

Gender Dimensions of the Adoption of the System of Rice Intensification (SRI) in Cambodia

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EXECUTIVE SUMMARY

The primary objective of the study is to provide Oxfam America with a thorough understanding on the current adoption, practices and outcomes of the System of Rice Intensification (SRI) as implemented by the Cambodia Center for Study and Development in Agriculture (CEDAC), a non-governmental organization in Cambodia, and its implications on gender relations. Specific questions were formulated to investigate the following issues: (a) The roles women and men played in conventional and SRI rice production and whether these were changing; (b) Changes in the systems and relationships in production and how these were affecting women and men; (c) Resources and support services available to women and men; (d) Decision-making on SRI adoption among women and men and within communities; (e) The impact of benefits derived from SRI adoption on women and men; and (f) the linkages to external conditions such as development, nature of social organization and labor markets with SRI adoption, and the implications of this relationship on household gender relations.

The study proceeded in four steps: first, qualitative interviews in the provinces of Kandal and Kampong Chhnang, initially selected for these provinces' high incidence of SRI adoption; second, large-sample SRI farmers' snowball surveys in selected villages in these provinces; third, a CEDAC program-wide survey of randomly selected 643 SRI farmer respondents; and fourth, relating field data with documentary information, official statistics, and relevant studies. The second and third stages of the research were intended to test the pervasiveness of the earlier farmers' responses in the first phase to a wider sample population. The fourth stage served the purpose of triangulation and information gathering for the broader meso and macro socio-economic changes and government initiatives.

The fundamental premise of this study rests on a holistic view that agriculture in Cambodia is embedded within a changing social and economic landscape that influences the extent, processes, and outcomes of SRI adoption by female and male farmers in the sites under study. Indeed, there are secular drifts at work in the broader context beyond the household and the village, which impinge on SRI program results, and thereby influence gender relations.

Agriculture is generally rainfed and farmers produce only one crop yearly. Support from the national government to the agriculture sector remains weak and favors strengthening the industrial and services sectors in urban areas. Landholdings in the sites under study are generally short of one hectare, thus for most farmers, rice farming is much more a subsistence crop than a commercial crop. Those who have adopted SRI methods report an average of about 50% increase of rice yield per harvest compared with conventional farming, and which increases household levels of rice sufficiency. Concurrently, people engage in agriculture together with other growing livelihood and employment opportunities in urban and peri-urban areas in Cambodia. The study reveals that men across all ages are increasingly working in non-farm occupations beyond their villages, while young women are working in garment factories in Phnom Penh and in provincial towns. In recent years, livelihoods have diversified into a multiple portfolio of income sources that crosscut rural and urban divides, create a hierarchy of income gains from different types and locations of

labor employment, and structure gender-specific labor markets. The rate of engagement in the urban economy and livelihood diversification by rural households are highest in provinces geographically closest to Phnom Penh. In the face of greater mobility of rural peoples and expanding non-farm opportunities, older, married women beginning in their 30s and over have instead become a sedentary presence in the rural villages. They continue to do farming, and it is not at all surprising that they are the recipients of SRI training by CEDAC and other extension agents.

Historically, female and male farmers share many of the tasks in conventional rice farming. Men, however, generally perform land preparation tasks, while seedling preparation and weeding are commonly assigned to women. All others – harvesting, uprooting, transplanting – were generally shared tasks. These divisions of labor have not significantly changed with the adoption of SRI methods, although there is indication that transplanting and uprooting are being increasingly left to older women farmers with lesser assistance from male farmers. The study also shows that the volume and heavy labor components of uprooting and seedling preparation have lightened, and as a result, have provided women more time for domestic work, paid work on other farms and backyard livelihoods. On the other hand, for men, land preparation tasks have become more intensive due to more meticulous seedbed preparation tasks, while weeding has also taken up more time from women.

Female adopters reported that the savings from purchasing seeds and fertilizers was a chief benefit they derived from practicing SRI farming, while both female and male adopters agreed that higher yields, lesser labor inputs in transplanting and the reduction of risk in crop failure in view of longer dry periods were other noteworthy benefits. Adopters, however, also cited more weeding, heavier land preparation tasks and more complicated water management and transplanting procedures as the downside of SRI farming. Some female heads of households are particularly disadvantaged since they have weaker access to male labor for land preparation and rely heavily on reciprocal exchange labor arrangements in farming. These arrangements do not always guarantee an exchange labor party of knowledgeable farm co-workers in SRI methods.

The decision to adopt SRI farming was less contentious between women and men contrary to earlier expectations. Most female adopters reported that their husbands supported their decision to adopt the new technology. Some early adopters were able to convince skeptical spouses through the evidence of higher rice yields. In other cases, husbands seemed to care less about farming in general, including SRI, most likely due to improved incomes that were coming from non-farm occupations.

Farmer promoters and, to a lesser extent, CEDAC extension agents trained the farmers – mostly women – on the 12 steps of SRI farming bundling the courses with skill training for backyard livelihoods such as aquaculture, poultry and vegetable gardening. Creating savings groups and training for backyard livelihoods have served as effective pathways for recruitment and enrollment of women into SRI farming since they resonate with feminine ascriptions of household income management and feminine identity in the villages. These enterprises provide immediate cash incomes to the older women, which are important since rice farming is still primarily a non-commercial activity for many farmers. SRI farming combined with these enterprises

also serve a status-enhancing function for the women since apart from being income earners, some have become SRI farmer promoters to other villages.

They are, however, exercising this autonomy within a domain that seems to be increasingly residualized vis-à-vis the changing livelihood patterns of rural populations in Cambodia and in many parts of Southeast Asia, where the agriculture sector provides a broad basis for support for industrial growth and urbanization by providing cheap migrant labor, food and social reproduction. CEDAC, for its part, has indeed enjoined women into its SRI agricultural productivity program, but has not explicitly addressed gender and power issues in SRI farming and livelihoods, in the wider social and economic environment, and in people's personal lives.

In view of the current lack of government support to agriculture and the emergence of other cash-generating non-farm livelihoods, farming currently serves as a 'food security safety net' that allows for household members to pursue other livelihoods beyond agriculture. Potentially, rural villagers may also retreat to farming when non farm livelihoods contract, or when cash incomes cannot cope with rising food and rice prices. Farming has become a refuge for highly mobile, migrant rural labor, and being such, has acquired a feminine face. It is therefore not surprising that it is left in the dutiful care of mothers and older women, a process akin to 'housewifization,' or which is often referred to as the 'feminization of agriculture.'

It is instructive, therefore, to juxtapose older farm women's situation against this backdrop of a stagnant agriculture sector and its dimming prospects for invigoration, and to find ways and means with which the empowering gains of women SRI farmer adopters can be expanded.

That said, the following are recommendations of the study for Oxfam America's policy and programming :

1. Build on and raise greater gender awareness in current local formations such as savings groups to expand and transform them into vehicles for the political self-organization of women to strengthen their claim-making capacities. Strengthened claim-making capacities will enable farmwomen to
 - a. engage with local authorities and NGOs to provide more infrastructural and technical support to agriculture such as irrigation and market facilities;
 - b. engage with men and raise their awareness about the need to jointly share in reproductive care activities in the household;
 - c. explore possibilities for viable extra-village enterprises that will enable women to expand their earning opportunities;
 - d. address relevant gender issues and redress inequities at the family and community levels, and especially address the livelihood and farming needs of women from female headed households.
2. In view of heightened livelihood diversification, SRI farming should not be

promoted in rural areas in a uniform way. It will be useful to conduct a mapping exercise to identify and prioritize villages or provincial districts where SRI farming can truly be more value-adding in terms of (i) enhancing food security, (ii) increasing gender equality, (iii) environmental sustainability and (iv) income-generation. These should be places where rural male and female labor is still highly devoted to farming, and relatively least channeled into urban livelihood activities. Promoting SRI farming in places where rural labor is strongly absorbed by non farm and urban employment could address food security needs, but with no expectation that farming will intensify or further expand under the present circumstances of weak state support for the agriculture sector.

3. Build on current knowledge and skills in SRI farming and integrate these with water management and resilience building especially in view of increasing drought and flooding brought about by environmental and climate changes. Ensure that both women and men equally engage in these activities.
4. Capacity building for SRI in villages should not be a stand-alone program. Instead, a basket of farm and non farm livelihood projects could offer resource building tools and trainings for rural women and men on SRI farming, employment rights and entitlements, entrepreneurial skills and other relevant trainings that may be custom-designed based on the local livelihood context. An inter-agency network of organizations can provide a multiple livelihood enhancement program, where each organization could contribute its particular competencies. Components of this program should be based on an analysis of effective demand for labor, products and gender configuration of workloads, knowledge and time, in an area-wide assessment of the local economy and changing livelihood patterns.
5. Increase the capacity of CEDAC for gender analysis and gender-responsive programming through gender awareness raising and gender mainstreaming skills enhancement.

Other recommendations for organizations engaged in rural development in Cambodia:

1. Greater engagement with national policy actors to strengthen infrastructure and technical development in agriculture for a more geographically and socially equitable development that places priority in gender equity and human well-being for those living in both rural and urban areas of the country.
2. Capacity building and awareness-raising programs on urban employment conditions to ensure that those who engage in non-farm employment can make gender-fair claims to security of tenure and fair wages.
3. Gender-awareness raising and gender mainstreaming skills training among agricultural government extension agents.

A. Background to the Study

Oxfam America (OA) is a private, non-governmental organization dedicated to finding lasting solutions to global poverty, hunger and social injustice. OA has worked in East Asia for over 30 years. Oxfam America's vision for East Asia is for a region where the increasing prosperity is shared equitably without discrimination and people affected by poverty and injustices have full opportunity to realize their rights to a just and secure life.

Building on years of experience working in the Lower Mekong Basin (LMB), OA is developing a new program, Livelihood and Income Security (LIS), which aims to improve the livelihoods of many small-scale farming communities in the Mekong Region. This security is strengthened through building their assets, increasing their access to resources and markets, and improved incentives. OA believes that the causes of poverty are rooted in the structure of economic and social relations, including gender relations.

Oxfam America is committed to a vision of the world in which women and men can participate fully in their own development, are recognized for their contributions, and share equally in the benefits.

Through the LIS program Oxfam America is supporting the adoption of a System of Rice Intensification (SRI) as an alternative strategy for increasing productivity and income of small-scale farmers in Cambodia. By changing the management of plants, soil, water and nutrients to follow the SRI methodology farmers have been able to increase their yields without purchasing high-yielding seed varieties and through decreasing use of chemical fertilizers and pesticides. Because the methodology implies significant changes to conventional rice production methods, Oxfam America seeks to understand the impacts of a shift to SRI from a gender perspective. Evaluations of SRI in Cambodia to date have primarily focused on monitoring the adaptation of the package of SRI techniques and measuring rice yields in areas under SRI cultivation. As interest in and promotion of SRI in the LMB is increasing and expanding it is essential to have better knowledge on the social aspects of production, including gender specifically. It is in this light that the study was commissioned.

Research Objectives

The primary objective of the study is to provide OA with a thorough understanding of the implications of a shift to SRI on the gender relations, for this critical knowledge to be used in program design and strategy development.

More specifically, the study should:

1. deliver baseline knowledge for the SRI component of the LIS program;
2. assess the intended or unintended impacts of the SRI component of the LIS program on gender relations

Research Questions:

The research will have to focus on the analysis of:

- the gender relations where SRI is employed;
- the effects of the introduction of the SRI on the gender relations so far;
- the institutional environment and the gender capacity of institutions at the local; societal and national levels;
- the possible effects of the introduction and further development of SRI, and the conditions to gender-integrated program improvement; *and*
- the implications for the further LIS programming in the different affected areas and countries where the program is expanding.

The gender analysis and impact assessment should take account of the gender roles and the division of labor, the access to and control over resources and income, and the participation in decision-making and institutions (in quantitative and qualitative terms) in the local communities and the society at large. The research questions addressed in this study include:

1. What are the roles of men and women (and boys and girls) in Cambodia in both conventional and SRI rice production? What were the specifics of rice production in the localities where SRI has been introduced, in the years prior to introduction? This gender analysis will identify the gender roles and responsibilities, indicate how different household members devote to different tasks (and why), and show how these tasks change according to the season, time of day and the rice production methodology.

2. How does SRI affect the quality (i.e. type of labour and technology utilized) of labour inputs of men and women? How do changes in the systems and relationships in production affect women and men?
3. What agricultural resources, technical knowledge and support services (credit, extension services and training) do women and men have access to? How much access to critical productive resources and services do women and men have?
4. At the household level, who decided to adopt SRI (men, women, together)? At the community level, who plays a significant role in SRI promotion? What are the gender differences in preferences, needs and criteria in determining whether or not to invest in SRI? And, how does this affect whether and how men and women engage in SRI? Are there any conflicts in the household or community? If so, how are they resolved?
5. Evidence suggests that SRI methods usually reduce the costs of production resulting in greater net returns for farmers. How are the additional resources available utilized? Who has access to and control over these resources? How does this affect gender relationships within the household and community?
6. Studies have also found external factors related to human development, including social organization, labor markets, self esteem, degree of agency felt by participants, development of transferable skills, educational opportunities, climate and environmental changes, etc., associated with the adoption of the SRI methodology. How are these externalities different for men and women? What are the implications of these externalities for intra-household gender relations in Cambodia?

B. Literature Review

The purpose of this review is to present the general landscape of debates and issues on the System of Rice Intensification (SRI), and in particular to make the connections with gender as a lens with which to view the differential response and impact of SRI adoption on farmers' lives. The first part of this review will discuss salient but general debates in the literature regarding the adoption of SRI, taking Cambodia as a case study where SRI has been adopted. The second part of the review will discuss gender issues in rice agriculture in the literature and at the same time, locate gender and agriculture in the wider changes taking place in a developing country like Cambodia. This review is related to the gender-impact research that we are currently undertaking among SRI adopters who have been trained by the Center for Studies for Development of Agriculture in Cambodia (CEDAC) since 2000.

Debates in the SRI Literature: Yields, Labor and Adoption

The System of Rice Intensification (SRI) has been introduced as an alternative system for growing rice that was developed in Madagascar in the early 1980s by a Jesuit priest, Fr Henri de Laulanie, who worked with Malagasy farmers to increase rice production. It is now being propagated by a Malagasy NGO, Association of Tefy Saina and scientifically promoted by the Cornell International Institute for Food, Agriculture and Development (CIIFAD) in Ithaca, New York, USA.

SRI is essentially a soil and plant management system of growing rice that aims to release the plant's natural potential through a set of farming practices. The management principles underlying SRI are as follows (Anthofer, 2004a):

- Rice is not an aquatic plant;
- Rice seedlings lose much of their growth potential if transplanted more than 15 days after emergence;
- The transplanting shock from uprooting the seedlings in the nursery to transplanting in the field should be minimized;
- Wide plant spacing leads to enhanced root growth and accompanying tillering;
- Soil aeration and organic matter creates beneficial conditions for plant root growth and subsequent plant vigor and health.

The preceding principles translate into a set of practices that could be applied to local conditions and environments (Ibid):

- Transplanting of young seedlings, preferably 8-12 days old and not older than 15 days;
- Selection of only strong seedlings for transplanting;
- Transplanting the seedlings after uprooting without delay, preferably within 30 min;
- Seedbed at transplanting should be moist but not flooded;
- Shallow transplanting depth, preferably 1-2 cm deep in the soil;
- Transplanting of 1-2 seedlings per hill;
- Wider spacing with 25x25 cm to 50x50 cm apart;
- Planting in square pattern or at least in rows to facilitate weeding;
- Alternate flooding and drying of the field during vegetative growth;
- Early and frequent mechanical weeding to control weeds and to aerate the soil;
- Add nutrients to the soil, preferably in organic form such as compost or mulch.

The benefits from SRI have been said to be many: higher yields, lesser reliance on inputs, firmer root growth, opportunities for water saving, more tillers per plant and higher quality grain.

Recent assessments of SRI farmer adoption in Cambodia have demonstrated an increase in yields from 1629 kg per hectare with conventional practices to 2289 kg per hectare with SRI, which is an increase of 660 kg per hectare or 41% (Anthofer, 2004 a/b). Another study found that Cambodian farmers cooperating with CEDAC have generated 6-8 tons per hectare with SRI against Cambodian average yields of about 1.7 tons per hectare (Uphoff, 2002). CEDAC researchers themselves declare SRI average yields of 2.75 tons per hectare compared with 1.34 tons per hectare with conventional rice farming methods (Tech, 2004).¹

Doubt however continues to be cast on the reported increased yields of SRI. In one

¹ A summary table of 13 countries where farmers have adopted SRI reports increased yields (Uphoff, 2007)

report, scholars claim that relevant data concerning cultivar, experimental design, statistical errors, dates of planting and harvesting, soil types, fertilizer inputs, weed control, disease control, insect control, water management and the weather are absent (Sheehy et al, 2004a). In another report, results in three locations in China comparing yields in conventional and SRI management systems implied that SRI has no inherent advantage over the conventional system and that reports of extraordinarily high yields are likely to be consequences of error (Sheehy et al, 2004b). Doberman (2003), on the other hand, concedes that SRI may serve the purpose of resource-poor farmers who work with poor soils by shifting from permanent paddy flooding to intermittent irrigation. However, this is unlikely to improve rice production in intensive rice cropping systems on more favorable soils.

Labor is one other contentious point in the debates on SRI adoption. In their study of Malagasy farmers, Moser and Barrett (2002; 2006) have found that there was a low rate of adoption despite savings on inputs and double or triple yields albeit from a low base (average of 2 tons/ha or less). Low adoption was found to be due to the intense labor effort that SRI seems to require at just the time farmers must go work on others' fields for wages. The opportunity cost of labor was simply too high for farmers to adopt SRI methods. Adoption constraints range from opportunity costs due to heavier labor inputs in weeding and unreliable skills in water and soil management.

Finally, there is some evidence that well-off farmers adopt and benefit more from SRI adoption since they are the least risk-averse and are often target beneficiaries of extension activities compared with poorer farmers (Anthofer, 2004a; Uphoff, 2007).

Studies and debates on the efficacy, adoption dynamics and productivity of SRI have largely been done based on a quantitative-positivist tradition of research. These have either isolated a factor of production as the unit of analysis (i.e. labor inputs in rice farming) or have studied atomized households or individual farmers engaged in SRI or conventional methods, and through statistical aggregation, have described or inferred patterns. Most of these studies lack a wider-system and contextual perspective, and sensitivity to broader change processes. In these studies of SRI adoption processes, farming households and men and women farmers have too often been de-contextualized and isolated from the broader conditions and trends of a

changing rural economy. For instance, debates among scientists and advocates on the efficacy, adoption dynamics and productivity of SRI, little has been said or written on SRI adoption in the context of present levels of livelihood diversification², as well as how this is taking shape in the context of wider changes in Cambodia. Further, from a livelihood diversification process perspective, virtually nothing has also been said on the differential impact of SRI adoption on women and men farmers. To redress this gap, this review therefore aims to locate and discuss the adoption of SRI within the wider socio-economic template of Cambodia's changing agrarian sector and rural livelihoods – and to conceptually explore how gender as a differentiating factor can potentially explain and reveal the extent, benefits or shortcomings, and limits of SRI adoption for farmers and crop production in general.

SRI Adoption, Livelihoods Diversification and Gender in Changing Cambodia

The adoption of SRI – its related labor processes, technical requirements, the extent of its productivity and impact – can be more holistically understood in terms of people's livelihood options. A livelihood comprises assets, the activities and the access to these (mediated by social relations and institutions) that together determine the living gained by the individual or the household (Ellis, 2000: 10). Livelihood strategies are the ways that household members mobilize material, human and social resources to meet their needs, which include subsistence production, self-employment, and wage labor (Kabeer and Tran Thi Van Anh, 2002). These strategies may involve employment of new technology in farming. However, not all rural households and farmers have equal access to assets and opportunities, engage in the same activities or experience the same livelihood outcomes. Gender is one major and useful category to unravel the differential aspects and impacts of adopting a new farming technology such as SRI.

