown for a long time. As in Mondulkiri, the growing of traditional rice varieties is closely linked with local food culture and local rituals as in O Rang district of Modulkiri.

Scientists generally agree that traditional varieties in the uplands are often robust and might cope better with climate variability than modern varieties. However, some modern upland varieties such as San Pidao, Rimke, and Sita have exceptional market potential and value and are recommended by CARDI and/or IRRI for integration into existing systems after trials by farmers.

Over 26 upland varieties have been noted in surveys. Many of these are found in the mountain areas of Mondulkiri and even Koh Kong. One of the ways to deal with drought is to continue to recognize the value of these resilient and stress tolerant varieties. Upland varieties are highly valued for food (many being aromatic and used in rituals). This rich agro-biodiversity could be conserved in these upland farmers in anticipation of future climate variability. However ways to improve their productivity are needed. Line sowing, intercropping with legumes and SRI offer special opportunities for upland rice improvements.

Production of upland rice can be increased by at least 30 percent by using UPLAND SRI methods. Rice is planted in rows spaced wider than normal (40 cms) apart – in order to accommodate an intercrop of red or black cowpea crops are planted.

Cowpea cultivars/varieties which are found in Mondulkiri are one of the most drought tolerant crops for the uplands. These local varieties are grown in between rice rows (point #10 above) or soon after rice. Cowpeas help rebuild soil fertility, control weeds and reduce moisture losses. The pods can be eaten as vegetable and their dry seeds used as grain legume. Black and red cowpea are proven to be more drought tolerant and may be considered as intercrops.

Upland rice farmers prefer the traditional rice varieties, because of their taste and aroma but, also because they are taller than modern varieties: taller rice crops makes them weed competitive. The three or four upland rice varieties grown in a typical Chamkar, though all usually planted on the same day, come to harvest at different times. This helps spread out the labor requirements at harvest time.

Lowland farms have flatter land areas with bunded fields. They have better access to irrigation or store rain water because of their location in the landscape. Here modern rice varieties have a bigger role to play. Some of the new varieties such as Chul'sa and Riang Chey can tolerate both drought and occasional floods. Other varieties known to be adapted and recommended for rainfed lowlands are Sante Pheap 1, Sante Pheap 2, Sante Pheap 3 and Sante Pheap 4 and Sarika, CAR 14 and CAR 15 (many of these are aromatic and have higher market value).

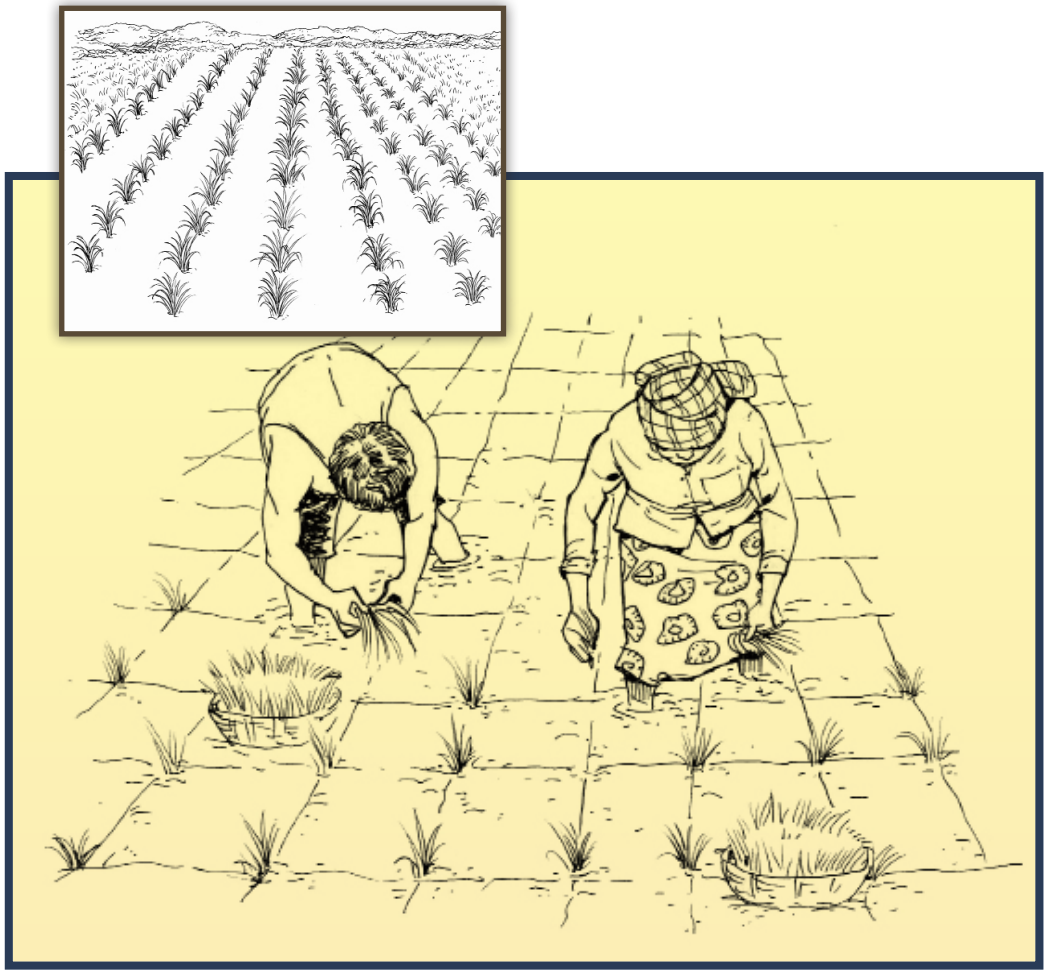
SRI has been extensively tested in rainfed lowlands and irrigated areas in Cambodia (see the last section of this primer for information references).

