A study on farmer behaviour change and household decision making in Svay Rieng

SNV

Connecting People's Capacities

Preface

This report was prepared for SNV Netherlands Development Organisation as part of our ongoing programme in the vegetables value chain.

Fieldwork for the report was carried out over a three week period between June and July 2011. The report involved the analysis of background data, field trips, focus group discussion, participant observation, a survey and key informant interviews.

The author of the report is Emmanuel Santoyo Rio. The survey team comprised of Ngy Sophorn, Ly Sereyrith (SNV), Sun Heng (SNV), Sdoeung Van Youthea (IDE), Bou Sitha (IVY), Tep Ratha (CFAP), and ten students from the University of Svay Rieng. Data entry was carried out by Try Chhon Huot and data analysis was conducted by Sothy Eng.

Special thanks must go to the many key informants, farmers and their families who generously gave their time to take part in surveys and focus group discussions, and allowed students to observe their daily activities.

The views expressed in this report are those of the author and do not necessarily reflect the views of SNV Netherlands Development Organisation, International Volunteers of Yamagata, International Development Enterprises or the Cambodian Farmers Federation of Agricultural Producers.

SNV
Connecting People's Capacities
Netherlands
Development
Organisation

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Basic Facts about SNV

Our Mission

SNV is dedicated to a society where all people enjoy the freedom to pursue their own sustainable development. We contribute to this by strengthening the capacity of others.

We help alleviate poverty by focusing on increasing people's income and employment opportunities in specific productive sectors, as well as improving their access to water and sanitation, education and renewable energy.

What do we do?

SNV supports national and local actors within government, civil society and the private sector to find and implement local solutions to social and economic development challenges. We stimulate and set the framework for the poor to strengthen their capacities and escape poverty. We do this by facilitating knowledge development, brokering, networking and advocacy at national and international level. Partnerships with other development agencies and the private sector are key to our approach.

Our advisors work in over 30 countries across five geographical regions-Asia, the Balkans, East and Southern Africa, Latin America and West and Central Africa-by providing advisory services to local organisations in seven sectors: Pro-Poor Sustainable Tourism, Renewable Energy, Water, Sanitation & Hygiene, Education, Health, Small Holder Cash Crops, and Forest Products.

SNV & Agriculture

Agriculture is recognised as a key **driver of economic growth**. In Asia, Latin America and Sub-Saharan Africa agriculture accounts for up to **40 per cent** of Gross National Product. But it is also important for **other reasons**. Agriculture enables **sustained food productivity** and helps to keep **prices stable** and **employment opportunities** open around and along viable value chains, thereby contributing to **poverty reduction** and **food security**. The grand opportunity at hand is to ensure that poor agriculture-dependent countries can **transform the sector into a driver of sustainable, economic growth**.

Three quarters of the world's poor live in **rural areas** in developing countries, including almost two billion **smallholders** (small-scale farming families) and pastoralists. From rice farmers to cattle herders, these individuals and their communities depend on the land and forests for livelihood and security. Agriculture provides the best opportunities for these groups to work and trade their way **out of poverty** by enhancing **productivity**, increasing **incomes** and improving **living conditions**.

Food demand is projected to increase by 50 per cent globally over the next 20 years. **SNV's key response** to improve agricultural productivity and achieve food security is to provide **innovative market-based solutions** along value chains, contributing to overall **equitable economic development** of the sector by **making markets work** effectively for the **rural poor**.

SNV's approach

SNV believes there should be a good balance between the added values of agriculture for **food security**, **inclusive economic growth** and **environmental sustainability**. New business models are called for including sustainable and balanced **trading relationships** and expansion of **economic opportunity** to include a greater number of people at the **base of the pyramid**. Collaboration between the public, private and civil sectors is a major opportunity area.

SNV takes a **systemic change view** of agriculture and views a value chain as a web of actors, relationships, constraints and opportunities that influence the flow of products to market. This enables the identification of key actors and issues along the whole chain and **informs intervention choices**. Working this way, with a focus on **governance** and **inclusive development**, we create a platform for

smallholders not only to gain access to markets, but also to express their **collective agency** in markets - for example, through forming cooperatives.

SNV's roles

- ***Advisory services:*** SNV has over 45 years of experience in the local implementation of agricultural programmes. SNV fills a specialist support role, facilitating creation of and change in market systems, bringing parties together, promoting innovation and developing capacities in new expertise areas.
- ***Knowledge development and networking:*** Through studies, analysis, effective M&E systems and practices, and market analysis and development for inclusive agricultural production, in partnership with local consultants.
- ***Evidence-based advocacy:*** Inclusive public policy development working with the appropriate local (governmental) partners.

Our main objectives in agriculture

1) To **increase income and employment** for smallholders;
2) To **improve food security** and living conditions for the poor and vulnerable groups;
3) To **strengthen** the **environmental sustainability** of agricultural production and meet the challenges of a changing climate.

Scope

- **Target audience**: Focused on poverty reduction and inclusive growth, SNV's primary target groups are **smallholders** and **pastoralists**, as well as **processors**, **retailers, service providers** and **cooperatives**. SNV involves medium to large scale **private, for-profit companies** who can benefit from collaborating with smallholders and labour pools through our Inclusive Business and Impact Investing services.
- **Subsectors**: The subsectors we work in include - **livestock, oilseeds, dairy, horticulture, fruits, vegetables, staple crops, spices** and **non-timber forest products**.

Practices and services

Systemic **Value Chain Development (VCD)** is SNV's central approach in the agricultural sector. The focus in VCD is two-fold: (1) development of **profitable and sustainable practices in the value chain**, resulting in increased income and employment for the poor and (2) development of **appropriate sector financing solutions** and improved value chain governance.

Next to VCD, other selected key practices SNV deploys in agriculture are:

- **Inclusive Business**: inclusion of low-income communities within the value chains of companies to create shared value with a focus on new market entry and supply chain development;
- **Impact investing advisory services**: advising and connecting social investors to investment opportunities in emerging markets, with a focus on financing the 'missing middle', including investment mapping, deal generation, business readiness, deal structuring, quality assurance and measuring impact.