The term *gender* refers to the socially constituted roles, resources and responsibilities of men and women as they relate to one another. Scott (1988) points out that gender organizes all of social life according to some notion of sexual difference; and that female and male identities are socially and culturally constituted. Thus, notions about gender influence on resource use such as in agriculture, meaning, that there are

² The studies of Moser and Barrett (2002, 2006) however come closest as the studies that have investigated SRI adoption vis-à-vis off-farm waged work.

specific ideas about what constitutes female and male farm work. These roles are not naturally given but are socially constituted, vary across different times and places according to changing values, practices and technologies. Scott (1988) also points out gender is a primary way of signifying relationships of power. This can refer to the way agricultural work is *organized* – that is, enacting concrete divisions of labor between women and men, which constitutes a hierarchy of valuation ascribed to female and male work in agriculture. Such a hierarchy is used to reinforce or weaken the various positions of women and men and to assign uneven values to women and men's work in agriculture (Mohanty, 1988: 76; van Halsema, 1991: 128-129).

Important gender differences may exist in the crops grown by women and men and/or the purposes for which the crops are used. Men may be more involved with producing cash crops and women food crops for home consumption; if these are different crops then choices for research and extension focus will impact differently on women and men.

These observations draw attention to issues of farm activity and labor (who does what?); issues of access (which resources are utilized?); and control (who has the authority to decide over the use and disposal of resources and assets?) (Li, 1993). Leach (1992) has developed an approach that unpacks differences and divisions in activities, responsibilities and rights in processes of resource management and use in a detailed manner (Leach, 1991; Leach, Joeke and Green, 1995). This approach ('micro-political economy of gendered resource use') helps identify differences not only between women and men – but also among women and among men. Within farming, for example, we can look at differences and divisions between distinct social groups (aside from women and men) such as between age groups or between different classes of rural households, patrons, landlords and clients or tenants. Divisions include those of work, responsibility, knowledge, and rights to use and decide the use of resources and farm products. We can then look at how divided interests and activities come together in relations: both between people, and between different aspects of farm production.

Crop production covers a wide range of activities from the decision making process of what to grow where, seed selection, cultivation practices and pest control, harvesting,

water levels and draining, processing and storage. There is a complex interaction of gender roles, responsibilities, access and control issues which need to be analyzed before the potential impact of development interactions can be understood. An interesting phenomenon is that of female heads of households (FHHs), which has been popularly referred to as being the 'poorest of the poor.' While caution is rightfully being warned at homogenizing all FHHs as a distinct vulnerable group (Chant, 2004), analysis of FHHs vis-à-vis livelihood opportunities could reveal important issues on the nature of choice and adoption of particular farm technologies as influenced by labor deficiencies and other institutional factors.

Access and control of new technology can affect gender relations if men are automatically selected as the people to contact or train. For example distribution of new varieties of crops, introduction of new crops, mechanization of crop cultivation or processing, use and application of fertilizers should involve women as well as men in order to provide them with equal livelihood opportunities. One of the lessons of the Green Revolution was the gender blindness of extension activities that trained farmers in farm mechanization and the use of new seed varieties, which displaced women in specific activities such as milling and winnowing from which they earned incomes as agricultural workers.

Access to resources such as irrigation facilities, land and new seeds does not only ensure positive livelihood outcomes. Apart from these, rural women, for instance, need transparent market prices and trustworthy traders to sell their products to. Exploitative male moneylenders and traders may curtail profitability of trade for these women. Thus social relations and institutions beyond the household portfolio of assets influence the security and sustainability of livelihoods.

Further, farmers make crucial decisions on the use and management of the resource base – land, water, forests – over time. Management decisions also depend on the repertoire of skills, implements and time of the male or female farmers. Research shows that male farmers seem to make the major farm decisions and control over productive resources (Rahman, 2008). There may be many different livelihood options taken by farmers that do not involve resource conservation and intensification of production at all (Blaikie and Brookfield, 1987; Jackson, 1993; Green, Joekes and

Leach, 1998) which nonetheless affect the benefits they derive from these livelihoods. Emerging research on decision-making over livelihoods somewhat depart from Ellis' (2000) view that farmers usually tap existing assets (human, social, financial, physical and natural) to support their livelihood strategies. Instead, farmers are known to behave intentionally or unintentionally with regards to livelihood options, where their actions are usually based on past experiences with a particular seed variety, technology or farming activity than on a vision of the future. This is now being referred to as 'livelihood pathways,' which involves an iterative process of making decisions on goals, preferences, resources and means that are constantly being reassessed in light of conditions with which the decision maker is confronted; which may have not been intrinsically planned in rational fashion; and will depend on the life history, political position, social networks and socio-cultural elements (de Haan and Zoomers, 2005; de Bruijn, et al, 2005). Pathways are also differentiated and will not be the same for women and men of different generations.

Farmers engage in multiple livelihoods and are relying less and less on farming as their only means to make a living, diversifying thus into other farm or non-farm activities. Diversification and adopting multiple livelihood strategies are not simply determined by and offshoots of rational intentionality and decision making capacity of individual farmers and households. Rather, they are directly related to opportunities, incentives and enablements being continually opened and conditioned by a complex of broader, extra-household and supra-village forces such as, for example, urbanization and developments in the service, commercial, and manufacturing sectors in the wider economy. Thus, understanding multiple livelihoods of farmers – and their gendered nature – also requires exploring the dynamics of broader forces conditioning them.

Livelihood diversification refers to attempts by individuals and households to find new ways to raise incomes and reduce environmental risk, which differ sharply by the degree of freedom of choice (to diversify or not), and the reversibility of the outcome. Livelihood diversification includes both on- and off-farm activities which are undertaken to generate income additional to that from the main household agricultural activities, via the production of other agricultural and non-agricultural goods and services, the sale of waged labor, or self-employment in small firms, and other

strategies undertaken to spread risk; included in this are what has been termed 'activity or environment diversification' in agriculture (Carter 1997), or more radical migratory strategies (Stark and Levhari, 1982). Ellis (2000) defines livelihood diversification as 'the process by which rural families construct a diverse portfolio of activities and social support capabilities in their struggle for survival and in order to improve their standards of living.' Kabeer and Tran Thi Van Anh (2002) adds to the discussion on livelihoods diversification by referring to the expansion to livelihoods into off-farm activities and away from a reliance on farming as the sole primary means of livelihood. Emerging research, however, depart from an exclusively productivist view of livelihoods and livelihoods diversification as including aspirations, negotiation and resistance, cultural change and contestation that show 'genderscapes,' or nuanced patterns and layers of resource management that involve more complex gender relations (Krishna, 2004).

To more fully comprehend the dynamics of livelihoods, gender and SRI adoption, it is useful to present the wider context of the changing rural economy of Cambodia.

Agriculture is central to the economy of the Cambodian household. The sector contributes 45% of GDP: about 25% represents the production of crops and 20% the value-added of livestock, fishing and forestry activities (World Bank, 1997). There has been a significant decline in paddy area from 2.5 million hectares in 1976 to 1.9 million today. However most of the 90% of Cambodia's rural households continue to cultivate rice in one form or another: over 85% of land under cultivation is lowland ricefields (Turton, 2000).

Cambodia continues to produce the lowest average rice yields in the region at 1.3 tons/hectare, compared with 3.2 tons/hectare in Vietnam, and 2.1 tons/hectare in Thailand (Hughes, 2003). Although farm sizes vary across Cambodia, the average farming household cultivated about 1.4 ha of rice land in 2000-2001 (McKinney and Prom Tola, 2002). Low rice productivity is largely due to small landholdings, rainfed farming and that most land in Cambodia is single-cropped where only 23% of agricultural land is actually irrigated. Low capital inputs such as draft animals and access to fertilizers, as well as lack of water control, exacerbate the problem. In many villages, the need to hire out their labor to raise cash for food in the rainy season

curtailed their chances of boosting their rice yields (Turton, 2000).

Agricultural development has been a central focus of many donor efforts: the solution to rural Cambodia's rural poverty problems is often assumed to be through improvements in rice productivity. McAndrew (1998), however, argues that the key livelihood security issue is not rice productivity but rice self-sufficiency as rural households generally rely on a diverse range of activities to increase food security.

According to an inter-agency study, women make up more than half of the agricultural workforce in Cambodia; hence, efforts to increase productivity will need to be both gender-sensitive and gender-responsive. In rural areas only 4 percent of women and 10 percent of men are in waged employment. The formal sector is only able to absorb approximately 5 percent of the total workforce. Of the 250,000 new workers joining the labor force each year, 94 percent must rely on the informal sector, primarily subsistence agriculture, where productivity and earnings are low. Given the high fertility rates in rural areas and the future exponential growth of the population, there is a concern about the limited availability and productivity of land and the implications for the livelihoods of future generations (UNIFEM, WB, ADB, UNDP and DFID/UK, 2004).

When examining rural livelihoods in Cambodia, it is important to look beyond the traditional area of rice production as McAndrew (1998) hints at earlier. The cultivation of rice and other crops employs rural people for an average of four to five months, less than half the year, and provides only about one-third of their total income. Farmers sell their produce to traders or millers. The small scale and fragmented family production system leads to low bargaining power and thus low farm gate prices. They supplement their subsistence and incomes by fishing, gathering a range of food and non-food items, entrepreneurial activity and seasonal waged labor (Acharya et al., 2003; Beresford et al. 2003) and increasingly, work in nearby towns and in the city of Phnom Penh.

Under these conditions, the extent of adoption of SRI is largely contingent on the capacities, time and opportunities of rural women and men to secure food through diversifying their farming and livelihood activities as Moser and Barrett (2002, 2006)

found in Madagascar. A likely scenario may find people weighing the tradeoffs between achieving higher rice yields with other opportunities for incomes. Within the internally-differentiated unit of the household, women and men of different generations may have to deploy their labor and time towards multi-local livelihoods and link up with emerging gender- and age-specific opportunities beyond their villages. It is also worthwhile to note that landholding sizes are not too huge in rural Cambodia in order to confine household labor in the villages.

In a study on food security in three study villages, Murshid (1998) concludes that rice accounts for 80–84% of calorie intake but that food security unsurprisingly depended not on production but on the power to obtain food. He notes the dependence of significant proportions of people on the market for supplies of basic food. Generating cash incomes and secure access to food sources were paramount considerations for rural households to survive. Murshid’s study conducted in villages in the three provinces in Table 1 below reveals the uneven importance villagers place on agriculture:

Table 1: Relative Importance of Household Income Sources (%)

Source	Prey Veng	Kampong Speu	Kandal
Hunting/gathering	14	10	18
Non-agriculture	15	45	50
Agriculture	42	13	13
Home gardens	9	3	6

Murshid, 1998

From the study above, clearly, the rural villagers under study explore non-farm sources of income and food.

The adoption of SRI should therefore be examined in the context of non-farm livelihoods including daily and seasonal mobility of rural villagers to nearby towns and the city of Phnom Penh in order to raise incomes to improve food security of rural households.

The apparent changes and trends in rural livelihoods in Cambodia are by no means a

distinctive national phenomenon. Rural Cambodia today is reflecting no less what scholars have noted about the changing peasantry of much of Asia: the economic, social and political pressures and opportunities that have befallen them have led them to diversify into a number of occupations and non-agricultural income-earning terrains such as straddling urban and rural residences and flooding emerging labor markets (Bryceson, Kay and Mooij, 2000; Elson, 1997). Farming is in the process of losing its resonance as emerging patterns of change in the countryside where the current trend towards pluriactivity is likely to be replaced by a mixed landscape of agrarian entrepreneurs, neo-peasants and remnant smallholders (Rigg, 2005).

The adoption of SRI in selected provinces in Cambodia will necessarily be affected by the flux and changing nature of the countryside where increasing mobility of women and men into multiple livelihoods intersect with a smallholder, largely subsistence-based, form of agriculture that continues to exist under policies that generally favor export industrialization over rural development. The wider study that this review is intrinsically part of will necessarily have to investigate SRI against such a social and economic template, together with the gender-related dynamics and ramifications that shape its adoption and impacts.

C. Methodology

The research employed a mixed-methods approach, combining qualitative and quantitative methods in data gathering and analyses in the following two subject components of this report: (1) impact of SRI agriculture on gender relations; and (2) program implementation process.

This evaluation study comprises a two-stage data gathering and analysis process.

The first stage employed a two-case case study approach, which is a comparative study of two sets of villages in two districts: A district in Kandal Province, which is more urbanized and adjacent to the capital city, Phnom Penh; the other in Kampong Chhnang Province, which is less urbanized and farther from the capital city. The research sites during this stage are the villages of Chung Ruk, Ou, and Beng in AngSnoul District, Kandal Province as one set; and the villages of Tropang Kor and Orung in Kampong Chhnang Province, as the other set.

The second stage is a program-wide random survey using a probability proportionate size (PPS) sampling based on clustering per province where CEDAC has conducted SRI training and formed groups of farmer adopters. The respondents for this survey were stratified according to gender. This survey has a total sample size of 648 respondents (equally divided between male and female respondents) distributed in the following provinces: Kandal (182); Kampong Cham (44); Kampong Chhnang (170); Kampong Speu (176); Kampong Thon (74); and, Kampong Pusat (2). Out of this total, 643 survey responses are valid.

The research team consulted with CEDAC staff on two separate occasions: first, on an initial introductory meeting that discussed the SRI program and the extent of its implementation in Cambodia. The second, as the research team began to prepare for the program-wide survey during the second stage of the research.

The first stage two-case study approach involved ocular visits in the five villages and conducting qualitative interviews. The research team conducted a total of 14 focus group interviews in the selected villages of Kampong Chhnang and Kandal. Each

focus group interview ranged between five to ten participants. These focus group interviews were conducted with mixed groups of women and men farmers who were adopters and non-adopters of SRI, as well as women-only SRI farmer adopters. Thirty-two individual in-depth interviews were also conducted with female and male adopters in these same villages. Further, a purposive sampling survey was conducted with 57 SRI adopters as respondents in the selected villages of Kandal, and 64 SRI adopters in the selected villages of Kampong Chhnang.

The case study approach employed in the first stage provided the initial explorations into the key issues and insights on implementation and gender-specific impacts of the SRI program. This approach had identified and confirmed important pathways of analysis to be pursued and important variables that the subsequent program-wide survey would have to consider as part of its template. Information and initial reflections culled from this first stage of research were indeed key to the design of the program-wide random survey in the second stage. Additionally, the comparative approach enabled the researchers to closely study the relative effects of differential urbanization patterns on local farming, cash incomes, labor mobility, livelihood strategies of local people and their gender dimensions.

In the second stage the program-wide survey quantified and measured the pervasiveness of certain patterns and characteristics discovered among SRI adopters in the five villages during the first stage. In the second stage, the sampling population was proportionate to the number of CEDAC's population of SRI adopters in provinces throughout the country. The randomness of the selection of respondents selection was ensured by pre-identifying the names of target respondents and their alternates in a province, both chosen through the use of random number table.

In the writing up this report, the team conducted a document review of official policy texts and secondary records, particularly in verifying and clarifying broader economic, social, demographic and infrastructural changes in Cambodia, and specifically in Kandal and Kampong Chhnang Provinces and their districts. These secondary data records served to triangulate primary data gathered at the household and village levels.

D. Findings of the Study

1. Brief History of CEDAC's SRI Adoption Program in Cambodia

The System of Rice Intensification (SRI) is an innovative rice cultivation method synthesized in Madagascar in the 1980s. It was introduced in Cambodia by CEDAC, a national NGO, in 1999. In that year field experimentation started with 28 farmers participating. According to the organization³, since then the number of adopters have increased to around 60,000 farmers. In the same year, SRI was incorporated in the National Development Plan of Cambodia (2006-2010). Its further adoption and promotion therefore have been carried out to date by both non-government and government organizations. CEDAC estimates that up to June 2007, the organization had 65,000 SRI farmer households in 1,827 villages in 15 provinces of Cambodia⁴.

A set of 12 principles or 'steps' of rice farming serves as the reference point in SRI adoption as promoted by CEDAC. These are the following:

- Smooth seedbed preparation
- Seed selection
- Moist and smooth seedbed transplantation
- Strong seedling selection
- Young seedling transplantation
- Single seedling transplantation
- Shallow transplantation
- Transplantation in square pattern
- Wider spacing of rice seedlings
- Alternative flooding and drying of paddy
- Weeding
- Application of nutrients (especially in organic form) to soil

³ Koma, Yang. "Experience with System of Rice Intensification (SRI) in Cambodia from 2000-2007" (undated). Another more recent document (CEDAC 2008) puts the figure higher – over 100,000 rice farmers from approximately 3,000 villages in Cambodia are adopting SRI practices.

⁴ Suon Seng, "Impact Assessment of CEDAC's Rural Development Program" (undated).

Defining an SRI adopter from a non-SRI adopter is, however, not straightforward. CEDAC does not strictly define the boundary between SRI adopters and non-SRI adopters. Based on its recent evaluation document, CEDAC acknowledges that SRI is first and foremost farmer-defined, with reference to the twelve aforementioned steps. Thus, most farmers define SRI methods based on the applications of *some* of the 12 steps. The CEDAC study estimates that on average, adopters practice three to twelve steps. The three most practiced steps are: (1) use of young seedling; (2) transplantation in a square pattern; (3) smooth and moist seedbed transplantation. Isolating these three as the hallmark of SRI adoption, however, is not without disagreements among farmers and CEDAC's extension agents. Rather than be bogged down by the need to officially define SRI adopters, this study examines actually existing practices of farmers as the starting point of analysis.

Four previous evaluation studies – three by CEDAC and one by GTZ – conducted in the period between 2003 and 2008, invariably point to the yield increase and income benefits of farmers adopting SRI. These are the following:

- CEDAC's monitoring of 120 farmers in 2003, showed that with SRI methods, rice yields on average rose from 2.75 t/ha, compared to 1.34 t/ha in the conventional methods⁵.
- CEDAC study in early 2007, which interviewed a total of 2,304 farm-households that have cooperated with the organization, found out that among the SRI users (25% of the total) who have applied the techniques in most of their fields, household rice production increased by around 110 percent on the average⁶.
- CEDAC study⁷ conducted in November 2007 to March 2008 involving 640 sample households -- 348 SRI-adopting and 292 SRI non-adopting farmers -- found that last season, SRI-adopters on the average got 2,196 kg per hectare, or 17% higher than SRI non-adopting households. The study further concludes that particularly in Kompot Province (with 174 total farmer

⁵ Koma, Yang. "Experiences with System of Rice Intensification (SRI) in Cambodia 2000-2007 (undated)

⁶ Ibid

⁷ CEDAC, Evaluation Study. Adoption and Non-Adoption of System of Rice Intensification (SRI) in Cambodia (July 2008).

respondents), there is no remarkable difference between the adopters and non-adopter households, while in two other provinces (Kampong Speu and Takeo) the rice yield average gain were 29% and 22% respectively.

- An evaluation of the study⁸ conducted by GTZ in 2004 found that on average, yield increased by 41% (from 1,629 kg/ha in the conventional method to 2,289 kg/ha in SRI).

Our own finding based on interviews with three-year SRI adopting farmers is close to the 2008 study of CEDAC and the 2004 study of GTZ. About 75 percent of farmers had averaged less than 50% increase in yields on the same farm during the last three years of SRI adoption (see Figure 8). Moreover, similar to the studies cited above, our interviews also clearly point to the benefits of farmers by way of reduced fertilizer and pesticide inputs and expenses.