Here are the key practical messages for SRI:

Nursery: Select only full grain seeds, prepare dry nurseries (dry beds with water surrounding the beds not flooded nurseries), use a lower density of seeds in the nursery, (sow seed seperately in rows three inches apart in the nursery), use compost as fertilizer, water the nursery by hand or by flooding the sides of the bed (the nursery should not be submerged in water). All these practices result in healthy, hardy and robust seedlings with strong roots.

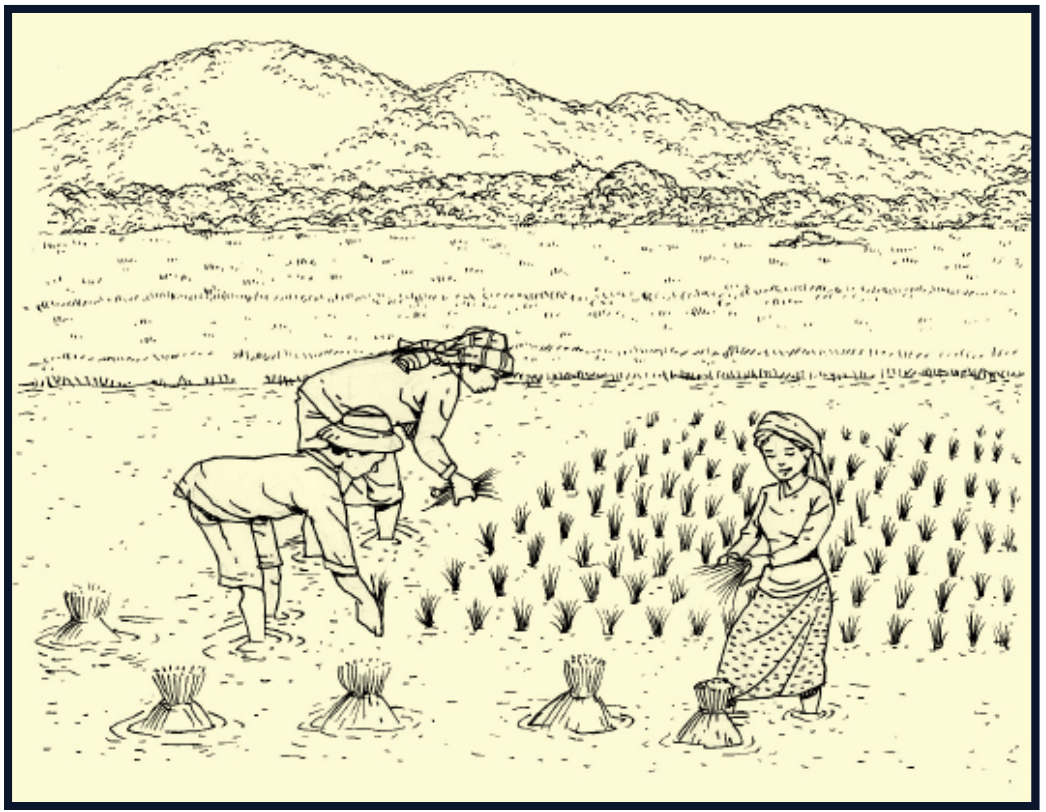
Source of artwork: General Directorate of Agriculture (GDA)

Transplanting: Young seedlings of 10 to 12 days age are used, one to two seedlings are planted at each hill, and spacing between rows is maintained 25 or 30 cms apart. In the case of saline affected areas older, seedlings that better tolerate salinity are used (30 to 35 days old).