Contents

Foreword

Based on its vast experience in the world and the Asian region, SNV decided in 2009 to expand its' activities in Cambodia into the agricultural sector. The choice was made to focus on agricultural diversification into fruits and vegetables with the aim to stimulate income generating activities for rural households.

Farming in Cambodia has for centuries been dominated by rice cultivation, primarily for self-consumption. With the gradual integration of Cambodia in the world market and the ongoing urbanisation a demand shift for agricultural products can be observed. The demand for vegetables is increasing, but the Cambodian production system is, so far, not able to provide an adequate response.

With this study we have aimed to try to understand what the underlying motivations are for farmers to decide to start growing vegetables, or not. From earlier field studies and observations it has become clear that many farmers have been trained on vegetables production in the last decade, though still very few have taken the decision to become vegetable farmers and invest in the required production technology and knowledge.

This study has given us some good insight into what motivates farmers and how the Cambodian cultural beliefs play an important role in that. We hope that the outcomes of this study can also help you to benefit in your work from these valuable insights.

Wilbert Schouten

Country Director

SNV Cambodia

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Executive Summary

This study examines the determinants of farmers' behavioural change with regard to agricultural practices in Svay Rieng province, Cambodia, to understand why some farmers grow vegetables and why others do not. It tests the assumption that behaviour change (the switch/diversification from just rice production to vegetable cultivation) is multi-dimensional, and is an outcome of several factors such as physical and social distance, assessments of risk, quality of relationships and status. This includes a lack of confidence among farmers, and other household members, in their capacity to do so. That is, they lack a knowledge base with which to compare their skills and have limited access to market information, water, labour and extension services. The study uses a mixed methods approach among a sample of over 200 farmers in 20 villages in Svay Rieng province.

The study shows that most surveyed farmers are keen to grow a variety of vegetables for self-consumption. They understand the benefits of supplementing the household diet, feeling healthier, saving money and, in some cases, earning an extra income from selling surplus vegetables. Small-scale vegetable farmers mainly sell their surplus at local markets, among friends and neighbours—sometimes in exchange for other products—and in neighbouring villages. Only a small proportion of farmers grow vegetables for commercialisation.

Farmers face a significant number of market challenges, such as limited information, poor contract enforcement, limited protection against risks, and high transportation and transaction costs. Furthermore, there is a high level of distrust between farmers and between farmers and other stakeholders, such as sellers of inputs, providers of technical assistance, collectors and market sellers. As a result, farmers do not tend to cooperate with each other or with other stakeholders. Weak implementation of the rule of law, coupled with the discretionary attitude of many public servants, reinforces this distrust, as farmers have no way to protect themselves against opportunistic behaviour.

Most farmers are reluctant to cultivate vegetables for commercial purposes. They find it highly risky and do not have sufficient capital to invest in inputs, equipment and infrastructure. Access to affordable credit is limited. Some farmers claim they have insufficient time to cultivate vegetables, particularly during the rainy season when they are busy growing rice. Farmers also claim it is not safe to grow vegetables in their plots away from home because animals eat them and other people steal them.

Female members of households, typically the wife of the head of household, are usually in charge of growing vegetables in garden plots. Men tend to migrate to the city to work as motorcycle taxi drivers or labourers during the dry season.

Farmers who grow larger quantities of vegetables are mostly male, more educated and older than other farmers; however young farmers and women are also among those who grow more vegetables. Farmers who grow larger quantities of vegetables are also more risk oriented. In the absence of affordable credit, they are willing to sell assets (mainly small livestock) to fund small-scale agricultural infrastructure and equipment, such as water pumps, fencing around their plots or small tractors. They also tend to have larger plots of land closer to home, where they typically grow their vegetables.

While they usually have long-term relationships with collectors—sometimes with some degree of trust—they do not cooperate with them or obtain benefits from their relationship. For instance, they do not receive credit or advance payments from collectors. Likewise, these farmers do not have trusting or special relationships with suppliers of inputs at markets, except for those who live close to the Vietnamese border and buy their inputs in Vietnamese markets, where they claim to receive good and reliable information.

Farmers value the training provided by INGOs and the Provincial Department of Agriculture, but are less satisfied with training provided by local departments of agriculture and local farmers' organisations. They would like to receive more and better quality training, but are reluctant to pay for it themselves.

This report presents a number of recommendations to address the challenges that have been identified with regard to markets, access to information and knowledge, linkages, relationships and trust between farmers, and between farmers and other stakeholders, and the empowerment of women as vegetable growers.

1 Introduction

SNV Netherlands Development Organisation, International Volunteers of Yamagata (IVY), International Development Enterprises (IDE) and Cambodian Farmers Federation of Agricultural Producers (CFAP) have been working together since 2010 to strengthen the capacity of farmers in Svay Rieng province to cultivate fresh vegetables for domestic markets. SNV, IVY and IDE, along with CFAP—a local farmers association—and other development partners have designed and implemented diverse activities and strategies to encourage and help farmers grow vegetables with a market-oriented approach. These initiatives are based on the idea that returns on investment for many crops, in particular certain kinds of wet season vegetables, can be attractive options for small holders in rural Cambodia as a way to increase their incomes (ADB, 2009). Studies show that smaller farms are more likely to diversify from rice production into income generating activities and risk minimisation strategies since rice is unlikely to provide enough income for sustainable livelihoods on such small land sizes. Vegetable production seems to be the first option for diversification, as it appears to be immune from increasing economies of scale, largely because it is labour intensive and thereby limits farm size (ADB, 2009).

Many institutional, financial, logistical, technical and other problems impede small-scale farmers from diversifying away from **mere** rice production, in particular in the poorer provinces of Cambodia. SNV and partnering organisations have worked individually and jointly to help farmers overcome some of these barriers in a sustainable way. So far, this work has had some success with both small and large local buyers showing an interest in purchasing local produce. However, several obstacles remain to increase the **interest and ability** of local farmers to produce fresh vegetables and meet buyers demand, in terms of quantity and quality.

Anecdotal evidence, preliminary research and international experience has also led to the feeling among several development partners that the way in which decisions at the household-level are made, based on particular perceptions, norms, assessments and beliefs, could be influencing farmers' decisions on whether or not to grow vegetables.