1.2 SRI-adoption and Non-adoption by farmers: Contrasting two analytical perspectives

In its latest evaluation (2008), CEDAC raises a quandary on why despite yield and cost benefits in SRI, farmers' adoption turned out to be unexpectedly slow. Further, while it cites positive improvements in assets of farmers conducting SRI, it cannot attribute these as outcome of the practice. Thus, the report in its Executive Summary states:

So far, SRI adopting farmers have better performed than non SRI adopting farmers both in term of absolute and in term of percentage. It is also indicated that SRI adopting farmers have better living standard than non-SRI adopting farmers. However, it is a present situation. We do not have data to explain how those SRI-adopters have become better over the last evolution. We cannot answer whether before project started SRI farmers were in a similar living standard as non-adopting farmers, or whether SRI adopting farmers have just become better since the collaborating with the project, or whether SRI adopting farmers have just become better since collaborating with the project, or whether project most attracts those who are living better in the communities (Ibid, 6).

While CEDAC's latest evaluation gathered very useful data on attributes of individual household adopters and non-adopters, it has confined its perspective and analysis to

⁸ Cited in Koma, op. cit.

the individualized system of household production, ostensibly overlooking the relationship of households' livelihood activities and strategies with broader pressures, forces and contexts. Yet, CEDAC's evaluation report could not totally ignore tallying extra-household economic activities with the differential responses of the adopters and the non-adopters. The report states, for instance, that “. . . majority of both SRI-adopting and SRI non-adopting households have their own business or petty trade or have members working in a garment factory. In general, the majority of rural households are involved in non-farming or self-employed jobs.” In addition, the report notes contrasting features in the profiles of SRI-adopters and non-SRI adopters, incidentally drawing attention to non-farm and economic opportunities beyond rural agriculture altogether. The report notes that non-SRI adopters have non-farm activities as their main economic activities and they take less interest in farming. On the other hand, SRI adopters have rice farming as their main economic activity.

However, in the end the lack of a broader analytical perspective, which takes into consideration extra household and meso-level economic and demographic transitions and other developments, constrained the report from interpreting these particular data and information further and to relate them to the issue of farmers' context and propensity to adopt SRI or not.

We argue that understanding farmers' patterns of livelihood activities and strategies, including farmers' behavior of SRI adoption or non-adoption, should be located in the broader political economy, and not confined to the study of yields and extent of farm production. We further argue that in understanding gender-differentiated livelihood activities and strategic changes adopted by members of households, including those related to adoption of SRI, broader structures and forces that influence and shape them should be seriously taken into account.

That said, we now proceed to discuss the extra-household and extra-village context and characteristics of livelihood activities, resources, and opportunities, which constitute farmers' gendered ways of making a living in multiple localities.

1.3 The broader context of transition and livelihoods in Kandal and Kampong Chhnang Provinces

(a) Cambodia's urbanization and economic transformation

Cambodia's urban population annual growth rate between 1998 and 2008 is 2.55 percent, much higher than its rural population growth rate of 1.30. The urban population grew from 2.03 million (or 17.6 percent of the country's total) in 1998 to 2.61 million or 19.5 percent of the country's total population in 2008. However, these nationally aggregated figures indicating urbanization do not fully reveal certain characteristics, such as: (a) that 60% of the total population of the country lives in six provinces located in the central plains and around the capital, Phnom Penh; (b) that there are a few strong urban growth poles that are attracting streams of migrants from the overwhelmingly rural provinces. There is an evident uneven, but significant process of urbanization, occurring in certain areas of the country in recent decades.

To illustrate, population density is very uneven in four natural regions: 22 persons per square kilometer in plateau and mountain region; 56, in coastal provinces; 64, in Tonle Sap; and 261, in the plains where Phnom Penh and another relatively urbanizing nearby province of Kandal are located. Kandal Province at present has a total population of 1.26 million, the third largest in the country, and also the rural province with the highest population density. It has been observed that the provinces of Phnom Penh and Kandal, particularly their urban areas, have been attracting a large number of younger women who take up jobs in garment factories (NIS 2008). In 1998, the provinces of Phnom Penh and Kandal registered the most number of migrants - 395,246 and 127,104 respectively in the whole country. Six years after (in 2004) Phnom Penh and Kandal also registered the most number of migrants - 363,429 and 152,862 respectively (NIS, 2006).

Although to date, Cambodia is still an agricultural country where 80.5 percent of the total population lives in the rural area, statistics throughout a 13-year period (1993-2005), show a declining percentage of population employed in agriculture. On the other hand, industry and services, which are urban-based or peri-urban-based activities have shown a steady rise in percentage growth (see Table 2, below). In formal sector employment, agriculture has been declining, from employing 40.1 percent of the population in 1993 to only 13.7 percent in 2005. Agriculture and

hunting, the largest segment in the sector, has accounted for the biggest decline. On the other hand, in informal sector employment in agriculture, the percentages have been clearly declining too, from 86.7 in 1993 to 69.3 in 2005. The decline of the whole agriculture sector has only been moderated by the increase in the share of the sub-sector of fishing, an employment segment that had recently received a boost due to the freeing of government restrictions of certain fishery areas for exploitation by the population. In the non-agricultural sectors, on the other hand, the most dynamic segments driving employment in the industry group forward are manufacturing and construction; in the service sector, trade and transportation.

Table 2: Percentage of Formal and Informal Sector Employment, by Major Economic Sectors

Major Sectors	Formal/Informal	1993	1996	1999	2002	2005
Agriculture	Formal Sector	40.1	37.3	30.3	20.5	13.7
	Informal Sector	86.7	86.5	85.3	76.5	69.3
Industry	Formal Sector	13.7	16.3	22.5	36.5	38.2
	Informal Sector	2.6	3.2	4.0	6.4	7.9
Services	Formal Sector	46.2	46.4	47.2	43.0	48.1
	Informal Sector	13.2	13.1	13.7	17.2	22.8

(Adopted from data of Statistical Yearbook 2006, NIS 2006)

Rural-urban population mobility has been boosted in the last several years by the government's program on road building, rehabilitation and maintenance. It was reported that between 1999 and 2003, a total of US\$ 430 million were allocated for national and provincial road network. A total of 1,850 km of national roads and 177 bridges were rehabilitated under the Ministry of Public Works and Transportation, while the Engineering Department of the Royal Cambodian Armed Forces rehabilitated another 1,371 km of roads and built 490 Bailey bridges. External assistance had been tapped for these road projects. In the government's strategy for road rehabilitation and maintenance, the first priority are the secondary national roads linking Phnom Penh to provincial capitals. The second priority is the 2,000 km of national roads that link adjacent provinces. By 2003, Cambodia had a total of 4,276.15 km of national and provincial roads (NIS, 2006).

Motorized transportation and travel by the local population has grown and become more intensive exponentially as a result of the expansion of the road system. Increase in motorized travel, especially by rural people, to the provincial and national capitals can be inferred from the following selected transport indicators covering the period of 1990 to 2005:

Table 3: Cumulative Totals of Selected Indicators of Motorized Transport (1990-2005)

Year	Minibus	Pick up	Bus	Truck	Motor- bike	Licenseses of motor bikes/trucks/buses
1990	221	533	105	683		3,116
1995	1,620	5,179	653	4,809	(19,080)*	29,459
2000	5,888	14,560	971	9,881	114,263	40,958
2005	11,366	25,473	1711	15,363	288,153	55,507

*Newly registered motorbikes in 1995. This is a more valid base figure since 1990-94 accumulated motorbikes would likely be out of service already by 2005.
(Data adopted from NIS, 2006: 308-09).

The numbers of minibuses, pick-ups, bus, and trucks, which are the major modes of public transportation of ordinary people in the provinces when traveling between the rural residence and the urban capital, have all increased dramatically in the last fifteen years. The most phenomenal rise in number is in the privately owned motorbikes, a highly popular mode of individual transport both in the rural and urban areas. In a five-year period alone, from 2001 to 2005, new motorbikes registered had increased three-fold.

From the aforementioned indicators of population, economic, and transportation growth rates, it is clear that the orientation of investment and development priority has been biased towards the urban areas and the urban economy. Public investment is concentrated in the urban area. According to one estimate, in the five-year period between 1996-2001, the urban areas got 65% of the public investment while only 35% went to the rural areas, despite the fact that 90 percent of the Cambodia's poor live in the countryside (Hughes 2003: 38). The value-added in the agricultural sector had grown below the rate of population growth in the rural areas.

Difference in the strong rates of growth in urban economy and the weak or stagnating growth rate in the rural has spurred high rates of internal rural-to-urban migration. In 2004, out of the 4.3 million enumerated as internal migrants, 3.6 million (84%) came from the rural areas. In 1998, there were 3.4 million internal migrants, with 2.7 million or 82% coming from the rural areas (NIS 2006: 54). Various duration and forms of migration and engagement in the urban and peri-urban economy by the rural people have further been given a boost with aggressive and urban-biased road building and maintenance program mentioned earlier. Intensifying migrations have been co-determined by the phenomenal growth of motorized transport modes, which enable rural households to enhance the multiple locations of their livelihood strategies, especially engaging with the formal and informal sectors of urban manufacturing, construction and service industry groups.

(b). Meso-level provincial profiles: Kandal and Kampong Chhnang

Kandal Province is located in the plain region of Cambodia, encircling and closest to Phnom Penh. It borders Kampong Chhnang and Kampong Cham to the North, Prey Veng to the east, Vietnam and Takeo to the South and Kampong Speu. It has an area of 3,568 square kilometers, largely made up of flood plains. Kandal is classified a rural province, but one that has many urbanizing characteristics and features, primarily due to its proximity to Phnom Penh.

Kampong Chhnang is another province, which is located in the Tonle Sap Lake region. It is a province farther away from Phnom Penh and shares a border with Kandal province in the south. Its total area is 5,521 square kilometers. It is also classified as a rural province.

Kandal Province has a higher population compared to Kampong Chhnang. The former's population is 1.26 million in 2008. Its population density is high by Cambodia standards, 355 persons per square kilometer. On the other hand, Kampong Chhnang, the bigger of the two in land area, has a population size of 0.472 million (2008) and a population density of only 85 persons per sq. km. In 2008, Kandal Province ranks third as the most populous province in Cambodia (out of a total of 24 provinces), constituting 9.5 percent share of the country's population. Kampong

Chhnang’s population on the other hand, ranks thirteenth in the provincial population hierarchy, constituting 3.5 percent share of the country’s whole population.

Official figures of poverty puts poverty incidence rate in Kandal at 31.2 percent, and Kampong Chhnang at a higher 42.8 percent (Cambodia Human Development Report, 2007). This income-based measure of poverty is also supported by non-income measures. Examining selected indicators on water supply, literacy, health, type of housing and electricity coverage of households, it becomes evident that Kandal Province as a whole has a better quality of life than Kampong Chhnang Province (see Table 4 below). Kandal Province has lesser dependence on unsafe water sources for drinking, has lower illiteracy rate for both men and women, has better access to health services, less percentage of temporary housing, and a greater number of households with access to city generated electricity.

Table 4: Comparative Selected Socio-Economic Indicators (Kandal & Kampong Chhnang)

Selected Socio-economic indicators	Kandal	Kampong Chhnang
A. % of HH by source of drinking H2O		
Piped Water	3.3	1.9
Tube/Piped Well	27.0	20.4
Protected Dug well	2.2	2.5
Unprotected dug wll	8.8	55.8
Spring, river, stream/etc.	41.1	18.2
Bought	17.5	1.2
Others	0.1	0.0
B. Adult literacy rate (2004)	77.4	66.4
Male literacy rate	87.2	79.2
Female literacy rate	69.6	56.2
C. Out-patient consultations and number of new cases (2005)	741, 384	250, 640
D. % of HH by Type of Housing (2004)		
Permanent	56.3	21.9
Semi-permanent	25.6	19.2
Temporary	18.1	58.9
E. % of HH w/city power (2004)	11.6	3.6

Data Sources: Cambodia Socio-Economic Survey (CSES) 2004; NIS, 2006

Differences in the standard of living between households in Kandal and Kampong Chhnang are outcomes of household livelihood strategies, conditioned and structured both by their own assets and resources and accessibility of opportunities beyond their villages. Two major areas have to be closely examined as important variables to understand the differential living standard between the two provinces: the characteristics of land tenure and agriculture; and the structure of farm and off-farm employment.

Both Kandal and Kampong Chhnang provinces rely on non-irrigated farms. Kandal has a total paddy area cultivation that has averaged at 96.8 thousands of hectares from 2001-05. During the same period, Kampong Chhnang total paddy area cultivation was higher, 112.2 thousands of hectares. In land tenure profile, the two provinces have significant differences. The combined rates of landless and near landless households (owning less than one hectare of farmland) in Kandal (83%) are significantly higher than that of Kampong Chhnang (69%) and the national average (64%). Kandal Province has also a far less percentage of households at the intermediate level of ownership (between 1 to 3 hectares), only 16%, as against 28% (Kampong Chhnang) and 30% (national average) [See Table 5 below].

Table 5: Land Tenure in Kandal and Kampong Chhnang

Indicators	Kandal	Kampong Chhnang	Nat. Average
Landless	17%	10%	15%
Owning < 1 hectare	66%	59%	49%
Owning 1 to < 3 hectares	16%	28%	30%
Owning > than 3 hectares	2%	3%	6%

(Source: CSES, NIS: 2004)

A close examination of the difference in the patterns of land tenure in paddy farming between the two provinces raises an important issue why Kandal Province, despite its higher landlessness and near landlessness and smaller area of arable land, is generally better off in terms of standard of living than Kampong Chhnang Province. This issue would seem paradoxical, however, if one confines analysis of livelihoods of people to being exclusively based on farming and land ownership. As a matter of fact, provincial-level data between the Kandal and Kampong Chhnang point to a marked

difference in diversification by industry employment (see Table 6 below), and strongly suggest non-farming sources of income as a significant contributor to livelihood sources and determinant of living standard of households.

Table 6: Labor force employment, by sector

Labor force employment sector	Kandal	Kampong Chhnang	Nat. Ave.
Agriculture	50%	71%	60%
Industries	21%	12%	13%
Services	25%	17%	25%

(Data Source, CSES 2004, NIS)

In the above table, Kandal's labor force employment rate in agriculture (50%) is much lower than Kampong Chhnang, and the national average. But on the other hand, its labor force employment rate in industry is much higher than that of Kampong Chhnang and the national average. (It ranks second only to Phnom Penh in terms of rate of industrial employment.) Kandal Province's employment rate in the services sector is also higher than Kampong Chhnang. These data suggest that households in Kandal have a more diversified and multi-local livelihood portfolio and in the aggregate, have a higher non-farming sector employment rate than both that of Kampong Chhnang and the national average. The high rate of non-agricultural employment of the labor force in Kandal becomes even more significant in the context that it has been ranked highest in average paddy yield per hectare in all the provinces of Cambodia in the five-year period of 2001 to 2005: 3.33 tons per hectare, compared with the national average in the same period of 2.11 tons. (Kampong Chhnang averaged 1.84 tons during the same period). Thus, the higher standards of living in Kandal (see Table 4) seem to be an outcome of a combination of elements: on one hand, a more diversified portfolio of multi-local livelihoods, particularly higher involvement in urban-based industrial and service activities; on the other, higher yield productivity in paddy cultivation. The relatively high rate of landlessness and near landlessness seems not to be a major factor constraining overall performance in the standard of living indices.

While the authors did not have access to updated census data on the provincial locations of industry and service firms in order to compare the non-farm employment

sites and opportunities between Kandal and Kampong Chhnang provinces, the Executive Summary Draft of the 2008 Census highlights the concentration of industrial opportunities in Kandal in the following statement:

Fertility, mortality and migration data which will be available after data processing is expected to provide the estimate of natural growth and the size of inter-province as well as rural-urban movements of population. This data will enable an in-depth analysis of changes in population at the provincial level. . . . Certain general observations however could be made at this stage based on reports received from provinces. The provinces of Phnom Penh and Kandal, particularly their urban areas, have been attracting a large number of younger women who take up jobs in garment factories. . . (NIS 2008: 10-11)

Data in an earlier census in 2004, already strongly suggest the above trend. Phnom Penh and Kandal provinces are, respectively the first and second ranked in number of migrants living in their provinces. While the median number of migrants for all of 24 provinces in Cambodia was 36.8 thousand, in Phnom Penh, the migrants had an outlier median of 363.4 thousand, while in Kandal, the migrants had also an outlier median of 152.9 thousand. This suggests that the two provinces are strong population growth poles of migration. Moreover, unlike in Kampong Chhnang, the migrants reported in 2004 both in Phnom Penh and Kandal provinces are predominantly women (see Table 7 below), lending support to the aforementioned judgment that a large segment of these migration stream from other provinces are attracted by the opportunities of working in garment factories in the urban and peri-urban areas of the two provinces.

Table 7: Migrants in Kandal, Kampong Chhnang and Phnom Penh, by sex (2004)

	Kandal	Kampong Chhnang	Phnom Penh
Both sexes	152,862	26,393	363,429
Male	73,752	14,300	165,559
Female	79,110	12,093	197,870

(Data Source: NIS, 2006)

Social statistics on two districts in the provinces of Kandal and Kampong Chhnang are important to examine. These two districts are the sites of five villages that CEDAC has conducted intensive and sustained SRI intervention programs since 2002.

Social indicators gathered from these districts – AngSnoul District in Kandal province and RoLea Pha Ea District in Kampong Chhnang Province, manifest strongly the distinctive characteristics and dynamics examined previously at the provincial-level of aggregation and analysis.

Table 8: Selected Socio-Economic Indicators in AngSnoul and RoLeaPha Ea Districts

	AngSnoul District Kandal Province	RoLeaPha Ea District Kampong Chhnang Province
(a) Total population	108,248	92,544
(b) No of families	20,335	19,722
(c) Families based in agriculture	16,559	17,758
(d) No hhs using irrigation system for farming	3,362	3,777
(e) No of landless hh	1,722	897
(f) No of hh owning < than 1 hectare	14,316	10,325
(g) No of people working as factory workers	6,024	3,399
(h) Working as female factory workers	4,576	2,844
(i) No of migrants	6,247	4,028
(j) No of female migrants	4,745	3,128
(k) No of age group 18-60 without permanent job and unemployed	2,669	3,202
(l) No of females of age 18-60 w/o permanent job and unemployed	1,205	1,805

There are important differences among the selected indicators of the two districts in each of the provinces. These indicators more or less reflect the differential patterns at the provincial level aggregation and patterns established earlier between the Kandal and Kampong Chhnang (See Table 8).

- Only 81.4 percent of families have their livelihoods based entirely in agriculture in AngSnoul, compared to 90.0% in RoLeaPha Ea District (b), (c);
- The number of landless households in AngSnoul are nearly twice the number of that in RoLeaPha Ea (e), while AngSnoul rate of near landless (less than a hectare) is also greater (28% more) [f];
- People working as factory workers (g), and women factory workers are far greater in number in AngSnoul than in RoleaPha Ea (h);

- Migrants are higher in AngSnoul than in RoleaPha Ea (i); women migrants are also higher (j);
- Unemployment and underemployment is greater in RoleaPha Ea compared to AngSnoul (k);
- Women unemployment and underemployment is also greater in RoleaPha Ea (l).

The above pointers suggest that in AngSnoul, a district in Kandal Province, has higher engagement in non-farm urban-based work, especially in factory work shouldered mainly by a female work force, and which has kept the local economy vibrant and with a lower unemployment and underemployment rate. Data suggest that local economy in AngSnoul is buoyant despite its higher rate of landlessness and near landlessness.

1.4. SRI adopters in the villages of Kandal and Kampong Chhnang Provinces

The authors conducted a series of focused group interviews with SRI adopters in three villages of AngSnoul District in Kandal Province, namely, Chung Ruk, Ou and Beng in Makak Commune; and, in the two villages of RoLea Pha Ea District in Kampong Chhnang Province, namely Trapiang Kor and Ou Rong in Chhary Commune.

The following are the brief profiles of the villages.