Management: In the rainfed lowland rice paddies, the continuous standing of water is not advised. Alternate wetting and drying is usually done in order to control weeds. This promotes well aerated soils, and healthy and deeper root development. These rice crops are more drought tolerant.

In the case of saline soils found in Koh Kong coastal areas, the rice fields are kept constantly wet and are not allowed to dry up as this will only worsen the effects of salinity.



Saline soils are found in a number of coastal areas of Koh Kong such as Andoung Tuek and Kandaol communes. Rice farming is still practiced inspite of low yields resulting from salinity. New stress tolerant varieties for saline areas are recommended by CARDI and IRRI need to be tested in these areas. The following are extensively tested (some aromatic) and recommended by CARDI and IRRI: Phka Rumduol-Praing, Phka Romeat and Phka Rumduol. These varieties fetch higher prices than locally grown varieties in coastal provinces.

Aside from stress tolerant varieties, there are other recommended practices for growing rice in rainfed saline environments: generous applications of compost help to reduces the effects of salinity. If the nursery can be raised in a non- saline site, the seedlings will get a good start and will better withstand salinity in the main field. The seedling are kept in the nursery longer than normal (30 to 35 days) before they are taken to the fields for transplanting. Older seedling tolerate salinity better (low seedling mortality).

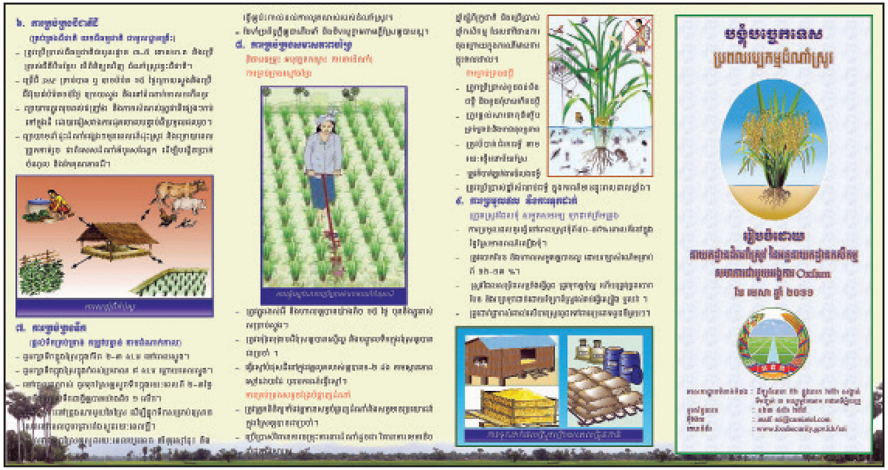
Source of artwork: General Directorate of Agriculture (GDA)

Water is regularly maintained in a saline rice field (no drying). A good post-rice legume for (non-dry) saline soils is mung bean. The incorporation of mung bean residues back into the soil will help to reduce soil salinity levels. The use of green leaf manure is also highly recommended and where possible sources should be grown on the farm boundaries (Gliricidia or Cassia species). In combination with modern new saline tolerant varieties and good practices for saline environments, rice farming will still be possible in coastal environments.

The overall increases in the annual rainfall will help to reduce salinity levels in the soils (leaching or washing out of salts). The growing of saline tolerant cashew nut crops and root and tuber crops (cassava and sweet potato), peanuts and banana in coastal agricultureshould be considered.

Rice farming remains an important livelihood option and source of household food security in Cambodia. With farmers increasingly focusing on high value varieties (aromatic and export oriented), new market opportunities have arisen. With the advent of farm mechanization the drudgery of rice farming (land preparation and harvesting) is reduced. There is a renewed interest in rice farming. Ways have now to be found to increase productivity, improve the resilience as well as sustainability of rice farms in different ecosystems (upland, lowland and saline) where small farms still prevail.

Annex

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