This study aims to increase understanding of the determinants of farmers' behavioural change and household decision-making in Svay Rieng province with regard to vegetable production and marketing. More specifically, it aims to test the assumption that behaviour change is an outcome of several factors[1].

To test the hypothesis, SNV agreed to conduct a study with mixed qualitative and quantitative research methods, including a survey of 200 farmers in 20 different villages across five communes in Svay Rieng province. In addition, 10 focus group discussions were conducted in 10 different villages across the five communes, and local students carried out observations whilst living in farmers' house in five villages over a one-week period.

[1] More specifically that the switch/diversification from just rice production to wet season vegetable cultivation) is multi-dimensional, and an outcome of factors including, physical and social distance, assessments of risk, quality of relationships and status along with a lack of confidence among farmers, and other household members, in their capacity to make changes in addition to farmers' also lacking the knowledge and basic skills access to market information, water, labour and extension services.

2 Rationale and context for the study

In countries with predominantly agrarian economies, like Cambodia, most farmers produce primarily to ensure food security for their families, only selling the marketable surplus that they generate. A smaller number of farmers produce commodities such as vegetables, fruit and chickens, first to sell to the local market or traders that collect at their farm gate. This emphasis is on production rather than demand from consumers, which ultimately leads to the familiar phenomena of market gluts, wastage and high price fluctuations, particularly in the case of perishable commodities (Alamgir 2008).

However, despite the common perception of 'low returns' to investment in agricultural activities, especially among farmers, studies have shown that there are opportunities for diversification out of rice production into a multi-crop and multi-farm use system. Gross margins for many crops have recently jumped significantly, making them more attractive options for agrarian households. Gross margins of between US$400 to US$1,300 achievable for vegetables, makes it the highest return small holder agricultural activity in Cambodia (ADB, 2009).

Studies (ADB, 2009) have found that farmers in Cambodia are often poorly connected to markets, suppliers, and other value chain actors. There is a lack of trust between farmers, and between farmers and suppliers and markets i.e. collectors and other buyers. In addition to this, market participation is often uncertain, risky and on unfavourable terms. As smallholder farmers typically have limited amounts of produce to sell, and what they have may only be occasional or of low value or quality, they face high transportation costs, are often dependent on buyers coming to them, lack information on market prices beyond their nearest market, and typically need cash from sales immediately. This creates high levels of risk and uncertainty for smallholder producers and high transaction costs for buyers. As a response, farmers are inclined to limit their investments in market-oriented crops in the perceived absence of reliable and safe markets for their produce.

Nevertheless, vegetable production has been growing in Cambodia since the early 1990s, albeit at a slow pace. The extent of growth is hard to assess clearly because a large proportion of vegetable cultivation is home garden cultivation. This is difficult to measure accurately given that vegetables on garden plots are grown inconsistently and the sizes of plots are often unknown. Most increases in production have been due to yield, given the limited area under cultivation.

While Svay Rieng province is not among the major vegetable producers in the country, non-rice crop production, which can include food crops such as maize, cassava, mung bean and vegetables, and non-food crops, such as jute and tobacco, is undertaken in both the wet and dry seasons. In 2004, non-rice crop production accounted for 3 per cent of the total cultivated area for all crops (see Table 1), which was lower than the national average. The heavy concentration on rice production within cropping systems means that the production of vegetables and fruit, which are important for nutrition, are limited.

Table 1: Overview of non-rice annual and perennial crop production in Svay Rieng in 2004

Non-rice crop indicator	**Wet season**	**Dry season**	**Both seasons**
Percentage of total annual crop cultivated area (ha) for non-rice field crops and vegetables	1%	29%	3%
Mean cultivated area (ha) per rural household	<0.1	<0.1	<0.1

Source: WFP (2011)

In 2004, 33 per cent of households in Svay Rieng were below the consumption poverty line and 35 per cent of households fell into the poorest two national quintiles of national consumption. These households

struggle to have enough cash available to buy food needs from the market and to meet other expenditure needs such as health services (WFP, 2011).[2]

Households in Svay Rieng lack economic assets of their own and will be more exclusively dependent on wage labour or common property resources to generate cash income to buy food and other basic needs. In 2004, 6 per cent of rural households in Svay Rieng had no crop land, compared to 15 per cent nationally.

In general, rural households in Svay Rieng have limited access to agricultural land for crop production. There are also large differences in the quantity of agricultural land available to individual rural households. Small land holdings and other factors limiting crop productivity limit food ability for many rural households. For instance, in 2004, 50 per cent of rural households in Svay Rieng had between 1.0 and 3.0 hectares of land, which although is more than the 30 per cent nationally, it is still significantly low. Additionally, nine per cent of rural households in Svay Rieng had more than 3.0 hectares of land, compared to only 6 per cent nationally (WFP, 2011). In 2004, 6 per cent of rural households in Svay Rieng were landless and did not produce their own staple food crops, compared to 15 per cent nationally. A further 34 per cent possessed less than 1.0 hectare of land, compared to 49 per cent nationally. These small hold farming households will typically only produce enough food from crop agriculture to meet a part of their staple food needs (WFP, 2011).

Overall, Svay Rieng is characterised by poor infrastructure, long distances to important markets and limited access to water sources, among others. Only five per cent of farmers, for example, reported having access to irrigation water and only one per cent claimed to have irrigation wells in 2008 (NCDD, 2009).

Relationships, linkages and trust

Social capital in Cambodia is low, which may in part stem from the recent civil war and in part from an alleged long history of individualistic values in the country. This has led to a high degree of distrust among farmers and between farmers and outsiders, including government officials and NGOs. This has hindered the potential benefits of collaboration or more stable exchange relationships. In turn, this has resulted in weak linkages between farmers and between farmers and other key stakeholders, such as sellers of inputs, traders, processors, and service providers (including NGOs). Several other factors also contribute to the poor quality of linkages, including poor implementation of the rule of law, deficient infrastructure, and high levels of corruption.