Three villages in Kandal Province, Makak Commune

(a) *Chun Ruk Village* is a farming village with 52 households, among which 20 are female headed. Forty-seven of the total households are primarily engaged in farming. There are 37 households reportedly owning less than one hectare in the village (SEILA Program, 2006). Based on focus group interviews by the author, there are 5 households that are landless in the village. There are also 5 households identified as principally engaged in non-farming activities outside of the village, most are involved in construction business.

The village relies on rain-fed farms. Irrigation facility is totally absent. Thus, there is only single-cropping in rice. The average rice harvest per year, according to village interviewees, is roughly 2 tons per hectare. Aside from rice farming, villagers in Chun Ruk are involved in other agricultural activities such as raising pigs, cow, and chicken, growing vegetables and making palm sugar.

Based on rough estimates done in focus group interviews with SRI adopters, 27 households in the village (out of the 47 engaged in farming) are rice sufficient throughout the year, a few of them having a little surplus. Five households are dependent on rice purchase for less than 3 months a year, while another 10 households are rice-deficit and dependent on commercial rice for 3 to 6 months a year.

To address rice deficits during the lean months, many households work outside in the urban area as waste pickers, garment factory workers, and construction workers. A few households also augment their cash to buy rice by having small poultry business.

In focus group interviews, the participants ranked the following economic activities by order of importance as sources of cash incomes: (1) work in garment factory by a female household member; (2) waste picking in the town; (3) chicken raising in their own village.

SRI was introduced in this village in 2003 by CEDAC. Currently there are 14 households practicing the SRI method in their rice cultivation.

(b) *Ou Village* is a farming village with 47 households, among which 20 are female headed. Forty-two households are primarily engaged in rice farming. Five others are primarily engaged in non-farming livelihood activity outside. There are 26 households reported owning less than a hectare (SEILA Program, 2006). Based on focus group interviews with SRI adopters by the authors, there are 5 households that are landless in the whole village. There are also 5 households identified as principally engaged in non-farming activities outside. Most of them are in construction business.

The village relies on rain-fed, single crop rice farming, irrigation facility being absent in the village. The average rice harvest per year, according to village interviewees, is 2 tons per hectare. Aside from rice farming, the other agricultural livelihood activities in the village are raising pigs and chickens, vegetable growing and making palm sugar.

Based on focus group interviews, the estimates on rice sufficiency of rice farming households are as follows: 27 households are rice sufficient all year round, a few might have a little surplus; 5 farming households commonly experience less than 3 months rice shortage; and 10 households have rice supply gap lasting from three to six months a year.

To meet their rice deficits during the lean months, households have to purchase commercial rice utilizing cash incomes of members who may be workers in garment factories, waste pickers in town or working in construction projects outside the village.

In the focus group interviews, the participants ranked the importance of cash income sources in the village according to the following order: (1) wage in garment factory by a female household member; (2) income from construction projects; and (3) waste picking in the town.

SRI was introduced in the village in 2004 by CEDAC, and at present there are 14 households practicing SRI.

(c) *Beng Village* is a farming village with 64 households, among which 30 are female-headed. Fifty-nine of the total number households are principally engaged in rice farming for their livelihood. There are 46 households reportedly owning less than one hectare in the village (SEILA Program, 2006). Based on focus group interviews by the authors, there are 5 households in the village that are landless. There are also five households identified as principally engaged in non-farming activities outside the village for their livelihood.

The village relies on rainfed, single crop rice farming. There is no irrigation facility at all. The average rice harvest per year is three tons per hectare. Other agricultural activities of households are raising livestock and vegetables.

Based on estimates made through focus group interviews, about a third of farming households are rice-sufficient all year round, with a few having a little surplus. About a fifth commonly experience rice shortage of less than three months in a year. Half of the number of farming households in the village experience rice deficits for a period of three to six months a year.

To cope with rice shortages, households purchase rice with money earned outside. Many households have adult female members working in garment factories and male members working in construction. Some also run small businesses like grocery and preparing and vending cakes and noodles to earn cash used to purchase rice during the lean months.

In the focus group interviews, the participants ranked the following sources by order of importance as cash source in the village: (1) wage of a household member in a garment factory; and (2) income from construction work.

SRI was introduced in the village in 2004 by CEDAC. At present, there are 59 households practicing SRI cultivation.

Two villages in Kampong Chhnang Province, Cherei Bak Commune

(a). *Tropang Kor Village* is a farming village with 126 households, among which 26 are female-headed. One hundred-and-one of the total are engaged principally in rice farming. There are only 20 households reportedly owning less than a hectare (SEILA Program, 2006). Based on the focus group interviews conducted by the authors, there are only 7 landless households in the village. There are also about 27 households engaged primarily in non-farming activity for their livelihood.

The village relies on rainfed, single-crop rice farming. There is no irrigation facility in the village. According to the village informants, the average rice harvest in the village is two tons per hectare.

Based on estimates conducted in focus group interviews with SRI adopters, there are about 25 households who are rice sufficient for the whole year round. There are roughly 10 households that have surplus rice, which they would sell to other households in the village, and about 65 households who experience rice deficits for a period of less than three months in a year. The rest of the households, roughly 27, experience rice shortage for a period of more than three months.

For households who have rice deficits, their members engaged in the following intra-village income-generating activities: chicken raising, fish farming, collecting firewood to sell in the town, pottery, and hiring out their labor during harvest season to other households. A number of households too have members working in garment factories and construction outside.

In focus group interviews, the participants ranked the following cash income sources according to their importance in the village: (1) chicken raising; (2) wage of a household member in a garment factory; and (3) pottery.

SRI agriculture was introduced in this village by CEDAC in 2005. At present, there are 90 households practicing SRI in rice cultivation.

(b) *Orung Village* is a farming village with 106 households, among which are 26 female-headed households. Eighty of the total households are principally engaged in rice farming as their livelihood. There are 60 households reportedly owning less than one hectare in the village (SEILA Program, 2006). Based on the focus group interviews conducted by the authors, there are 24 landless households in the village. There are also 24 households who are principally engaged in non-farming for their livelihood.

The village largely relies on rain-fed, single-crop rice farming. There is an irrigation system in the village though that serves 15 households. Aside from rice farming, the

other agricultural livelihood activities popular in the village are pig and cattle raising, poultry, fish farming, vegetable growing, and producing palm sugar. Gathering firewood to sell is also popular.

Based on estimates done in focus group interviews, there are about 16 farming households who are sufficient in rice supply for the whole year, with a few of them having a little surplus which are sold to other households in the village. There are around 34 households who commonly experience rice shortage for less than three months. Around 32 other households have rice shortages ranging from 3 to 6 months a year.

To meet rice deficits the villagers engage in multiple livelihoods. The landless households earn wages by working on farms of others during harvest time and in non-farm activities. There are about five households who have members working for wage labor in the Thai border area. Others purchase rice from the market from earnings from pottery making, raising fish and chicken. A few are also working as garment factory workers (women), and as construction workers (men).

In the focus group interviews, participants ranked the following livelihood activities based on their importance as source of cash in the village: (1) making palm sugar; (2) firewood gathering; (3) pig raising; and (4) poultry raising.

SRI was introduced in this village by CEDAC in 2004. At present, there are 33 households practicing SRI in the village.

1.5 Comparison of quantitative descriptors of Kandal and Kampong Chhnang Villages

The authors conducted a large-sample random survey of 57 SRI adopter households in villages of Chung Ruk, Ou, and Beng in Kandal Province, and another random survey of 64 villages of Tropang Kor and Orung in Kampong Chhnang Province to test the validity and pervasiveness of certain characteristics and patterns that emerged from ocular observations and focus group interviews.

In Table 9, selected comparators strongly suggest the following patterns: (1) the three villages in Kandal have lesser grain deficit (j) and a capacity to support larger size households (a); (2) that Kandal villages have comparatively higher dependence on extra-village and non-farm sources of livelihoods (e), (f), (g); (3) that comparatively less labor is devoted by Kandal residents to farming (b), (c); (4) that a higher percentage of adult women in Kandal villages are involved in non-farm work outside, compared to the adult women in Kampong Chhnang villages (h). These empirical findings support earlier provincial and district level analyses regarding the growing importance of non-farm work and people's engagement in the urban and peri-urban economy to improve livelihoods. Women are the principal agents of this important development in the village economy.

Table 9: Selected Comparators of SRI-household Livelihood Profiles Between Kandal and Kampong Chhnang Villages

Selected Comparators	Kandal Villages	Kampong Chhnang Villages
(a) Median # of hh members	6.00	5.0
(b) Mean # of hh adult members principally engaged in farming	1.73	1.97
(c) Mean # female adults principally engaged in farming	1.20	1.39
(d) Mean # male adults principally engaged in farming	1.38	1.38
(e) Mean # of members working regularly outside for more than 50 percent of their time	1.68	1.47
(f) Mean # of weeks regular work outside	50.49	40.94
(g) Mean # of members of hh occasionally working in non-farm livelihood activities	1.83	1.81
(h) Mean # of female members occasionally working in non-farm livelihood activities	1.42	1.39
(i) Mean # of male members who are occasionally working in non-farm	1.36	1.37
(j) Mean days dependent on bought rice in grain deficit hhs	67	77

n1= 57 SRI farmer adopters in Kandal

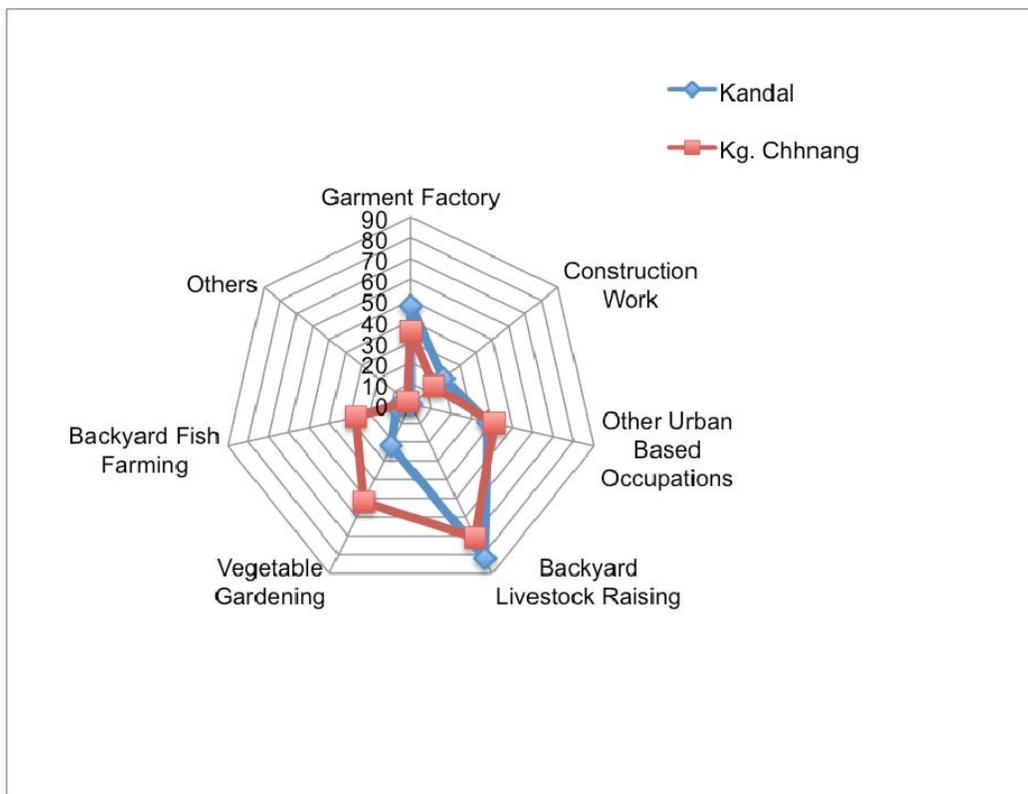
n2=64 SRI farmer adopters in Kampong Chhnang

Between the two sets in Table 9 above, the villages in Kandal have more SRI-adopter households that rely on their cash income in garment industry and construction work. They are also more engaged in backyard gardening and livestock raising compared to their Kampong Chhnang counterparts (See Figure 2 below). It is important to note that based on the author's interviews, young women are the ones employed in the

garment industries, while older women in the village are the ones mostly in charge of backyard livestock raising. Men are the ones who go out for construction work.

On the other hand, SRI-adopter households in the two villages of Kampong Chhnang have a higher involvement in backyard fishing and vegetable gardening as their sources of cash income, while Kandal villages have a small percentage of households engaged in these two activities (see Figure 1 below). These data strongly suggest the primary importance that households in Kandal have attached to occupations in the urban non-farming economy. Close to the urban centers of growth, these villages are relying on urban livelihood activities while maintaining their agricultural activities in the rural areas.

Figure 1: Multiple Responses of SRI Adopter Households in Kandal and Kampong Chhnang Villages on the Sources of Cash Income



n1= 57 respondents (Kandal)
n2= 64 respondents (Kampong Chhnang)

In the foregoing discussions, we have argued that rice farming and the performance of SRI adoption as a livelihood strategy should be assessed in the context of the

multiplicity of livelihood sources, heightened mobility of rural populations, and the growing importance of engagement in the urban economy. Further, the expanding female labor force, both in farming and garments factory employment has to be an intrinsic part in the study of gendered responses to the SRI program and its impacts in the rural villages. We now turn to this topic.

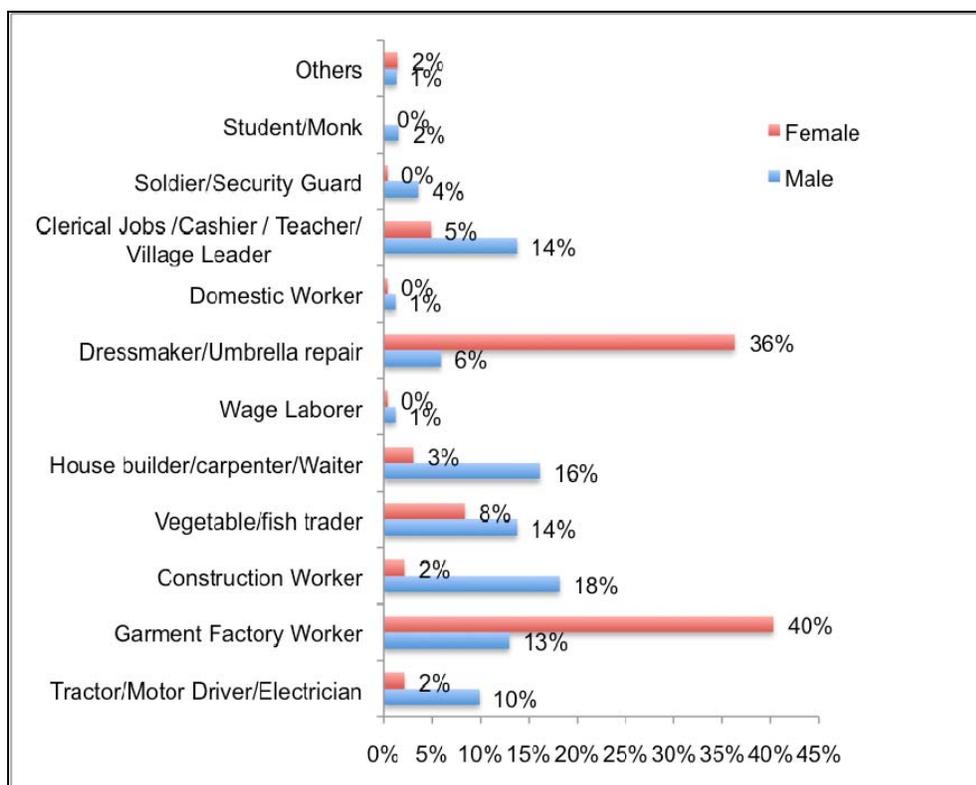
2. Gender-specific Activities and Workloads in SRI Farming

2.1 Labor divisions in non farm occupations and rice farming

Rural women in Cambodia are generally associated with farming as a whole, whereas men are highly mobile laborers as they engage in non-farm activities that are steadily expanding in Cambodia. This however does not preclude the fact that women are also increasingly taking up non-farm work. Survey findings reveal that most non-farm occupations of women are in garment factories and as dressmakers. Survey results also show that women who work in garment factories usually fall within the 18 to 29 year-old bracket. Men, on the other hand, work mostly as construction workers, house builders, and as clerks, village leaders and teachers, and they generally come from all ages.

Figure 2 below shows the gender-specific non-farm occupations of respondents in the program-wide survey.

Figure 2: Percentage of Women and Men in Non-Farm Work (N=479)



Source: SRI Farmers' Survey

Meanwhile, survey respondents also confirm greater association of women with agriculture than men as shown in the table below.

Table 10: Household Members Principally Engaged in Farming and Non Farm Work

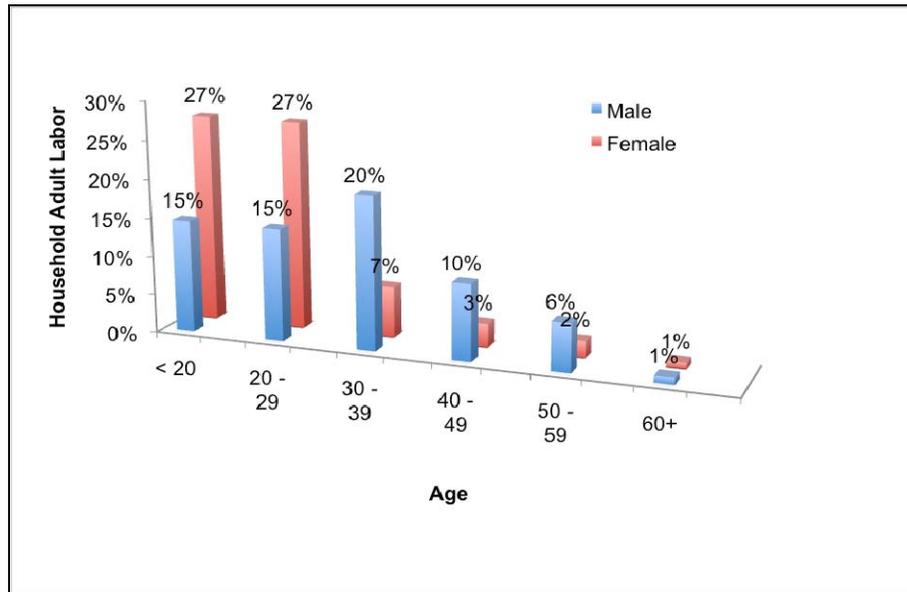
	Farm Work		Non farm Work	
	Frequency	Percent	Frequency	Percent
Female	915	53	226	47
Male	803	47	253	53
Total	1718	100	479	100

Source: SRI Farmers' Survey, April 2008

Additionally, it is noteworthy that beginning in their 30s, more men than women work elsewhere from their villages to perform non-farm occupations. However, it is equally noteworthy that there are more women than men who work outside their villages up to age 29. From the age of 30 onwards, there is a deep plunge in the percentage of women who work elsewhere than in their villages. This seems to indicate that older

women usually remain as a constant presence in their villages and are therefore the farmer mainstays. Figure 3 below presents this differentiation among ages and genders.