Furthermore, agricultural producers in Cambodia tend to be risk averse and are reluctant to undertake any value added activities unless they see direct demonstrated benefits. Traders from nearby towns with links to larger traders, processors and exporters typically collect marketable surplus from households, often well below the market prices available in urban centres. Producers tend to lack storage facilities and at the same time are in need of cash, which leaves them with no other option but to sell at any given price. Lack of proper market organization also means that producers lack bargaining power.

As a result of this situation, farmers are unable or unwilling to engage in formal or informal contracts with other farmers and stakeholders. Furthermore, in the absence of efficient implementation of the rule of law, there are no informal enforcement mechanisms to mediate disputes and facilitate long-term relationships between parties. This adds a degree of risk to transactions; in an existing highly risk averse culture.

Behavioural change

It is widely acknowledged that agricultural development largely depends on how successfully knowledge is generated, spread and applied, and it is increasingly recognised that behavioural change among farmers is one of the prerequisites of agricultural modernisation processes (Leagans and Loomis, 1971). The extent and speed to which farmers adopt available innovations therefore impacts substantially on progress in productivity growth. However, it is a common phenomenon that farmers, like all other entrepreneurs, do not adopt innovation as soon as they appear on the market (Dierdeen, Meijl, Wolters and Bijak, 2003).

This "behavioural approach" emerged as researchers came to realise that people, in this case farmers, do not necessarily indulge in economically optimal decision making, but are influenced by cultural, social

[2] Consumption poverty refers to having insufficient cash income (or its equivalent in kind) to meet basic livelihood needs. This includes having insufficient cash income to buy foods that people need for an adequate diet as well as cash income to buy other basic needs such as shelter, clothing, health and education (WFP, 2011).

and psychological factors. A number of researchers have attributed behavioural change among farmers to factors such as goals, attitudes, values (e.g. Gasson, 1973; Gilmore, 1986; Coughenour and Swanson, 1988; Beedell and Rehman, 2000; Burton, 2004). However, they have also argued that variables such as motives and attitudes intervene between the environment and economic behaviour and that it is important to incorporate psychological and subjective variables in any analysis in order to understand economic processes.

Research on has also found that failure to display symbols of group belonging can result in social disapproval, leading to a sense of loss for the individual and a corresponding decrease in self-esteem (Burton, 2004a). As a consequence, individuals try to minimise the opportunity for this to occur by acting not only on the basis of their utilitarian goals, but also on the basis of how their behaviour concurs with both social and internalised personal norms.

In some places, for example, a rich and well established system for the display of behaviours provides a means of maintaining the farmer's position within the community and their self-identity as a 'good farmer' (Burton, 2004a). These systems appear to focus largely on the skills evident in the production of agricultural commodities that could be visibly assessed from the road by neighbouring farmers and the transfer of status information through looking over neighbouring hedges. In these cases, the main difference between a farmer who is perceived by the community as a 'good farmer' and one who is perceived as a 'bad farmer' is the quality of crops and livestock produced, as judged by two principal criteria, namely the physical appearance or attractiveness of the crop (or animal) and the crop yield per acre or hectare (or weight/quality per animal) (Burton, 2004).

In other instances, a prejudice has been found that farmers who diversify represent failed farmers. While they recognise the success of some farmers, that does not usually come attached to a better or worse social status.

With specific regard to Cambodia, a recent study conducted for IDE-Cambodia (Santoyo Rio, 2011) suggests that there can be additional factors that influence the behaviour of farmers in Svay Rieng. The study shows that relationships, social status, and access to information and resources are key for farmers. It found that there is a widespread culture of risk aversion among the farmers interviewed and that even when the 'conditions are right', this risk aversion might prevail unless specific actions are taken to help farmers overcome this sometimes exaggerated fear of failure.

The study also found that entrenched attitudes among farmers, partly incentivised by development organisations, are proving difficult to change. Informants claimed that farmers would often wait as long as possible to see if they could obtain free seeds and products from NGOs instead of buying inputs themselves from available suppliers. However, interesting individual cases were found where farmers were willing to change their behaviour and try new ways of relating to other key stakeholders (i.e. farmers, buyers and suppliers) and cultivating vegetables. However, it seems that this would only happen when the social and economic conditions were 'right' for them. This includes feeling in control of the outcomes of their investments, for example by having enough information and training to minimise potential failure when cultivating vegetables, having a good network of relationships to rely on when needed, and having some access to capital or resources.

This study therefore suggests that behaviour and risk-aversion can change if farmers 'feel'—based on a rational assessment that makes sense locally—that it is 'safe' to change their behaviour and if they clearly understand the benefits of doing so and have access to an adequate environment and support.

Other reports on rural poverty (IFAD, 2011) show that, at the household level, decisions about how to allocate resources, including cash, land and labour, take into account not only available opportunities, but also the attempt to minimise any potential shocks that can seriously damage the household. In the case of Cambodia, research suggests that farmers attempt to manage risk through sticking to known practices, namely growing rice and sometimes engaging in non-farm activities.

3 Methodology

Rationale and framework

Several studies have been conducted to investigate the types of crops that farmers grow and the structure and characteristics of vegetable value chains in Cambodia, but limited information has been collected on the determinants of farmer behaviour using a mixed methods approach. However, it is considered that the perceptions and beliefs of farmers about the benefits, advantages, disadvantages, and challenges of growing vegetables may be as important as other agricultural and socioeconomic data.

Data collection

A desk review of the main issues regarding behaviour change in farming practices in Cambodia was conducted at the outset of the study to identify the determinants of behavioural change, and interventions by the government and development partners that respond to these determinants in Cambodia. Programme documentation and the grey literature on farmer behaviour and vegetable production in Cambodia were also reviewed.

The study used a mix of qualitative and quantitative research methods for fieldwork. This included semi-structured interviews with key stakeholders, a survey of 233 farmers, 10 focus group discussions with farmers, and participant observation at farmers' households. A mapping exercise of key relationships and sources of information and resources was also used to explore whether spatial variables influence the behaviour change of farmers.