Figure 3: Percentage of Adult Labor Performing Non Farm Occupations Outside Villages by Gender (N=479)



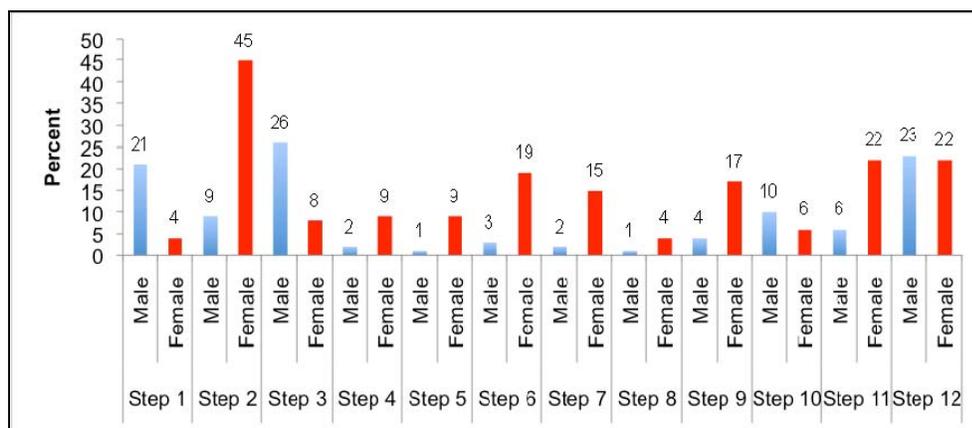
Source: SRI Farmers' Survey

The gender and age differentials in non-farm employment indicate that new meanings regarding the position of women as farmers and factory workers are being re-worked along age and life cycle parameters. Two occurrences can be observed here: First, in the past, rural women in Cambodia were farmers alongside men in rice agriculture. This is changing since men are pursuing other income opportunities beyond farming. Second, interviews reveal that younger women are being recruited to work in garment factories and hence, old definitions that tie women to farming are eroding. An older generation of sedentary farmwomen seems to be emerging out of this new landscape, primarily responsible for maintaining agriculture in the villages. These occurrences demonstrate the fluidity of the workings of gender as power relations within which new definitions of appropriate gender roles are shaped and reshaped in the everyday work practices of women and men engaged in increasingly multiple and multi-local livelihoods. This seems to suggest that age and life cycle are defining women's work

and mobility in changing rural Cambodia, and creating new imbalances in opportunities, status and resources.

The gender divisions of labor in SRI farming demonstrate that women are chiefly responsible for transplanting and weeding, while men perform land preparation tasks. Figure 4 below indicates women and men’s work in SRI farming.

Figure 4: Percentage of Women and Men’s Involvement in 12 Steps of SRI Farming*



- Step 1: Smooth Seedbed Preparation (n=243)
- Step 2: Seed Selection (n=446)
- Step 3: Moist & Smooth Seedbed Transplantation (n=287)
- Step 4: Strong Seedling Selection (n=205)
- Step 5: Young Seedling Transplantation (n=193)
- Step 6: Single Seedling Transplantation (n=468)
- Step 7: Shallow Transplantation (n=420)
- Step 8: Transplantation in Square Pattern (n=128)
- Step 9: Spacing of Rice Seedlings (n=421)
- Step 10: Alternate Flooding & Drying of Paddy (n=181)
- Step 11: Weeding (n=448)
- Step 12: Application of Nutrients to Soil (n=551)

Source: SRI Farmers’ Survey, April 2008 (N= 643)

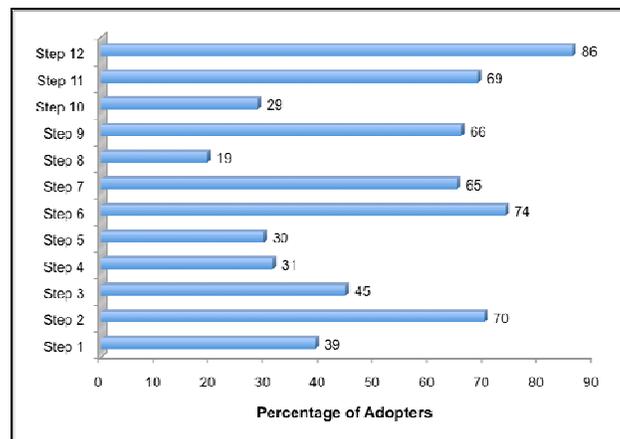
*Respondents also indicated that both women and men engaged in all SRI steps.

As in conventional rice-farming prior to SRI adoption, Figure 4 shows that women are generally more engaged in SRI rice farming than men, and in particular, women are more involved in transplanting activities than men. These findings, however, do not reveal whether the workloads have actually increased or decreased. Popular accounts of SRI technology point out that its methods lighten former rice farm tasks. Has this been the case? A total of 643 survey respondents were asked whether SRI

farming tasks were lighter than conventional rice farming: 74% agreed, 13% strongly agreed, while only 4% and 1% disagreed and strongly disagreed, respectively. These perceptions corroborate earlier accounts of less labor applied to the conventionally difficult tasks of uprooting and transplanting (Anthofer, 2004a; Koma and Siny, 2004).

Farmer promoters and CEDAC extension agents have taught farmers to adopt the 12 steps of SRI. Findings however show that farmers practice the 12 steps unevenly, some observing more steps than others.

Figure 5 : Percentage of SRI Adopters Who Practice 12 SRI Steps*



- *Step 1: Smooth Seedbed Preparation (n=250)
- Step 2: Seed Selection (n=448)
- Step 3: Moist & Smooth Seedbed Transplantation (n=286)
- Step 4: Strong Seedling Selection (n=201)
- Step 5: Young Seedling Transplantation (n=190)
- Step 6: Single seedling transplantation (n=472)
- Step 7: Shallow Transplantation (n=417)
- Step 8: Transplantation in Square Pattern (n=124)
- Step 9: Wider Spacing of Rice Seedlings (n=421)
- Step 10: Alternate Flooding & Drying of Paddy (n=183)
- Step 11: Weeding (n=440)
- Step 12: Application of Nutrients to Soil (n=551)

Source: SRI Farmers' Survey

As Figure 5 indicates above, Steps 2, 6, 11, and 12 are the steps that adopters most practice (seed selection, transplantation, weeding and application of soil nutrients). These tasks are mostly assigned to female farmers rather than male farmers. The least implemented is Step 8, which is a complicated task since it requires strict measurement and may be done by a group of farmers who may have uneven skills and

familiarity with SRI methods. Water management (Step 10) is also not implemented widely since water draining and flooding requires level ground and possibly additional farm implements like pumps and water hoses.

2.2 From conventional rice farming to SRI adoption

Farmers in Cambodia generally practice a combination of traditional and green revolution-type technologies in rice farming, such as the application of chemical fertilizers, the use of traditional rice varieties, with some application of chemical pesticides. Rice farming is sedentary and paddy-based, where draft animals assist men in land preparation tasks followed by uprooting and transplanting young rice seedlings grown for 30-35 days, applications of chemical fertilizers and pesticides, flooding paddy fields, weeding paddy embankments and bunds, harvesting and post-harvest activities. Most rice farming in the country is rainfed and allows for only one harvest yearly.

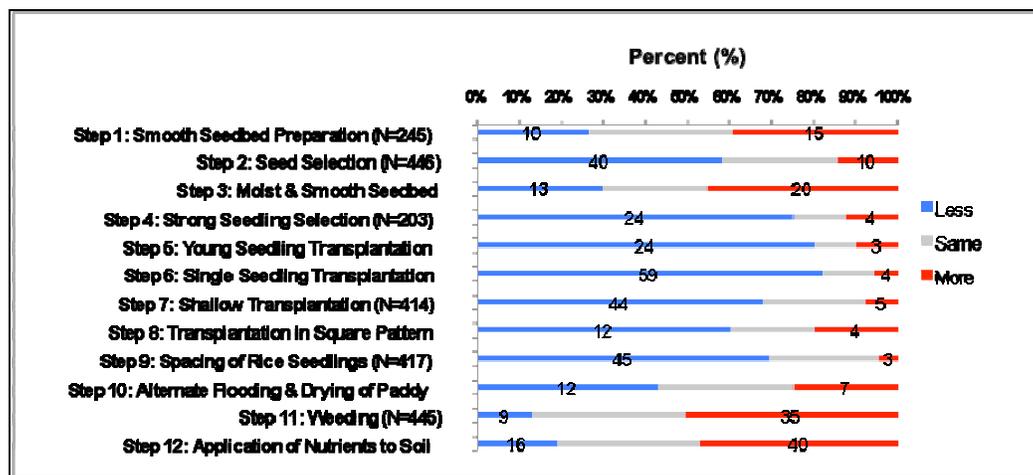
In conventional rice farming, rural women and men generally shared rice-farming activities in Cambodia, with some activities associated more with men, such as land preparation and application of farm inputs like fertilizers. Women, on the other hand, are more associated with weeding and rice seedling planting and transplanting, although men assist them in transplanting seedlings onto the rice paddy once these are mature. Post-harvest activities are also generally shared between women and men. Women dry and winnow the grain, followed by both women and men transporting the grain to be milled in a nearby rice mill. Women store the milled rice, which they also prepare and cook for meals.

Men are expected to collect fuel wood, raise cattle and collect palm sugar juice, which women process into palm sugar to be sold in village shops and town markets. Household reproductive work such as cooking, child and elderly care, cleaning and the laundry are tasks that women disproportionately shoulder more than men.

When farmers adopted SRI in the sites under study, not much changed in the women and men's assigned tasks, or in the gender divisions of productive and reproductive work despite marked changes in the manner and volume of rice seedling transplantation, water management, weeding and land preparation. Interviews

however revealed that men assisted women less in transplanting and uprooting rice seedlings since these were fewer and the tasks became lighter. Survey respondents were also asked to judge whether each of the 12 SRI steps required lesser, the same or more labor contributions compared with conventional rice agriculture. The question was intended to gauge changes in SRI farming that compare with the labor requirements and practices in past conventional rice farming. Figure 6 below presents their responses to this issue.

Figure 6: Comparison of Percentage of Labor Inputs in SRI 12 Steps Compared with Conventional Rice Farming



Source: SRI Farmers' Survey, April 2008

According to survey respondents, SRI Steps 1, 3, 11 and 12 (seedbed preparation, weeding and fertilizer application) require *more* work than conventional rice farming. On the other hand, most steps that involve seed selection and transplantation (Steps 2, 4, 5, 6, 7, 9) have resulted in *lighter* workloads for the respondents. This confirms earlier research on labor inputs in SRI (Moser and Barrett, 2002; 2006; Anthofer, 2004a; Uphoff, 2007). Selecting seeds and transplanting seedlings are tasks generally assigned to women, thus practicing these tasks following the SRI manner has made these tasks comparatively lighter for women. Men, for their part, work harder in their land preparation tasks (Step 1), while women spend more time and energy in weeding since more weeds grow on paddies with less water (Step 11). SRI-applied paddy fields do not require heavy flooding as in conventional rice farming.

Thus, the types of work did not change for women and men who adopted SRI

farming. Some of farm tasks only became lighter or heavier for them, and for women, reproductive work remained a chief responsibility.

Compared with conventional farming, SRI produces higher yields. Survey respondents express this in Table 11 below.

Table 11: Farmers’ Assessment of Average SRI Rice Yields Compared With Conventional Rice Farming Yields

Comparison of average volume of SRI rice yields with average volume of conventional rice farming yields on the same cultivated plot	Frequency	Percent
Greater	511	80
Somewhat the same	86	13
Lesser	14	2
Do not know	32	5
Total	643	100

Source: SRI Farmers’ Survey, April 2008

Respondents, however, do not practice all steps and methods in SRI farming as presented in Figure 5. Later sections will discuss the downside of adopting SRI as well as the benefits that farmers gain from its adoption.

2.3 The implications of SRI adoption on other livelihood activities

In-depth studies in two provinces - Kandal and Kampong Chhnang - where CEDAC representatives have considered SRI adoption most pervasive, interviews revealed that other livelihood activities have declined since farmers in these sites adopted SRI methods. The decline, however, cannot be fully attributed to SRI adoption only. Farmer interviews revealed that the time freed by lighter farm tasks has led to taking up other livelihoods. These livelihoods are also in part influenced by the expanding opportunities in non-farm work emerging in the changing economic landscape of Cambodia. In Kandal Province, interviews with 12 SRI women farmers almost unanimously revealed that men’s collection of palm sugar juice declined, leading to a steep fall in palm sugar production altogether. Other livelihoods such as waste picking, goat raising and vegetable growing also declined. In rice farming, interviewees said that they no longer spent too much time carrying seedlings to the

field since much fewer seedlings are needed for transplanting compared with conventional farm practices of the past. This lightened their work load and allowed them more time to collect cow dung and in reproductive work activities such as childcare, house cleaning and in keeping their homes in order.

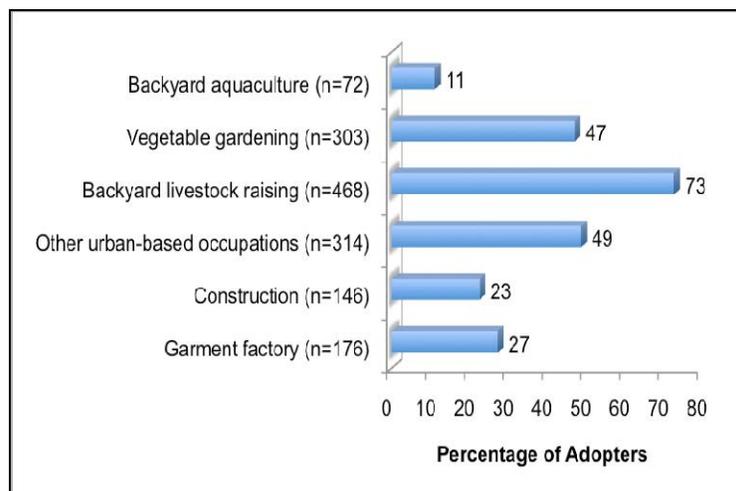
In SRI farming, men no longer help to uproot rice seedlings since these became fewer and an easier task, thus it appears that they devote their time more fully to non-farm work and social activities (as indicated in Figure 12). While they participated less in transplanting, those who strictly implemented SRI methods, however, had to level and smoothen the land three times compared with only two times in conventional rice farming. Land preparation tasks did not require as much time as other farming tasks such as weeding, which had to be done more frequently since weeds under the SRI farming regime now grew more ubiquitously.

Women farmers from Kampong Chhnang Province reported that palm sugar production also significantly declined. Additionally, due to more time freed from farming, they are able to more fully perform reproductive tasks such as doing the daily laundry and keeping their homes in order. In contrast with their counterparts in Kandal Province, they are able to engage in poultry raising, vegetable growing, aquaculture and cow dung collection. Men, for their part, no longer had to fetch or pump water from nearby groundwater wells to irrigate paddies, withdrew from fishing in small lakes and instead engaged in pottery making (*peang* jars) as well as in non-farm work such as road and building construction. As corroborated by Table 2 and Figure 5, men were found to engage in non-farm work slightly more than women. They also found work in nearby provincial towns and in Phnom Penh, the capital.

Palm sugar production has been a traditional supplementary livelihood especially when incomes decline and taper in rural Cambodia. Once other employment opportunities and rice yields increased as a result of the adoption of SRI methods, palm sugar production declined as a supplementary source of income. The same happened to other supplementary livelihoods like waste picking, goat raising and vegetable growing especially in Kandal Province, which is near the city of Phnom Penh where non-farm and informal sector-related work are most available.

In the case of rural women in Kampong Chhnang Province, they had more time to engage in other livelihoods like poultry, aquaculture and vegetable growing. Compared with the residents of Kandal, this may be due to the longer distance from Phnom Penh and therefore keeping sedentary yet multiple livelihoods remained a viable option for Kampong Chhnang farmers. More effective program interventions by CEDAC may have also prompted the growth and development of other livelihoods as a result of lighter workloads and freer time from farming the SRI way – which may not have been the case in Kandal. Over all, it therefore appears that the women under study became much more entrenched in household domestic work and have increasingly engaged in multiple on-farm livelihoods, as a result of lighter work from the adoption of SRI techniques especially in the more remote province of Kampong Chhnang. Below, Figure 7 shows that incomes of SRI adopters have been generated from backyard livelihoods. Combined with urban-based occupations, these can generate improved incomes for rural households.

Figure 7: Percentage of Adopters and Their Sources of Cash Incomes



Source: SRI Farmers' Survey

Non-village based and non-farm occupations, indeed, are increasingly becoming important sources of income. As indicated in Figures 3 and 7, younger women and daughters are 'released' farm labor, thus they are able to travel and work in garment factories. Younger women have begun to increasingly work in garment factories in nearby provincial towns. The lighter farming load resulting from SRI adoption adds more reason to their mobility and non-farm employment, although SRI farming is not

the sole enabling factor for their increased mobility.

Focus group discussions with farmers revealed that a daughter working in a garment factory can earn about 70-80 USD monthly. Young women who live in Kandal Province have an easier time commuting to the suburbs of Phnom Penh or to the city itself for work. Many young women from Kandal travel to work daily in factories located in provincial towns. They ride at the back of a shuttle truck that ferries them to and from their villages early in the morning and towards evening. Additionally in Ou Village, Kandal Province, group interviewees reported that in 27 out of 48 households, women work in garment factories in nearby towns. Below is one case of a daughter who works in a garments factory:

Prang Chovea , Beng Village, Kandal Province

Chovea began rice farming at 10 yrs old. Her family is from the village and her mother died there. She married a man from another village. State land was granted to her parents and they farmed the land for an annual harvest. She used to transplant a lot of seedlings which were around 2 months old. Transplanting is her most difficult job especially since her natal family lacked sufficient labor, and she had only one brother. Transplanting, uprooting and tying seedlings were also difficult. When a drought struck and damaged her family's rice crops, she and her brother worked at house construction sites by carrying rocks and wood, while their father found some work to do outside the village. But that was short-lived since her father became blind and her mother broke her leg, so only she and her brother farmed the land.

She has five children who are all living with her. Her eldest is a daughter aged 25 years old. Since she began rice farming as a married woman, she devoted her time to caring for her children. Her husband, on the other hand, worked as a construction worker, junk collector, and coconut tree farmer. Rice farming was her only livelihood. Her husband assisted her during the peak work periods in rice farming. He also harvested palm juice that she processed into palm sugar to be sold in nearby markets.

Her eldest daughter has been working in a garment factory in Kandal Province for the last 7 years, while her other 4 children are still in school. She is married but lives in her parents' home. Her son-in-law is also involved in farming and also collects junk and resells this.

Chovea thinks that her daughter's work is difficult whereas she just worked on the fields when she was a young mother. Her daughter works 6 days weekly, comes home daily, and helps in the farm for one day a week when she is free during farm peak labor periods. Her daughter contributes her earnings to both her own and her mother's family.

As a whole, SRI adoption did not significantly re-configure traditional gender-assigned tasks in rice agriculture but led to lighter workloads for women especially in the tasks around seed selection and transplantation of rice seedlings. SRI farming nevertheless required more weeding from them and special techniques in land preparation from the men. SRI adoption combined with growing opportunities for employment in provincial towns and in the capital city, has led to the decline in palm

sugar production – a traditional source of income. Men are increasingly more mobile than women, who have been more fully assigned a chief role in rice farming and reproductive work. Younger women – daughters – are able to work in factories since farming tasks have been left largely with their mothers or older women. Meanwhile, women who head their households find it difficult to step in pace with the challenges of SRI farming due to the heavy demands of land preparation and their weak access to male labor to address such demands. On the other hand, demand for older female labor seems relatively absent outside the rural villages.

3. Benefits, Harms and Unintended Outcomes from SRI Farming

3.1 Benefits

One of the key benefits adopters gain from adopting SRI farming is an increase in yields. In the program-wide survey, three cohorts of farmers reported increased percentages in rice yields. These cohorts are grouped according to three periods they had adopted SRI farming between 2005 and 2008. Figures 8 a, b, c below demonstrate the extent of their yields.

Figure 8a: Percentage of Farmers (Cohort 1) Who Annually Adopted SRI Methods Since 2005 by Percent of Rice Yield Increase

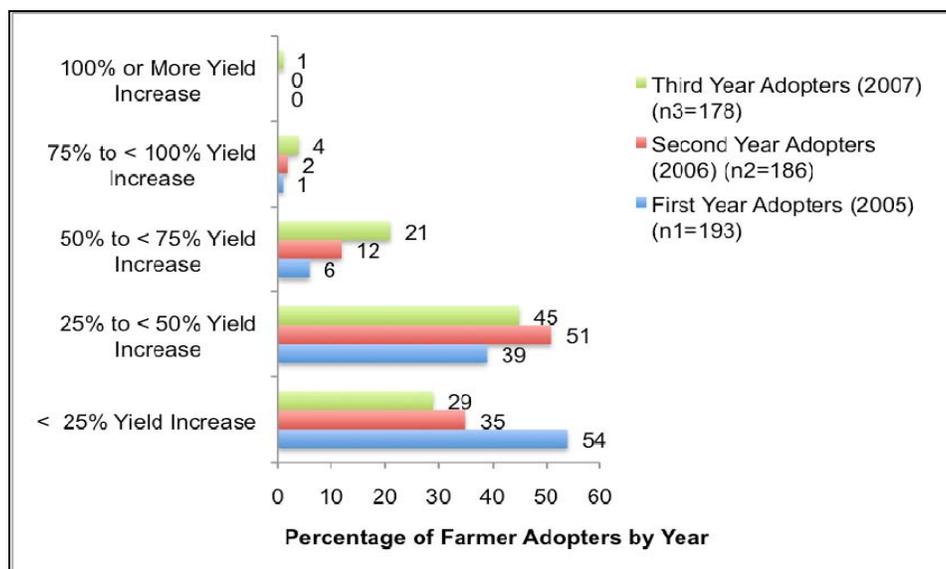


Figure 8b: Percentage of Farmers (Cohort 2) Who Annually Adopted SRI Methods Since 2006 by Percent of Rice Yield Increase

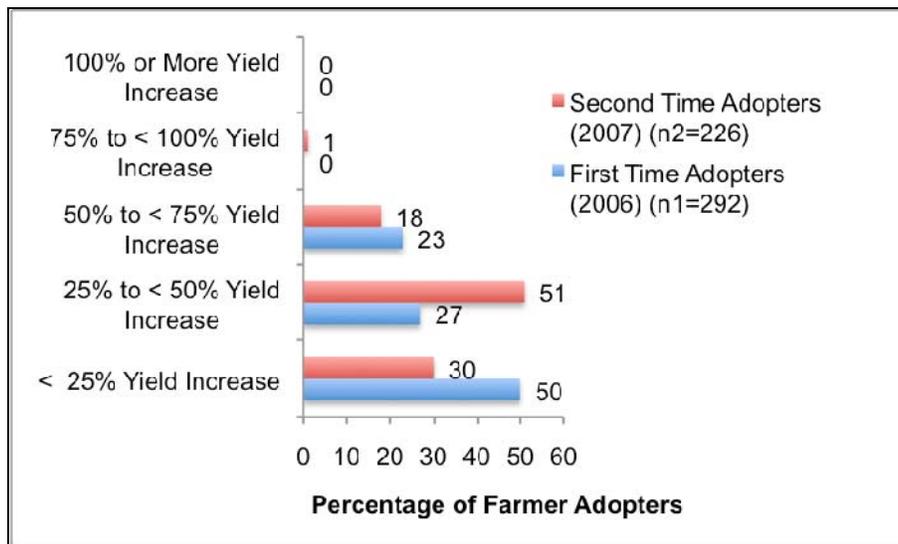
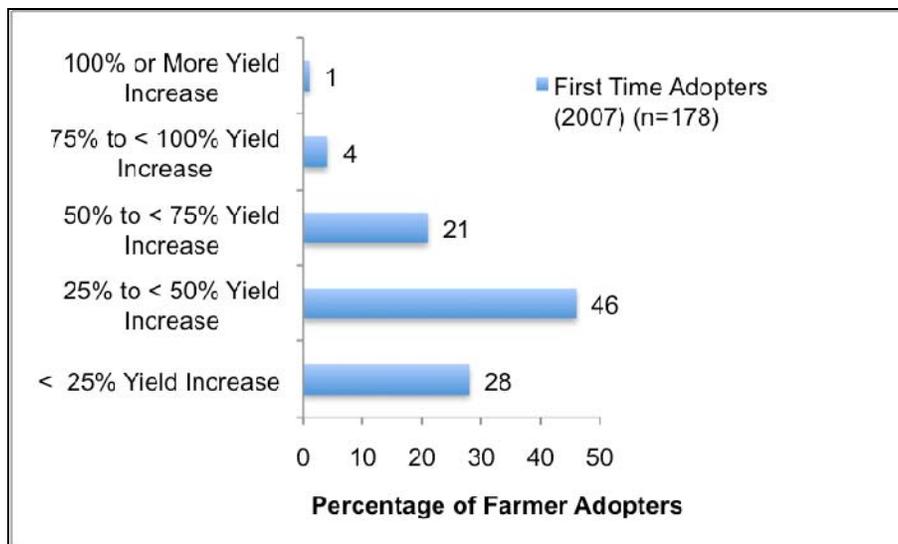


Figure 8c: Percentage of Farmers (Cohort 3) Who Annually Adopted SRI Methods Since 2007 by Percent of Rice Yield Increase



Source: SRI Farmers' Survey, April 2008

Figures 8 a,b,c indicate that most adopters increased their yields short of 50% more than their past yields from conventional farming. Only around 12% of all adopters from among all three cohorts were able to generate 75 to 100% or more yields than past volumes from conventional farming. The following cases from Beng Village,

Kandal Province, tell of people's livelihoods and their yield increases after adopting SRI farming:

Si Sarom, Beng Village, Kandal Province

Sarom was born in Beng Village where she also met and married her husband. She has engaged in rice farming since she was 17 years old. Together with her sister, she helped her parents farm the land. Her father collected palm juice while her mother stayed home to process the juice into palm sugar. Their rice supply used to be enough for only 10 months, and so the earnings from the palm sugar was needed to buy them rice for 2 months.

Sarom recalls that she had to spend a lot of time in rice farming, which meant being at the field at dawn till 11 am, and then working there again from 1 to 5pm. Her parents did not use chemical pesticides or fertilizers. Today, work on the field is basically shorter and less tiring due to the practice of SRI.

Drought struck them while she was young, which compelled her father to rely on palm sugar for earnings. Today, when drought strikes and affects their rice crops, her husband looks for a job elsewhere, especially selling (bottled) water and of course offering his services for repair of bikes and motorbikes.

At present rice farming is Sarom's only livelihood whereas her husband sells water and repairs motorbikes and bicycles in the village. Neighbors bring these vehicles to him for repair, although he has no shop in his home. Her eldest son helps in farming.

They are able to sell surplus rice although they do not hire farm labor. They began to practice SRI 8 years ago. Her husband was in fact the first farmer to practice SRI in the village. Sarom received SRI training prior to her husband. Before her husband consented to the application of SRI, he had to see demonstration farms outside the village to be convinced. He then began to experiment with SRI methods himself. It took time since land preparation became more difficult: where the land has to be prepared three times instead of only once.

They used to harvest 1 ton of rice per hectare prior to SRI. Today, they harvest two tons of rice per hectare.

Yin Saren, Beng Village, Kandal Province

Saren began to engage in rice farming at 15 yrs old with her mother and 5 siblings. Her father died young. Besides farming, her mother kept a small store selling dry goods in the village. They lived in another province, Prey Veng, whereas her husband was from this Beng Village in Kandal province.

Saren and her husband live separately from her in-laws and have their own rice land, which provides them sufficient rice supply for a year. Her husband is a seasonal construction worker outside Beng Village.

She has practiced SRI for 4 years and was trained by CEDAC prior to her husband's knowledge of SRI. She then taught SRI methods to her husband and he also learned these from other farmers. So both experimented on their rice land. Her husband had first to see the actual methods before he let his wife apply the methods that she learned from the training. Their yield per hectare prior to adopting SRI farming was 1 ton. Today, they harvest 2.5 tons from the same land.

Apart from increased yields, farmer adopters have also experienced other benefits from adopting SRI methods. In the data sets of Table 12 and Figure 9 below, respondents expressed relatively the same findings. However, the purpose of Table 12 is to show the advantages experienced by two groups of farmers who each had three

years of experience in SRI adoption. Whereas the data set of Figure 9 purposively disaggregates the experienced advantages of female and male farmer adopters.

In Table 12, two groups of farmer respondents each with three years of adopting SRI methods, reported that they benefited from higher rice yields most.

Table 12: Advantages of SRI Adoption, by Two Cohorts of Three-Year Adopters

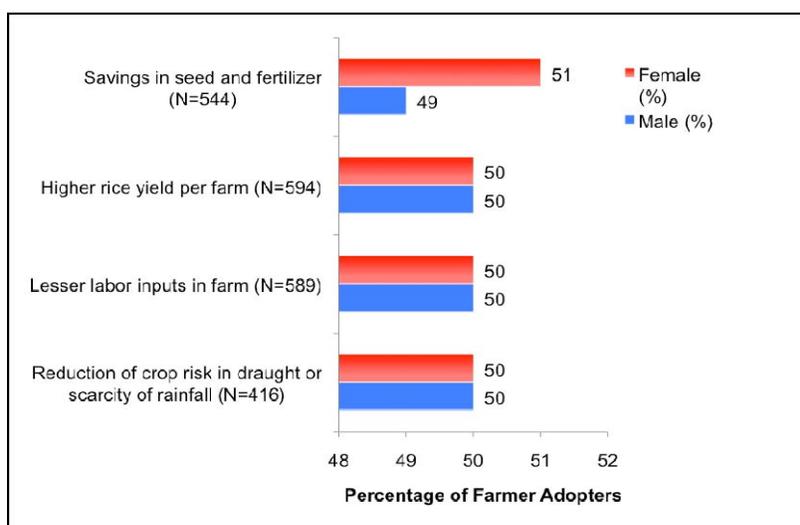
Advantages of SRI Methods	Group 1 2005-2007	Group 2 2006-2008	Total
Reduction of crop risk in drought or scarcity of rainfall	109	22	131 (64%)
Lesser labor inputs in farm	158	22	180 (89%)
Higher rice yield per farm	176	24	200 (98%)
Savings in seed and fertilizer	153	22	175 (85%)
Others	1	0	1 (0.5%)
Total (N)	181	24	205 (100%)

Source: SRI Farmers' Survey, April 2008

Some women in group interviews reported that they no longer have to hire labor for transplanting and this results in some savings for them.

Survey findings also show that women and men generally agree about the advantages of SRI adoption. Figure 9 below shows this.

Figure 9: Advantages of SRI Methods, by All Adopters Disaggregated by Gender



Source: SRI Farmers' Survey, April 2008

Figure 9 demonstrates that for both male and female SRI adopters, the greatest advantage is also higher rice yield per farm, followed by fewer labor inputs. However, women more than men recognize that savings from non-purchase of seeds and fertilizers is important. SRI promoters emphasize that due to planting fewer rice seedlings and collecting cow dung, farmers can save money. The respondents of the program-wide survey have confirmed this. Women in group interviews said that from their savings, they are able to (i) purchase medicine to address the health concerns of family members; (ii) purchase clothing; and (iii) engage in religious rituals. Women in Khmer households usually manage household budgets and their outflows.

Figure 9 also shows that both women and men recognize the reduction of crop risk during periods of drought – largely due to the lesser use of water for irrigation – but which ranks lowest in their order of benefits from SRI adoption.

3.2 Harms from SRI adoption

Two groups of survey respondents with a three-year experience of SRI adoption were also asked about the disadvantages of adopting SRI. Table 13 below presents their responses.

Table 13: Disadvantages of SRI Adoption According to Two Groups of Farmers with Three Years' Adoption Experience

Disadvantages of SRI Cultivation	Group 1 2005-2007	Group 2 2006-2008	Total
More labor time for weeding	128	22	150 (77%)
More difficult land preparation	133	21	154 (79%)
More time for managing water in the field	140	20	160 (82%)
Lower yield	53	13	66 (34%)
Insects eat / Others	14	0	14 (7%)
Total	172	23	195 (100%)

Source: SRI Farmers' Survey, April 2008

In Table 13, most respondents replied that more time for managing water in the field and land preparation were the biggest disadvantages they had experienced from adopting SRI. In Ou Village, Kandal Province, group interviewees said that the SRI method in water management enables farmers to adapt better to drought or long, dry spells. Rice crops can be watered individually. On the other hand, heavy rainfall is more beneficial to conventional rice farming. As a result, a number of farmers

practice conventional rice farming on one part of their ricefield and SRI farming on other portions that are usually more elevated and drier. ‘We farmers are afraid of too much water so many of us do not apply SRI techniques to our entire fields,’ remarked one group interviewee from Orung Village, Kandal Province.

Further, respondents also expressed more difficult land preparation tasks in SRI farming. Land preparation tasks require a more thorough smoothening and leveling of the paddy field in order to avoid flooding since the seedlings require only a moist, not flooded, paddy. This can lead to women’s greater dependency on male labor, which in the long-term, may discourage its practice altogether since more men are getting employed in non farm jobs that require greater mobility and travel outside the villages.

Adopters are usually risk-averse at first and apply SRI techniques to only a part of their ricefields. They usually do not strictly observe all twelve steps of SRI farming taught to them. And even if uprooting and transplanting fewer rice seedlings use up lesser time, a number of farmers still follow the conventional practice of stockpiling seedlings due to lack of labor to transplant them straight from the seedbeds. For instance, Ms Hing Phan, a female head of household in Ou Village, Kandal Province, recalled, “I was not able to expand the practice of SRI to my entire farm land since there is no time to transplant the seedlings immediately. So I practice the old conventional way of transplanting more mature seedlings of more than 18 days’ growth.”

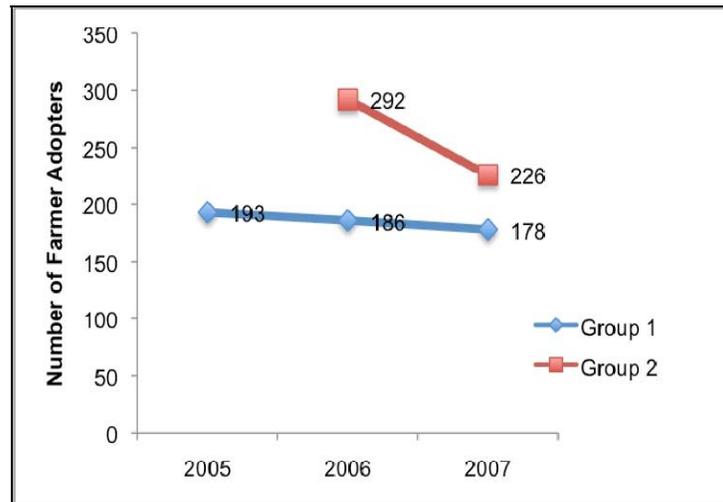
For Tak Morn, aged 53, and Tem Tin, 30, of the same village, they are unable to combine water management – usually over-flooding of paddies – together with transplanting young rice seedlings immediately from their seedbeds. Tak Morn remarks, “I cannot observe the right period of time for transplanting the young seedlings since I cannot do the task hurriedly. I cannot combine transplanting and managing the paddy from flooding.” SRI farming requires less water on paddies, thus there is need to drain out water from low-lying paddies that frequently flood especially during the rainy season.

Additional weeding and plowing have also been the women farmers’ constraints.

Many of them expressed that their husbands are usually helpful, but that more intensive land preparation places more pressure on their husbands to spend time away from non farm occupations.

There have been a few fallouts from the cohorts of SRI adopters. The trends in Figures 10 below indicate this decline among SRI adopters under study.

Figure 10: Number of Farmer Adopters Who Continued to Practice SRI Methods, 2005 to 2007 (Group 1) and 2006 to 2007 (Group 2)



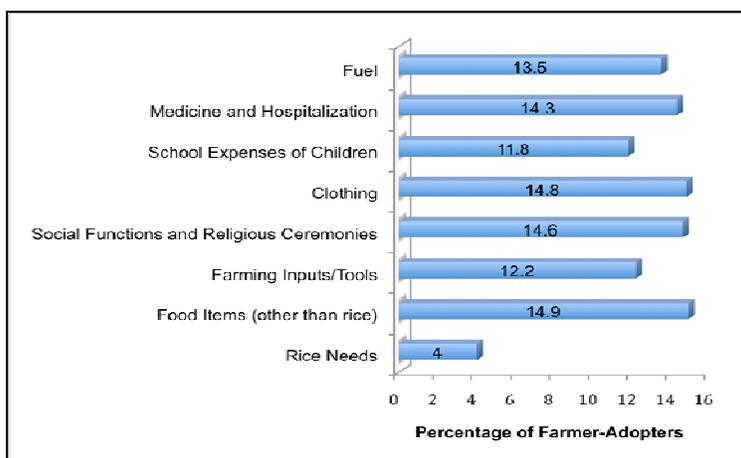
Source: SRI Farmers' Survey, April 2008

Reasons for the fallout of a number of SRI adopters over a three-year period may be attributed to a number of factors. First, the problems associated with irrigation and water management as well as increased weeding cited in Table 6 may have dissuaded some adopters – largely women – from continuing to practice SRI methods, or possibly farming altogether. In a focus group discussion in Beng Village, Angsnoul District, Kandal Province, farmers said that among the top three factors that dissuade them from adopting SRI methods, ‘water management is more difficult in SRI farming.’ Irrigation and water management are largely male activities in rice farming. Men who are currently more engaged with the growing labor market beyond their rural villages, may make it difficult for village-based women farmers to attend to water management needs intrinsic to SRI farming.

Second, the increase in yields does not significantly contribute to bigger household incomes due largely to the marginal nature of agriculture practiced in these parts, which is rainfed cultivation on small farm landholdings as described more in detail in Section 1. The farmers also engage in only one harvest per year due to the lack of irrigation facilities and reliance on rain for agriculture. Thus small landholdings reliant mostly on rainfed agriculture do not generate huge surpluses that result in significant earnings, but contribute instead to food self-sufficiency. Decline in the importance of rice farming as a livelihood source is evident in the fact that in a number of villages, land is increasingly no longer an index of wealth. For instance, in Beng Village, Kandal Province, farmers in a focused group discussion said that the people from 7 landless households in their village generated incomes from work on construction sites, employment in the army and the sale of dry goods in a local store. One non-SRI farmer remarked: “They are better off compared to us. They have no land, they do not need to work on the field or to raise cattle like us, but they have cash incomes. Look at their houses, they are made of concrete with iron window frames, while we have wooden houses.” Access to sources for cash incomes is increasingly therefore the index of wealth in these villages.

Third, SRI and non-SRI farmers in focus group interviews both in Kandal and in Kampong Chhnang attest that rice farming remains largely for household consumption rather than serves as a strong source of income. The program-wide survey registered only 24% of 121 respondents who generate a rice surplus for commercial use. Survey results also revealed that rice sufficiency is at best, only up to 11 months in one year. There is need therefore for most farmers to earn cash to purchase rice for the rice-lean and scarce months, as well as to address other household expenditures. In Figure 11 below, respondents allocate most of their money to food (other than rice) and clothing.

Figure 11: Major Household Expenses of Farmer-Adopters (N=643)



Source: SRI Farmers' Survey

In sum, generating incomes from rice farming to meet household needs has therefore not been lucrative for most farmers, but instead, they are increasingly relying on non farm employment to shoulder the growing costs of living. Water management, labor intensiveness in land preparation that may make women more reliant on male labor that is currently more devoted to non farm work, the need for cash incomes from non farm employment, small landholdings coupled with a single yearly harvest in which rice production is largely for household consumption could then explain why the number of SRI farmer adopters may have decreased over the last three years.