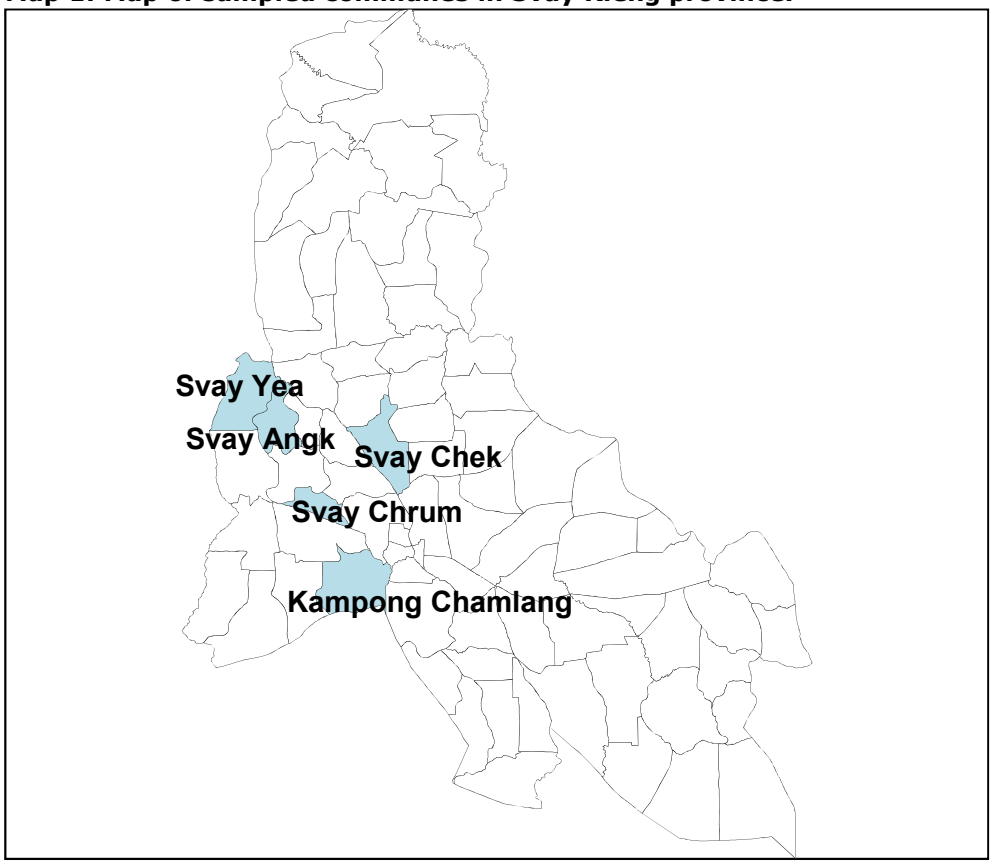
While the sample for the survey was random, it was relatively small and largely based on lists of farmers provided by SNV, IDE, CFAP and IVY, many of whom are already beneficiaries of activities implemented by these organisations. Thus, the study findings are not statistically representative of farmers in Svay Rieng or Cambodia. Some caution therefore needs to be taken in further extrapolating the findings to wider groups and locations[3].

Coverage

The fieldwork covered 20 villages across five communes in Svay Rieng province, in south eastern Cambodia (see Map 1). The communes are Svay Yea, Svay Anak, Svay Chek, Svay Chrum and Kampong Chamlang. Selection of villages and communes was made in consultation with CFAP and IVY, and focused on villages where these organisations are currently working in order to understand the behaviour of farmers in support of their existing projects. As a result, these findings are not statistically representative of other villages in Svay Rieng or Cambodia and caution has to be taken before making generalisations.

[3] If you need a full description of the methodology please contact SNV in Cambodia

Map 1: Map of sampled communes in Svay Rieng province.



Key information collected

The following key information was collected during fieldwork:

- **Economic status:** The level of income and assets of farmers could show if better off or less well off farmers were more likely to engage in vegetable growing, as a consequence of their capability to invest or take risks.
- **Land tenure:** Different land tenure among farmers could affect the propensity of farmers to take risks or to innovate by growing vegetables.
- **Access to credit:** Access to credit can be an important factor in a farmers' decision to cultivate vegetables. It can also demonstrate their willingness to take risks.
- **Relationships, linkages and trust:** Social networks (of which trust is a key element) are important in spreading innovation and information that can help farmers to access knowledge about vegetable growing. Women tend to be more reliable in passing information on to others and could be a way to transfer information about home grown vegetable cultivation. Linkages with other stakeholders in the value chain (i.e. suppliers, collectors and market vendors) can influence farmer behaviour.
- **Geographical information:** Understanding the location of farmers in relation to markets and buyers, natural resources such as water, sources of capital, and sources of information about agricultural techniques and vegetable cultivation, provides a clearer picture of the contrasts of geographic and social distance in determining behavioural change.
- **Marketing:** Access to information about prices and markets could be a determinant for farmer behavioural change.
- **Sources of information:** Having good sources of information about prices, knowledge on new agricultural techniques, and new markets, can influence farmers' adoption of new practices.

- **Media exposure:** Exposure to information about agricultural techniques and best practices through media could influence farmers to grow vegetables.
- **Training:** Better understanding of farmers' access to training and by whom can help determine what the perceived and real impact is of training on farmer behaviour with regard to vegetable cultivation.
- **Knowledge about vegetable cultivation:** Understanding the level of knowledge about vegetable growing among farmers indicates whether knowledge of vegetable cultivation translates into real or actual behaviour in practice. If the level of knowledge is moderate or high, for example, then other factors may need to be prioritised in addressing the low uptake of vegetable cultivation by farmers.
- **Beliefs:** Understanding farmers' beliefs about issues such as the trustworthiness of fellow villagers, the benefits of growing vegetables, and the impact of growing vegetables on a farmers' status, can determine which key behaviours need to be addressed and how best to shape activities to bring about changes in such behaviour.