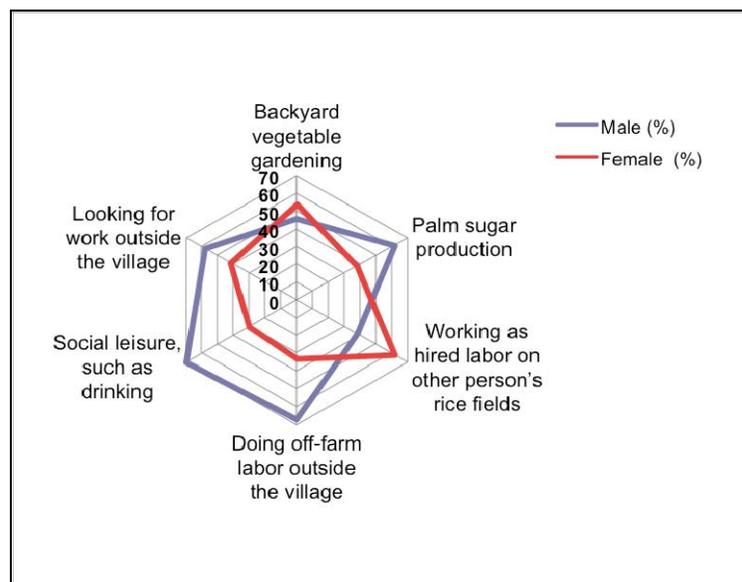
Therefore, it is important to note that in view of the current lack of government support to agriculture and the emergence of other cash-generating non-farm livelihoods, farming has been rendered largely as a residual livelihood. Farming could serve as a 'food security safety net' that allows for household members to pursue other livelihoods beyond agriculture. Potentially, rural villagers may retreat to farming when non farm livelihoods contract, or when cash incomes cannot cope with rising food and rice prices. Farming has become a refuge for highly mobile migrant rural labor, and being such, has acquired a feminine face. It may then not be surprising that farming has often been left in the dutiful care of mothers and older women.

More on this in the section that follows.

3.4 How is free time from farming being spent? Some unintended outcomes from SRI adoption

The study also explored how SRI adopters were spending their free time that result from lighter farming workloads. Respondents said that they spent their free time away from farming for other activities. They reported differences in these types of activities. In Figure 12, for instance, men allocate their free time from farming to non farm work and social drinking. In contrast, women work as hired labor on other people's farms and engage in backyard gardening.

Figure 12: Allocation of Saved Labor Time From SRI Farming to Different Activities by Percentage of Women and Men (N=636)



Source: SRI Farmers' Survey, April 2008

Interviews with women SRI farmers in the provinces of Kandal and Kampong Chhnang largely concur with the program-wide survey findings regarding the use of freed labor time. In the focus group interviews with SRI women farmers in Kandal, there was general agreement that SRI adoption has freed them from the tedious job of uprooting rice seedlings from seedbeds and stocking seedlings for several days prior to transplantation. When they stocked the mature seedlings, they had to wipe off mud and brush off small weeds that were pulled out together with the seedlings. SRI has truncated the stocking procedure by enabling the women to transplant younger seedlings directly onto paddy field. Transplanting fewer seedlings was faster and

more manageable. Uprooting fewer and younger seedlings did not tire the women, thus lightening their task and shortening the time for it. Plowing and weeding, however, have taken more time.

One woman in a group interview said, “We now have more time to look after our children, sew and clean more. We now only spend 1-2 hours in the field, at about 7 to 9 am, and in the afternoon at 4 to 6 pm. We can also work during the hours when sunlight is not too strong. Unlike in conventional farming, we have to spend all morning and most of the afternoon in the field.”

In Kampong Chhnang, women from focus group interviews said that they are now able to spend more time for livestock and poultry raising: “We can now spend more time cleaning chicken pens than before. However, we spend a lot of time weeding the ricefield and manage the water in the paddies since the men also work outside the village. Besides all this work, we also attend village meetings now more actively,” remarked the leader of the group.

Over-all, there seems to be widespread consensus that older farm women have been freed from the pre-transplantation requirements of heavy uprooting and stock handling of the seedlings. Less attended household reproductive work and multiple backyard livelihood activities, especially in remote villages in Kampong Chhnang Province, now take up their free time from farming. Husbands and younger women, for their part, have responded to growing income opportunities beyond their villages.

Most group and individual interviews with women farmers have confirmed freer time from farming that is now being allocated to reproductive work. They are generally satisfied with this outcome, since they are aware that the labor markets beyond their villages only absorb younger female labor and male labor. Farm women also appreciate that they have more time for village meetings, and this has increased the public face of women in the rural areas. For some, it has meant leadership roles such as those by female farmer promoters who successfully and continuously adopted SRI farming. Freer time and new farming skills provided them with opportunities to travel to other provinces to train other farmers. It must be acknowledged that this is an empowering experience for women farmers generally. They remain unaware,

however, of the declining status of agriculture at a time when the country is making more strides toward industrialization, which is simultaneously stimulating urban-directed mobility. It may be worthwhile, therefore, to juxtapose the situation of older women against the dimming prospects of an invigorated agriculture sector in Cambodia, and to find ways and means by which the empowerment of women farmers can be sustained and even expanded under these rapidly changing socio-economic circumstances.

4. Processes of Adopting SRI Farm Techniques

4.1 Enrolling farmers to adopt SRI farming

Ms. Chariya from Orung Village, Kampong Chhnang, is 36 years old with three children, has been practicing SRI farming since 2005. Prior to 2005, she started to join skill training sessions and meetings organized by CEDAC. Apart from SRI, other skill trainings included vegetable cultivation and fish farming. She was initially not sure about the results of SRI farming, which was why she did not adopt it immediately. In 2005, Ms Chariya learned from Ms. Srey Pouv – a farmer promoter in her village about the high yield of rice that results from employing SRI methods, specifically by using fewer seeds and less time spent for transplanting. This made her decide to try SRI methods. She first applied SRI techniques to her land of about 100 sq. meters and was able to produce 2 *tang* (24 kg) of unhusked rice that year. It was a good yield for her because she used to produce only 0.5 *tang* (6 kg) of rice from the same land with the use of conventional rice cropping methods. In 2007, Ms Chariya expects to produce 3 *tang* of rice. She is also successful in other agricultural activities such as raising fish and chickens. She farms 700 fish and raises 30 chickens in her backyard. All these are enough for her to meet her household's basic essentials.

Many other women SRI adopters share Ms Chariya's accounts of adopting SRI farming and successfully increasing their rice yields. CEDAC begins imparting farming techniques of SRI through training sessions.

Farmers learn SRI methods through CEDAC extension workers or key farmer promoters from their own or nearby villages. These key farmer promoters are usually the first 3 to 10 cohorts of trainees who have succeeded in their own field trials of SRI

farming. They are able to demonstrate the farming techniques on-site and provide evidence of higher yields to other farmers.

For instance, in 2004, a farmer trained by CEDAC came to promote and train local farmers SRI farming methods in Beng Village, Kandal Province. Farmers from only three households were interested. Adopters from one household applied SRI techniques to their rice field of 1,000 sq meters. Then in 2006, all 3 households applied SRI techniques to their entire farm plots. These three households doubled their harvests in the same year, thus attracting great interest from other farmers. By the following year, 2007, farmers from 56 other households adopted SRI, learning from the three pioneer families in the village. Participants in training sessions recall that it was easy to observe the practice of the pioneers and to ask questions. They found it easy to learn from fellow farmers. In seedling management, these farmers wait for rice seedlings to mature for only 15 to 18 days, a much shorter period than the traditional 30-35 days. However, only three out of the 59 households apply SRI techniques to their entire ricefields. They still remain as key farmer promoters and are often sent to other provinces to train other farmers as part of the CEDAC program on capacity building for SRI farming. The rest (56), however, apply SRI techniques to only half their ricefields.

Women farmers make up the majority of trainees for SRI farming. Group interviews in Kandal and Kampong Chhnang Provinces revealed that this is a consequence of women staying in their villages most of the time compared with their husbands. Additionally, women are generally considered ‘primary farmers.’ Women farmers expressed this in the interviews:

‘Women here are primary farmers and men are secondary farmers. Men only plow the land. So women want to know and learn more about new farming methods and related news about this.’ – Ms. Eab Chong, *Chung Ruk Village, Kandal Province*

‘Women have more experience in farming so they wish to know more about the new technology.’ – Mr. Khem Pat, *Ou Village, Kandal Province*

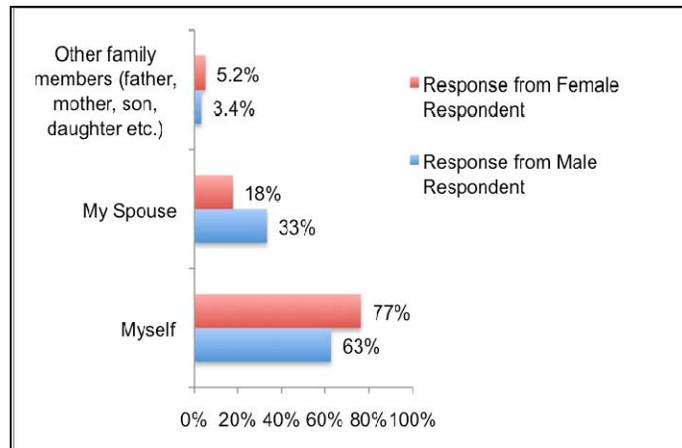
‘Women always stay home to do housework and remain in the village. So they have more time to participate in the trainings. Unlike women, men work outside our village.’ – Ms Dy Chntrea, *Beng Village, Kandal Province*

‘Men are busy collecting fuelwood to sell and other types of work. They do not have time to learn new farming skills.’ – *Mr Morn Sarom, Orung Village, Kampong Chhnang Province*

‘Women have the responsibility to look after the ricefields and stay mostly at home or in the village. Unlike women, men work outside the village.’ – *Ms Men Chan, Orung Village, Kampong Chhnang*

The opinions of informants underscore women’s central role in farming, particularly in adopting new farming technologies. The program-wide survey also demonstrated that within households, women – more than men – were first to participate in the acquisition of skills in SRI farming (see Figure 13 below).

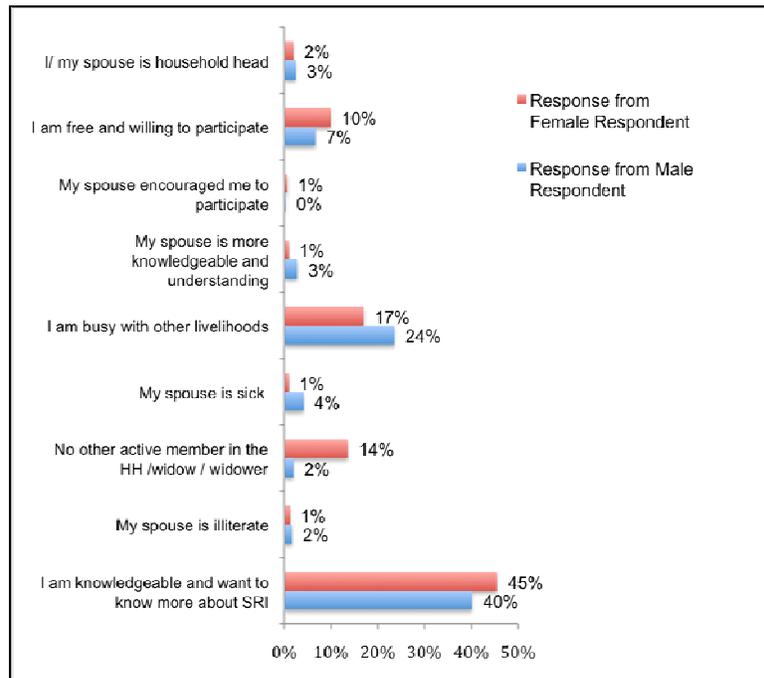
Figure 13: Household Member Who Trained in SRI Techniques (N=643)



Source: SRI Farmers’ Survey

Additionally, the program-wide survey also revealed the justifications underlying women’s central role in SRI training and adoption, as demonstrated by the responses of women and men in Figure 14 below. Female respondents cite their experience and knowledge in farming as the most important justification for their interest and involvement in SRI training and adoption.

Figure 14: Reasons for Involvement in SRI Training and Adoption by Women and Men (N=643)



Source: SRI Farmers' Survey

Village group interviews have revealed that mostly farmer promoters and to a lesser extent, CEDAC extension agents, trained interested farmers – mostly women – on the 12 steps of SRI farming. They demonstrated these steps, on-site. In Orung Village, Kampong Chhnang Province, for instance, farmers were trained in SRI farming in 2002. The following year, the same 37 cohorts (31 women and 6 men) were trained to initiate other livelihood activities beginning with the formation of a women's savings group. They were later taught skills for aquaculture, frog and poultry raising and vegetable gardening. In some other villages, the government complemented CEDAC's capacity building efforts with skills training on hog raising. As an outcome of CEDAC's capacity building initiatives, three committees have been created: savings group, aquaculture and vegetable gardening.

In Tropang Kor Village, also in Kampong Chhnang, CEDAC first recruited two male farmers to conduct SRI demonstration farms. In the second year, these two farmer promoters trained 17 other farmers from 17 households. In the third year, SRI farming was taught to an additional 90 farmers. In these last two years, more women

participated in the trainings by the farmer promoters. Farmer promoters were chiefly influential in the spread of knowledge and skills on SRI farming, rather than CEDAC extension staff themselves. Most individual interviews with farmer adopters also confirm that they learned most from farmer promoters.

The group and individual interviews in both Kandal and Kampong Chhnang Provinces underscored the key importance of organizing a savings group. All 14 group interviews and 24 individual interviews in these provinces convey the importance of the savings group and women's involvement in them. It is around this group that women congregate and gather, and where they are also able to share progress on their SRI farming. Interviews with women express the importance of this group's formation and its link with SRI farming.

'Women are very interested to participate in the savings group since they are more powerful in terms of budgeting their money which their husband gives to them. Husbands usually trust their wives to keep the money that is needed to pay for the family's needs. Therefore the women are interested to save their money in the savings group. Being part of the savings group, women are able to take loans with a very low interest rate. For every 10,000 riels borrowed from the group, we pay only an interest rate of 3000 Riels monthly.' – *Ms Moch Son, Chung Ruk Village, Kandal Province*

'The savings group has attracted women the most because this group addresses their immediate cash needs.' – *Ms Ouy Kim, Beng Village, Kandal Province*

'There are 5 savings group in this village established and managed by CEDAC and BASAC, another NGO. Women are most active in the savings groups. Women are most active in this group because these are women-only groups. This is the policy of CEDAC and BASAC. Through this group women can share experience and the SRI method to each other and other information and consult each other when they have problems. Savings groups make donations to repair water canal and repair pagoda.' – *Ms Nheb Sat, Tropang Kor Village, Kampong Chhnang Province*

'In 2002 CEDAC staff conducted several trainings on SRI method and other skills (such as animal husbandry, fish raising, vegetable cultivation) among the villagers including the village chief. CEDAC has also established savings groups. Each of these groups consists of 25 members and most of the members are women. Among these savings groups there are 5 women who are active. They always participate in CEDAC activities and CEDAC has also arranged exchange visits for these women to other provinces to get and share SRI-related experiences. These 5 women have disseminated information and knowledge on SRI and other farm activities to the members of savings groups through monthly meeting of the groups.' – *Ms , Lay Tet Keng, Tropang Kor Village, Kampong Chhnang Province*

'The villagers have created the 'savings group' with support from CEDAC. Women in this group are most active compared to other groups in the village. CEDAC gives more space and privilege to women through 'savings groups'. – *Group Interview with Long Sorn, Chan Lot, Men Chan, Loch Lay and Sieng Chan Set, Orung Village, Kampong Chhnang*

CEDAC's strategy of creating savings groups and conducting trainings for multiple backyard or village-based rural livelihoods has served as a potent pathway for recruitment and enrollment of women into SRI farming. In an earlier section, SRI adoption lightened some of women's farm tasks, providing them more time to fully attend to reproductive work. Backyard livelihoods and savings opportunities complement and reproduce socially embedded and traditional gender ascriptions of Khmer women's work and their obligations of care.

Older women, being mostly mainstay farmers, were logically the constituency enrolled by CEDAC and farmer promoters into SRI adoption. It is unclear whether CEDAC took the opportunity to raise awareness on gender issues in agriculture, the wider economy, and in other spheres of their social and personal lives. In their 2006-2010 program, CEDAC aims to "Strengthen the capacity of 100,000 women in farm-household management and enable them to participate in local development through group training and an exchange program" (CEDAC Summary of Strategic Plan, 2006-2010). This goal links well with the interviews and discussions with farmers and CEDAC representatives throughout this study: it appears that CEDAC is principally pursuing a productivity-oriented approach to rural and sustainable development, and mobilizing rural women towards this end. This means that the envisaged program outcomes are greater agricultural productivity and food security in ways that are environmentally sound. Older farm women are therefore enjoined to realize such goals. However, there is little being done institutionally to raise awareness on or draw attention to gender issues and the social status of older women vis-à-vis men, younger women, and the changing social and economic landscape. There is little said about their disproportionate obligations of care and reproductive work, or of the narrowing opportunities for older women as they are increasingly confined to the obligations of farming and food provision at a time when agriculture occupies a very low place among national development priorities. It appears therefore that food security goals are being met somewhat at the expense of greater gender equality for older women.

4.2 Female-headed households and their adoption of SRI farming

Of the 2.5 million households in Cambodia, women head 29%. The percentage of female-headed households is slightly higher in rural areas (29%) than in urban areas (28%) (Royal Government of Cambodia, 2004).

In the village of Orung, Kampong Chhnang Province, a focus group discussion with mixed farm women and men revealed that among 116 households, 26 are female-headed, and among these female-headed households, 11 adopted SRI farming methods. These women do not have land preparation implements or draft animals, thus they farm with others through exchange labor arrangements and share their rice harvest. They are women aged 30-47, who no longer wish to venture outside Orung for non-farm or factory work. “If we do not have daughters who go to work in factories, we rely solely on rice farming. Rice farming, despite many other opportunities outside our village, is still the most stable livelihood,” said Srey Pov, one female head of household and a consistent farmer promoter.

Other women household heads benefited more from the livelihood training sessions on aquaculture and poultry-raising, rather than from training for SRI since they have weak access to male labor for land preparation tasks.

Female heads of households in the same village who do not have draft animals have found it difficult to employ SRI farming because other households will not want to dispatch their draft animals to plough their fields under the SRI system, which requires more labor time. Being dependent on labor exchange for land preparation, SRI adopters from female-headed households do not easily find labor exchange partners with draft animals, therefore a number of them minimize their practice of SRI techniques on their ricefields.

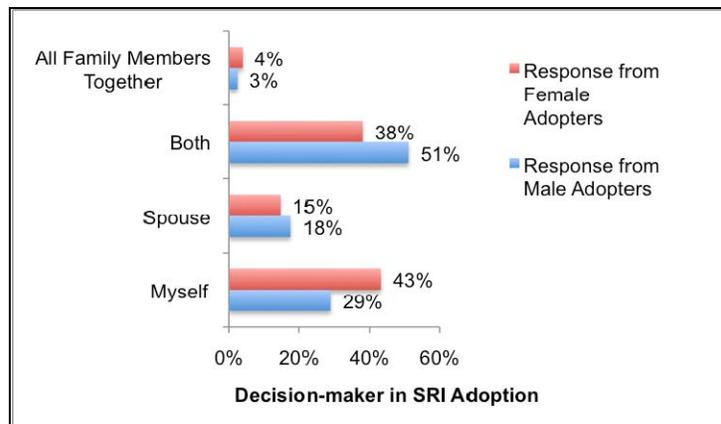
Other female heads of household like Hing Phan, aged 64, has adopted SRI farming, but is unable to strictly follow the more intensive plowing and land preparation technique since she does not have enough equipment and only has irregular access to male labor. For Ros Son of Tropang Kor village, Kampong Chhnang Province, joining the savings group was more beneficial since like other female heads of households, she has difficulties in land preparation but at least can access needed cash loans during critical periods. From the interviews, it appears that women who head their own households are more risk averse than women from male-headed households since they have weaker access to male labor and to partners in labor exchange arrangements who have SRI skills. However, for those who have adopted SRI

farming, they form part of labor exchange parties that have adopted SRI farming methods. These are however few, suggesting therefore that risk aversion among women farmers is mediated largely by their access to supportive networks that provide labor and other farming needs.

4.3 Negotiating SRI farming within households and co-villagers

Adopting a new farm technology is a fairly complex process especially for small-scale farmers whose survival rests on the productivity of their farms. Farmers are generally risk-averse in order to maintain a reasonable level of food security. Earlier sections disclose their risk-aversion in several ways, such as in their partial adoption of SRI steps and partial application on ricefields, gradually creating a firmer critical mass of adopters over time, not without its share of fallouts due to a combined set of factors. Adopting SRI farming methods has proceeded alongside the steady growth of other livelihood opportunities, both farm and non farm. It is against this context, that decision-making in SRI adoption does not present a consistent, uniform picture. From the program-wide survey, we see that women see themselves as the main decision-makers with respect to SRI adoption. This is supported by responses from male adopters. See Figure 15 below.

Figure 15: Who Decides to Adopt SRI Methods?



Source: SRI Farmers' Survey

The narrative accounts, however, show more complexity.

Ms. Kut Loueng, Orung Village, Kampong Chhnang

Ms Kut Loueng said that her husband opposed her a lot when she told him about SRI method. Her husband disagreed to change the rice cropping method to SRI from the conventional one. He said that using a single seedling instead of a bunch of seedlings for transplantation was unbelievable and will not result in good yields.

She did not agree with her husband since he does not usually help her in agricultural work even with conventional farming. She started to produce rice with SRI methods with the help of her children.

Ms Soun Thear, Tropang Kor Village, Kampong Chhnang Province

‘My husband is a village chief and he taught me SRI farming. I didn’t want my husband to follow this method because we are using traditional method for rice farming from our parents, so we should not change. Then my husband tried to apply this method on 2mx4m of my land by himself even when I disagreed. From this, my husband got good results (high rice yield) then I started to change my idea and follow my husband to do SRI method on my whole land. Since then, I have disseminated this method to all saving group members and they do follow me because they know I have a high rice yield in every year.’

Ms Sok Chariya, Orung Villlage, Kampong Chhnang

Ms. Chariya did not encounter any challenge or opposition from her husband to adopt the new method of rice cropping. She says, ‘I used to share the knowledge and idea of SRI and other skill trainings of CEDAC with my husband. He is a soldier and works far from home. He always encourages me to be involved in new things, even to change the rice farming system to SRI from the conventional one.’

She also disseminated the results and impacts of SRI method to her relatives and neighbors inside and outside the village. She said the male heads of households did not listen to her. They always criticized the possible failure of very few seedlings to grow after transplantation. They saw that only a few days’ old young seedlings are transferred to the plantation site directly from the primary seedbed for transplantation.

Women in a group interview conducted in Orung Village, Kampong Chhnang, reported that their husbands protested or disagreed to adopt the new method of rice cropping. They were anxious about the yield of rice using SRI methods. The men thought that their families would experience food shortages. However, the women said that they did not oppose their husbands. Instead, they began to grow rice using SRI methods in small portions of land to demonstrate the effectiveness of the method to their husbands in order to convince them. Eventually, with the high yield and simplicity of SRI methods, their husbands were finally convinced to adopt SRI in full scale.

The accounts demonstrate that some early adopters were able to convince their spouses through the evidence of higher rice yields. However, the process was not straightforward, and for some the disagreement remained. In other cases, husbands seemed to care less about farming in general, including SRI, most likely due to their non farm occupations. On the other hand, other husbands and wives jointly make decisions on SRI adoption, which is probably the case for those whose reliance on farming remains more than with non farm and non sedentary livelihoods. Generally, however, women farmers are free to decide on the employment of SRI methods. Yet they are exercising this autonomy within a domain that is growing increasingly marginal vis-à-vis the changing livelihoods of rural populations in Cambodia.

Making decisions to adopt a particular technology also departs from a purely productivist reasoning or rational choice that point only to economic gain as an outcome. Decision-making also involves more iterative ways with which people decide, depending largely on one's life history and experiences, social networks and socio-cultural and gendered elements that re-assign women and men to take up certain types of work. The case below demonstrates that life's historical antecedents and experiences influence the decisions people usually make in the present.

Kum Oum, 28 years old, Beng Village, Kandal Province

Oum has been engaged in rice farming since she was 15 years old. Her husband is from a different district in Kandal province and he began living in this village since 1998. They work on her mother's land. Her husband also has land in this village that he had exchanged with land in his former district. So Oum and her husband now cultivate two lands – 1 kilometer away from each other.

In the past, they hired three female farm workers to uproot seedlings and to harvest ripe crops. The payment for hiring workers came from the sale of cattle. Every year, he sold cattle. Her husband cares for and sells the cows.

It was her husband who received training on SRI from CEDAC. He later taught Oum the methods and both adopted SRI five years ago. In the first year, they applied SRI to only part of one land. It was only in the 3rd year, that they applied SRI to all their lands. It was mainly her husband who observed the results of SRI and so it was he who decided to apply SRI methods to all their lands. What convinced her husband was that it took only a few seeds to harvest a greater yield. In the past, what was difficult for her was to uproot and then transplant the seedlings, and then carrying the seedlings to the field. During a drought period, half the crops were damaged, so they had to repeat the process. Again for this, her husband hired female farm workers.

In the preceding case, the male farmer principally decided for SRI adoption, as he is the one who also usually decided on hiring labor and the sale of cattle. Decision-making is thus an outcome of past practices and contingent circumstances that draw from re-creating gendered elements of work and obligation. It thus also appears that he does not engage in any other livelihood other than rice farming.

SRI adopters also reported numerous instances of resistance to SRI adoption from neighbors and relatives. Below are some of them.

Ms Tem Tin, Ou Village, Kandal Province

I did not face any resistance from my husband in changing to the SRI method. Because he didn't care much about this he let me go ahead with it and learn for myself. I have disseminated the method to other villages, and I received resistance. They adhere to the traditional method of plantation strictly. They questioned how one seedling can become many seedlings, and whether a seedling can survive if it is transplanted too early. They said that in traditional method, 4-5 transplanted seedlings can still die, so how can one seedling survive and become productive? They also said that the space between transplanted seedlings is too far to yield good results.

Poul Srey Pouv, Orung Village, Kampong Chhnang Province

Srey Pouv is the Deputy Village Chief so she has the opportunity to disseminate SRI methods and other skills that she has learned from CEDAC. But the villagers didn't believe and accept what she disseminated, particularly the SRI method. They were unlikely to give up the traditional practice of rice cropping. However, she kept sharing her knowledge with them. In 2004, five households started using SRI methods after achieving a high yield of rice. By 2007, the number of families adopting SRI method increased to 33. Among these 33 families, only 8 families follow all major steps of SRI.

Ms Lam Na, Orung Village, Kampong Chhnang Province

Ms Lam Na learned SRI methods from her husband. She has also shared these methods to other villagers but they didn't believe her, especially the women. They think that the traditional methods learned from their parents are better than the new SRI ones.

It appears that conforming to traditional rice farming methods that farmers have learned from parents is valued highly. Interestingly, this value for traditional knowledge mixes with the more practical concerns of productivity and crop survival, which all feed the skepticism of farmers when they learn about SRI farming from adopters.

Conclusions

At the outset of this study, specific questions were formulated to investigate the following issues:

- The roles women and men played in conventional and SRI rice production and whether these were changing;
- Changes in the systems and relationships in production and how these were affecting women and men;
- Resources and support services available to women and men;
- Decision-making on SRI adoption among women and men and within communities;
- The impact of benefits derived from SRI adoption on women and men;
- Environmental changes attributed to SRI adoption and whether these bear on women and men's welfare and livelihood security;
- The linkages to external conditions such as development, nature of social organization and labor markets with SRI adoption and the implications of this relationship on household gender relations.

The study proceeded in four steps: first, qualitative interviews in the provinces of Kandal and Kampong Chhnang, initially selected for these provinces' high incidence of SRI adoption; second, large-sample SRI farmers' snowball surveys in selected villages in these provinces; third, a CEDAC program-wide survey of randomly selected 643 SRI farmer respondents; and fourth, relating field data with documentary information, official statistics, and relevant studies. The second and third stages of the research were intended to test the pervasiveness of the earlier farmers' responses in the first phase to a wider sample population. The fourth stage served the purpose of triangulation and information gathering for the broader meso and macro socio-economic changes and government initiatives.

In addressing the research questions (paraphrased by the issues above), it is important to reiterate the fundamental premise of this study: agriculture in Cambodia is embedded within a changing social and economic landscape that influences the

extent, processes, and outcomes of SRI adoption by female and male farmers in the sites under study. Indeed, there are secular trends at work in the broader context beyond the household and the village, which impinge on SRI program results.

Rice agriculture is generally rainfed and farmers produce only one crop yearly. Support from the national government to the agriculture sector remains weak and favors strengthening the industrial and services sectors in urban areas. Landholdings in the sites under study are generally short of one hectare, thus for most farmers, rice farming is much more a subsistence crop than a commercial crop. Those who have adopted SRI methods report an average of about 50% increase of rice yield per harvest compared with conventional farming, and which increases household levels of rice sufficiency. Concurrently, people engage in agriculture together with other growing livelihood and employment opportunities in urban and peri-urban areas in Cambodia. The study reveals that men across all ages are increasingly working in non-farm occupations beyond their villages, while women sometimes younger than 20 are working in garment factories in Phnom Penh and in provincial towns. In recent years, livelihoods have diversified into a multiple portfolio of income sources that crosscut rural and urban divides, create a hierarchy of income gains from different types and locations of labor employment, and structure gender-specific labor markets. The rate of engagement in the urban economy and livelihood diversification by rural households are highest in provinces geographically closest to Phnom Penh. In the face of greater mobility of rural peoples and expanding non-farm opportunities, older, married women beginning in their 30s and over have instead become a sedentary presence in the rural villages. They continue to do farming, and it is not at all surprising that they are the recipients of SRI training by CEDAC and other extension agents.

Historically, female and male farmers share many of the tasks in conventional rice farming. Men, however, performed land preparation tasks, while seedling preparation and weeding were commonly assigned to women. All others – harvesting, uprooting, transplanting – were generally shared tasks. These divisions of labor have not significantly changed with the adoption of SRI methods. There is some indication that transplanting and uprooting are being increasingly left to older women farmers with lesser assistance from male farmers. The study instead shows that the volume and

heavy labor components of uprooting and seedling preparation have lightened, and as a result, have provided women more time for domestic work, paid work on other farms and backyard livelihoods. On the other hand, for men, land preparation tasks have become more intensive due to more meticulous seedbed preparation tasks and leveling (SRI Steps 1 and 3, see Figure 4), while weeding due to less flooded paddies has also taken up more time from women, although SRI proponents argue that this activity serves to aerate the soil for better productivity. These findings support earlier studies where similar outcomes were observed.

Female SRI adopters said they now have more time for reproductive work such as cleaning their homes and childcare, and for some, this has also allowed them to work as farm laborers and further engage in backyard livelihoods. Men, on the other hand, are able to devote their time more fully to non-farm work beyond their villages, apart from engaging in social activities since they usually perform land preparation tasks on relatively small plots of land. Findings also show that adopters mostly practice SRI methods in seed selection, transplanting, applying soil nutrients and weeding (largely women's tasks), but least practice the more complicated tasks of water management and transplanting in a square pattern. Farmer adopters, however, have also expressed that lesser use of water is an advantage especially during increasingly dry weather conditions in Cambodia, and for some adopters, this reduces the risk of crop failure in view of increasing environmental and climate changes experienced by farmers.

Female adopters said that the savings from purchasing seeds and fertilizers was a chief benefit they derived from practicing SRI farming, while both female and male adopters agreed that higher yields, lesser labor inputs in transplanting and the reduction of risk in crop failure due to drought were other noteworthy benefits. Adopters, however, also cited more weeding, more difficult land preparation tasks, more complicated water management and transplanting procedures as the downside of SRI farming. Female heads of households are particularly disadvantaged since they have weaker access to male labor for land preparation and rely heavily on reciprocal exchange labor arrangements in farming. These arrangements do not always guarantee a party of knowledgeable farm co-workers in SRI methods. Additionally, dependency on male labor for land preparation tasks is unsustainable in view of the increasing number of rural men who are taking up non farm livelihoods beyond their

villages. This may explain a small decline in the number of SRI farm adopters.

The decision to adopt SRI farming was less contentious between women and men contrary to earlier expectations. Most female adopters reported that their husbands supported their decision to adopt the new technology. Some early adopters were able to convince skeptical spouses through the evidence of higher rice yields. In other cases, husbands seemed to care less about farming in general, including SRI, most likely due to improved incomes earned from non-farm occupations. On the other hand, other husbands and wives jointly made decisions on SRI adoption, which is probably the case for those who rely more on farming as a central livelihood, rather than on non-farm and non-sedentary livelihoods. Although not straightforward, women farmers are generally free to decide on the adoption of SRI methods.

Farmer promoters and to a lesser extent, CEDAC extension agents, trained the farmers – mostly women – on the 12 steps of SRI farming bundled with skill training for backyard livelihoods such as aquaculture, poultry and vegetable gardening. They were mostly women since men were preoccupied with other income sources besides agriculture. It is possible that men could have been trainees as well if this were not the case. There were a number of female farmer promoters in the SRI training program who traveled to other provinces. Their travel and allowances were covered by CEDAC, but this was not regular employment for them. Trainings also took place during the non-peak labor periods such as before and after transplanting and harvests, to ensure that both the farmer promoters and the farmer trainees are available.

Farmer adopters, for their part, conveyed the importance of the formation of savings groups and women's involvement in them. It is around this group that women congregate, and where they are also able to share progress on their SRI farming and backyard livelihoods. Creating savings groups and training for backyard livelihoods have served as effective pathways for recruitment and enrollment of women into SRI farming since they resonate with feminine ascriptions of household income management and feminine identity in the villages. These enterprises provide immediate cash and incomes to the older women who remain in the villages, and which has become important since rice farming is still primarily a subsistence, non-commercial activity for many farmers. SRI farming combined with these enterprises

also serve a status-enhancing function for the women since apart from being income earners, some have become SRI farmer promoters to other villages.

They are, however, exercising this autonomy within a domain that seems to be increasingly residualized vis-à-vis the changing livelihood patterns of rural populations in Cambodia and in many parts of Southeast Asia, where the agriculture sector provides a broad basis for support for industrial growth and urbanization by providing cheap migrant labor, food and social reproduction (Razavi, 2003). CEDAC, for its part, has indeed enjoined women into its SRI agricultural productivity program, but has not explicitly addressed gender and power issues in SRI farming and livelihoods, in the wider social and economic environment, and in people's personal lives.

In view of the current lack of government support to agriculture and the emergence of other cash-generating non-farm livelihoods, farming currently serves as a 'food security safety net' that allows for household members to pursue other livelihoods beyond agriculture. This bodes well in view of the current escalating prices of rice and food commodities, since SRI may have contributed to enhancing farmers' resilience against the shock of these prices, although this has yet to be examined thoroughly. Potentially, rural villagers may also retreat to farming when non farm livelihoods contract, or when cash incomes cannot cope with rising food and rice prices. Farming has become a refuge for highly mobile migrant rural labor, and being such, has acquired a feminine face. Therefore, it is not surprising that farming is often left in the dutiful care of mothers and older women, a process akin to 'housewifization,' or which is often referred to as the 'feminization of agriculture.'

It is instructive, therefore, to juxtapose older farm women's situation against this backdrop of a stagnating agriculture sector and its diminishing prospects for invigoration, and to find ways and means with which the empowering gains of women SRI farmer adopters can be expanded.

Recommendations

There is need for rural development programs to seriously come to terms with the increasing linkages between rural and urban areas characterized by heightened population mobility, globalized labor markets that absorb cheap, female labor, and more diversified, multi-local livelihoods that re-configure gender and other social relations. Human well-being and gender equality have become an imperative in view of the rapidly changing socio-economic terrain, as people make choices that often do not lead to long-term livelihood security and sustainability. With good intentions, extension agents may inadvertently enroll women into their rural development programs without a view to redress and transform unequal gender and power relations that disadvantage women in the first place.

In particular, there must be a conscious effort to expand the choices and opportunities of older women and female heads of households who are being confined to agriculture and reproductive work in the villages. Reproductive work should be consciously and jointly shared with men in order to truly free women's time. Younger women and men venturing into short-term factory employment should learn of their rights to fair wages and gainful investments of their labor and savings. In short, human and social resilience should be strengthened to confront the growing insecurity and complexity of livelihoods and new risks in emerging employment, as well as unfair practices that marginalize groups of rural women, men and young women.

That said, the following are recommendations of the study for Oxfam America's policy and programming :

1. Build on and raise greater gender awareness in current local formations such as in savings groups to expand and transform them into vehicles for the political self-organization of women to strengthen their claim-making capacities. Strengthened claim-making capacities will enable farmwomen to
 - a. engage with local authorities and NGOs to provide more infrastructural and technical support to agriculture such as irrigation and market

facilities;

- b. engage with men and raise their awareness about the need to jointly share in reproductive care activities in the household;
 - c. explore possibilities for viable extra-village enterprises that will enable women to expand their earning opportunities;
 - d. address relevant gender issues and redress inequities at the family and community levels, and especially address the livelihood and farming needs of women from female headed households.
2. In view of heightened livelihood diversification, SRI farming should not be promoted in rural areas in a uniform way. It will be useful to conduct a spatial mapping exercise to identify and prioritize villages or provincial districts where SRI farming can truly be more value-adding in terms of (i) enhancing food security, (ii) increasing gender equality, (iii) environmental sustainability and (iv) income-generation. At present, these should be places where rural male and female labor is still highly devoted to farming, and relatively least channeled into urban livelihood activities. This is to optimize the productivity of premium labor in farming in particular places where it can potentially still be highly productive in farming rather than in the urban economy. This situation may be due to the current limitations young women and men could face, such as difficult roads, transport or lower literacy. Promoting SRI farming today in places where rural labor is strongly absorbed by non farm and urban employment could address food security needs, but with no expectation that farming will intensify or further expand under the present circumstances of weak state support for the agriculture sector. Priority setting based on a spatial mapping exercise should be reviewed periodically to monitor changes, evolving government plans and their possible impacts on agriculture and farming incomes, such as for example, the possible expansion of rural irrigation and road infrastructure in a particular region.
3. Build on current knowledge and skills in SRI farming and integrate these with

water management and resilience building especially in view of increasing drought and flooding brought about by environmental and climate changes. Ensure that both women and men equally engage in these activities.

4. Capacity building for SRI in villages should not be a stand-alone program. Instead, a basket of farm and non farm livelihood projects could offer resource building tools and trainings for rural women and men on SRI farming, employment rights and entitlements, entrepreneurial skills and other relevant trainings that may be custom-designed based on the local livelihood context. An inter-agency network of organizations can provide a multiple livelihood enhancement program, where each organization could contribute its particular competencies. Components of this program should be based on an analysis of effective demand for labor, products and the gender configuration of workloads, knowledge and time, in an area-wide assessment of the local economy and changing livelihood patterns.
5. Increase the capacity of CEDAC for gender analysis and gender-responsive programming through gender awareness raising and gender mainstreaming skills enhancement.

Other recommendations for organizations engaged in rural development in Cambodia:

1. Greater engagement with national policy actors to strengthen infrastructure and technical development in agriculture for a more geographically and socially equitable development that places priority in gender equity and human well-being for those living in both rural and urban areas of the country.
2. Capacity building and awareness-raising programs on urban employment conditions to ensure that those who engage in non-farm employment can make gender-fair claims to security of tenure and fair wages.
3. Gender-awareness raising and gender mainstreaming skills training among agricultural government extension agents.

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