4 Findings

Summary of main findings

- Farmers grow rice and vegetables mainly for self-consumption.
- Most farmers do not want to grow vegetables for commercial purposes.
- Farmers grow vegetables because "that is what a farmer does".
- Farmers have different strategies to sell their surplus vegetables: directly at markets, from house to house, to market vendors and to collectors from the farm gate.
- Farmers in general prefer to diversify vegetable cultivation for auto-consumption and to hedge their risk by only selling what is currently at a high price.
- Farmers only want to grow vegetables in their garden plots for several reasons, including safety, lack of infrastructure (water sources), and risk-aversion.
- The need for conformity among farmers is very strong. Farmers want to be like other farmers.
- Farmers have a limited understanding of the way markets work.
- Farmers do not want to cooperate. They are openly distrustful of each other and believe that people are dishonest.
- Farmers are 'trapped' between the benefits of top-down knowledge transfer approaches and the lack of bottom-up initiatives.
- The links in the value chain are very weak. There is no trust between farmers or between farmers and market vendors, collectors, or input sellers.
- The main obstacles to growing vegetables, according to farmers, are poor infrastructure, lack of capital and labour, and lack of knowledge.
- The benefits from growing vegetables include extra income, better health, more food on the table.
- Women, who are largely responsible for growing vegetables at home, have little time to gather to discuss agricultural or other issues.
- Farmers would prefer their children to migrate to the city rather than stay and work on the farm.
- Farmers that grow vegetables intend to carry on growing vegetables in the future.
- Farmers who grow vegetables for commercial purposes are generally men, older and more experienced than other farmers, sometimes have a higher educational level, tend to have larger plots of land near home, are more risk-oriented and independent minded.

General characteristics of respondents

Informants for this research are on average middle-aged farmers, both male and female, from Svay Rieng province. The average age of respondents is 46 years, although the full age range extends from 18 to 77 years old. Almost 56 per cent of respondents are female and 44 per cent are male. See Tables 7 and 8.

From the surveyed households, 69 per cent have a male head of household and 31 per cent have a female head of household. Almost 88 per cent of heads of households are married, while 9 per cent are widowed and 2 per cent are separated. See Tables 9 and 10.

Surveyed households have an average of 5.46 family members, with 38 per cent of households having one adult male and 36 per cent having two adult males. Almost 20 per cent of surveyed households have three adult males living in the household. On the other hand, 35 per cent of surveyed families have one adult female and almost 30 per cent have two adult females living in the household. Just over 27 per cent have three adult females living in the household. See Tables 11 and 12.

Almost 68 per cent of surveyed households report having only one male child (under 15) living in the household, while 72 per cent of households have only one girl under the age of 15 living in the household (see Table 13).

With regard to education, surveyed households report that almost 10 per cent of heads of households have no formal education, while 47 per cent have attended primary school and almost 30 per cent have attended secondary school. Only 12.5 per cent of heads of households have attended high school. The educational level of spouses of heads of households follows a similar pattern (see Table 14).

Observations made by students reveal that many households do not encourage their children to go to school, and children rarely attend school after grade nine. It appears that farmers do not see formal education as a way to increase income or as a means to get out of poverty.

Few surveyed farmers have a public role beyond their household (see Table 15); only seven surveyed farmers are teachers, four have a role as deputy village chief, two farmers are members of commune councils, and four work as village healers or health workers. Only two village chiefs were interviewed as part of this survey. In general, surveyed farmers tend to have lived in their villages for a long time, an average of 35 years (see Table 16).

Economic status

Survey responses show that almost 46 per cent of households earn less than USD 500 a year (see Table 17). Another 33 per cent of households earn between USD 500 and USD 1,000 USD per year, while less than 22 per cent earn more than USD 1,000 annually.

There is a strong variation, however, in seasonal income (see Tables 18 and 19). During the dry season, 27 per cent of households make less than USD 100 a month, 21 per cent make between USD 100 and USD 200 a month, and a further 20 per cent of households earn between USD 200 and USD 300 a month. A staggering 18 per cent of households report earning more than USD 500 a month during the dry season, as opposed to only 9 per cent during rainy season.

During the rainy season almost 50 per cent of surveyed households report earning less than USD 100 per month, with another 26 per cent earning between USD 100 and USD 200 per month. An extra 10 per cent of households make between USD 200 and USD 300 USD per month during the rainy season and only 15 per cent of make more than that.

The estimated average daily income (see Table 20) and weekly profit (see table 21) of surveyed farmers during the dry and rainy seasons were also measured. The findings show that the average daily income is estimated at USD 7.3 and USD 5.7 respectively, and the average weekly profit is estimated at USD 17.5 and USD 12.3 during the dry and wet seasons. Further analysis revealed that farmers tend to earn more in the dry season (on average 71,572 Riel) than in the wet season (on average 49,227 Riel). The consistent findings of high income in the dry season between monthly and weekly reports help to confirm that the income report is reliable (see Table 22).

These findings are significant because they suggest that rice cultivation is not necessarily the highest income earner for farmers. The fact that vegetables are grown more in the dry season, when farmers receive a higher income, may indicate that farmers are earning more from growing vegetables or that they are engaging in other work during the dry season (i.e. migrating for labour), which brings in an extra income.

Fifty per cent of farmers in Chek commune earn equal or less than USD 400 to USD 500 and 50 per cent of farmers in the commune earn equal or more than this amount. This is higher than those in other communes. Interestingly, the villages of Thmol and Veal Lmut are among those with the highest median incomes, and they are also the villages where the largest proportion of farmers visibly grow wet season vegetables.

The main sources of income of surveyed farmers are rice, vegetables and (small and large) livestock (see Table 25). For example, 209 farmers reported vegetables as one of their main sources of income during the dry season, while 157 farmers reported vegetables as being a main source of income during the rainy season (see Table 2 below for fruits and vegetables grown by farmers in surveyed villages). Furthermore, 157 farmers reported selling small livestock as one of their main sources of income during the dry season, while only 123 farmers reported selling small livestock as one of their main sources of income during the rainy season.

Selling rice was not always stated as a main source of income. This is because in some cases farmers do not always earn an income from rice cultivation, as they only grow it for self-consumption only reporting rice as their main source of income, when directly asked. In this case, although enumerators were told to ask farmers, it is clear that they did not always do so.

Students carrying out observations found that most farmers want to grow vegetables for self-consumption. Some farmers even express that they do not like growing vegetables. This creates a further challenge, as houses situated on 'low land' get completely flooded during the wet season impeding the cultivation of vegetables. This was observed during the mapping exercise, which showed that only farmers in certain areas of the village that are not prone to seasonal flooding grow vegetables. The noticeable exception to this is Thmol village where, according to observers, more than 90 per cent of farmers grow vegetables during both the wet and dry seasons (see Box 1).

Interestingly, farmers in focus group discussions claim that women decide how to spend the money they earn from selling vegetables. This is in line with the widely held belief that women have strong control over household finances in Cambodian families. While this may be the case, a closer examination of household decision making through focus group discussions show that, while women appear to have control over household finances (as administrators, for instance), they do not always have the final word on how to spend the money. In other cases, the limited household finances do not allow for much decision making, and instead the cash goes towards meeting basic needs, such as food, shelter and health expenses.

Table 2: Fruit and vegetables grown in surveyed villages

Papaya	Kror Chet (Khmer name)
Sugarcane	Taro
Water melon	Bottle gourd
Pumpkin	Tomato
Mango	Water lily
	Cucumber
Water Spinach	Lotus
Plov Kong Kep (Khmer name)	Bitter gourd
Kondieng (Khmer name)	Wax gourd
Chili	Potato
Cabbage	
Eggplant	
Garlic (leaf)	
Ridged gourd	
Green bean	
Long bean	
Maize (Chea Russei Village)	
Tror Kiet (Khmer name)	

Source: Focus Group Discussions

Table 2 shows the most common fruit and vegetables grown in surveyed villages. These include papaya, sugarcane, water melon, pumpkin, mango, water spinach, eggplant, cabbage, cucumber and potato. While farmers grow a wide variety of crops, they are reluctant to reduce the variety of vegetables they grow, as their priority is to complement their diet, rather than producing for commercialisation. This is discussed in more detail later.

Land

The majority of surveyed farmers have been using their land since the mid-1980s, although some claim they have been using their land since the 1950s. This suggests that farmers have been working on these

plots for many years and are familiar with the characteristics of the land and surrounding environment, including the benefits and challenges.

The average plot size of surveyed households is 0.34 hectares. Farmers in Svay Chrum and Svay Chek communes seem to have larger plots than farmers in other surveyed communes, both with 0.41 hectares (see Tables 26 and 27). More specifically, farmers in Ta Chey, Chamb Bok, Beoung Veng and Trobek villages appear to have larger plots than others, averaging 0.70 hectares, 0.58 hectares, 0.45 hectares and 0.44 hectares, respectively.

Examination of the size of cultivated plots, starting with the home plot and continuing with other plots from the closest to the furthest away from home shows that farmers have an average of 0.16 hectares of cultivated land at home (see Table 28). Their closest plot away from home has an average of 0.37 hectares, and increases to an average of 0.45 hectares for the second plot away from home. The size then decreases for subsequent plots, though they are still larger than the land at home.

When considering the size of cultivated land in Plot 1 (the vegetable garden), 109 out of 183 respondents (almost 60 per cent) have a vegetable plot equal or less than 0.10 hectares (see Table 29).

With regard to land tenure, around 94 per cent of respondents own the land where they live and have a title for the land (see Table 31). Around 3 per cent of respondents rent the land where they live and a smaller proportion claim to share it. Furthermore, 91 per cent of farmers own the closest plot to their home, while almost 6 per cent rent it. Almost 90 per cent of farmers own the second plot away from home (Plot 3), while nine per cent of them rent it. The percentage of farmers owning their land decreases for plots furthest away from home, while the percentage of farmers renting these plots significantly increases.

The only significant relationship is between the number of adult female members in the family and cultivated land, meaning that families with more adult females tend to have larger cultivated land size (Table 32). This could be because women are able to support agricultural activities (i.e. ploughing, transplanting rice) or help men with other activities, such as growing vegetables or taking care of livestock, thus allowing men to devote more time to growing rice.

From the focus group discussions, many farmers claim that one of the reasons why they *do not* and *would not* grow vegetables in their rice fields is because they are far from home. They claim that animals would eat their vegetables or people would steal them. They argue that people steal vegetables even in their home plots during the night. On the other hand, during observations students found that farmers claim one of the main challenges to growing vegetables in their rice fields is the lack of water sources during the dry season. Other reasons why farmers do not grow vegetables include a lack of labour force, no collectors or markets nearby, low prices of vegetables and no time to grow them.

However, these claims have to be taken with caution. Firstly, some farmers grow vegetables in their rice fields and protect them either with fencing or by sleeping at the fields. Secondly, when probed if they would really grow vegetables if these obstacles were removed (such as poor irrigation), they claim they would still grow rice instead of vegetables. Nevertheless, it is an important perception by farmers that may, to some extent, help to shape their behaviour and decision whether to cultivate vegetables.

In rural Cambodia, animals such as cows, pigs and chickens freely wander around villages. This is no exception in the villages surveyed in Svay Rieng. Farmers claim that they are each in charge of looking after their own animals (mainly cows) and making sure they do not go into other farmers' fields. However, they admitted they do not always do this. If each farmer were to take more control over the grazing locations of their cows and make sure they do not wander unrestricted onto other farmers' land and thereby destroy their crops. However, farmers fail to understand the collective benefits that this would bring, such as being able to safely grow vegetables away from home. No one wants to be the first to cooperate through fear that others will abuse their behaviour or their effort will be in vain. Keeping cows in their cowsheds or tied up on their own property would require farmers to spend more time gathering grass to feed them, which they are not always willing to do, despite the collective benefits.

Credit

The survey revealed that 61.4 per cent of farmers have a loan (see Table 33), despite the negative perception of loans that was openly expressed by both male and female farmers during focus group discussions. Of these farmers, 57 per cent have only one loan, while 30 per cent have a second loan and 13.2 per cent have a third loan. This puts into question the belief that farmers do not have access to credit, although admittedly the sizes of loans are limited and not enough for significant investments in agricultural hardware.

The average value of a farmers' first loan is USD 293.06, while the average value of their second loan, which only 74 out of 251 farmers claim to have, is USD 341.32. The average value of the third loan, which only 33 farmers report as having, is USD 268.79 (see Table 34).

According to farmers, the main use of their first loan is to buy agricultural inputs (24 per cent), followed by livestock purchase or veterinary expenses (13 per cent), and consumption (13 per cent) (see Table 35). Other uses include medical and health expenses (9 per cent), non-agricultural expenses (9 per cent) and, to a lesser extent, school expenses (4 per cent) and social or religious celebrations (2 per cent).

The main uses of the second and third loans are similar: agricultural inputs (26 per cent and 27 per cent respectively), livestock purchase or veterinary expenses (19 per cent and 16 per cent), consumption (6 per cent and 11 per cent) and non-agricultural expenses (8 per cent and 9 per cent). This suggests that farmers are willing to take loans to purchase agricultural inputs, although more in-depth questioning on the use of loans during focus group discussions reveal that farmers tend to use their loans and any other available cash (such as cash from selling livestock) various purposes including agriculture.

The main providers of loans (see Table 36) are microfinance institutions (48 per cent, 46 per cent and 29 per cent for first, second and third loans respectively), followed by relatives and friends (19 per cent, 18 per cent and 24 per cent, respectively). The role of informal creditors appears to be growing in rural areas[4], as microfinance institutions strengthen and tighten their lending policies and farmers find them too strict or inflexible, thus limiting their access to credit. It is noticeable that traders play virtually no role in providing loans or credit, with only 2 per cent among first loans. This could be explained by the low level of trust among actors in agricultural value chains and by the limited cash flow available from traders and collectors. Even when farmers have used the same collectors for several years, the level of credit or advances is limited (see Box 1).

Box 1: The experience of an older man in Thmol Village

A man interviewed in Thmol Village (born in 1950) has always been a farmer, except when he was a soldier during the war. He does not have a large plot of land, only about 0.5 hectares at home and another plot of similar size in the rice fields. He only cultivates vegetables in his home plot during the dry season because he is too busy cultivating rice during the rainy season, in addition to selling tickets at a cinema in Svay Rieng town.

During the rainy season, his plot of land in the village is left unused because he cannot hire labour to work it, as "everyone is busy working in their own rice fields".

He believes that growing vegetables is good because it can provide an extra income for farmers. During the dry season, like many other villagers, he produces cucumbers, wax gourd, ridged gourd, sugar cane and water spinach. According to him, people in his village usually have more than one plot of land to grow rice and vegetables, and most can produce more than 100kg of vegetables in the dry season. He claimed that people in his village have the potential to grow vegetables if they want to because the soil is very rich.

The village appeared well organized and clean, and many people grow vegetables. When asked why so many do, he responded, "people copy each other", and "nobody wants to be left out". Farmers who do not grow vegetables are seen as "lazy".

According to him, farmers usually sell their vegetables to a middle man or vegetable collector who comes to the village; few farmers sell vegetables directly to the market. However, he believes it would be possible, but that it, "would take a lot of time because farmers do not have the same relationships with market sellers that collectors have", and "the market sellers might say something bad about their produce or may ask them to reduce the price of their vegetables". Additionally, it is not easy for farmers to transport their vegetables to the market.

Cucumber is a popular vegetable to grow because farmers can sell it every day during June and July. Farmers can earn as much as 1,000 Riels/kg for cucumbers, but this can drop to 400-500 Riels/kg depending on the season and supply.

He explained that, during the rainy season, less people in the village grow vegetables because they are busy working in their rice fields. Some farmers that have plots on high land can continue producing vegetables because the land does not flood. They have an added incentive because the price of vegetables increases during the rainy season.

This man has also worked as a loan officer for a bank, an experience that showed him how easy it is for people to get into trouble with loans. He has never asked for a loan himself because he believes it is risky. However, many other households in the village

[4] See, for example, article on informal credit in Cambodia in Economics Today, Vol. 5, Num. 88, 1-15 June, 2011.

take loans from government extension departments or micro finance institutions and village money lenders. He claims "people are usually cheated by the informal money lender in the village".

Source: Prepared by Ngy Sophorn from a conversation with an older man in Thmol village, 21 June 2011.

Survey results show that spouses (usually wives) have a say in the decision whether to get a loan and how to use it – 49 per cent for first loans. Many interviewees also claim that the decision to get a loan and how to use it was taken among all family members - 37 per cent for first loans (see Table 37). This is in line with the widely held belief that women have strong control over household finances in Cambodian families. While this may be the case, a closer examination of household decision making through focus group discussions show that, while women appear to have control over household finances (as administrators, for instance), they do not always have the final word on how to spend the money. In other cases, the limited household finances do not allow for much decision making, and instead the cash goes towards meeting basic needs, such as food, shelter and health expenses.

Further analysis shows that there are slight differences between households across communes with regard to who makes the decision to get a loan. For instance, households that have a loan in Svay Chek and Svay Ank communes claim that spouses tend to have a stronger say in obtaining a loan than any other family member. Meanwhile, more households in Svay Chrum, Kampong Chamlong and Svay Yea claim that the decision to obtain a loan is taken between all the family members. Older children do not seem to play much of a decision making role in getting the first loan across all communes.

The decision to get second loan is more likely to be made by the spouse and between family members. In Chek commune, the results show that the decision is made more frequently by the spouse, whereas in Kampong Chamlong commune, the decision is more likely to be made between all the family members.

The overall participation of women in decisions regarding loans is an important finding because household decision making is also related to the fundamental aspect of risk, particularly in the context of a highly risk-averse society. If women and men have different attitudes towards risk, then it is important to understand how decisions about spending are made at home. This research finds that, if the conditions are right, women are more inclined to take calculated risks. Focus group discussions also show that both men and women would benefit from training in basic and management accounting skills. A better understanding of how to manage and repay loans could diminish existing fear and aversion to loans.

During observations, student observers found that villagers are generally afraid of taking out loans because they fear they could not pay them back by the required deadline. According to students, farmers claim that they cannot predict whether they will get good yields from their vegetable fields. In particular, they worry about getting a pest or disease that would destroy their crop. One woman said, "What will happen to my land, my house or other property if I cannot pay back the loan? They [the creditors] might seize my property and I will have no way to earn an income".

Relationships, linkages and trust

The survey enquired about participation in agricultural activities by different members of the household. The results show that it is mainly the head of household and their spouse (46 per cent) who participate in rice and/or vegetable cultivation (see Table 41). Older children above the age of 15 also contribute to these activities (33 per cent).

Qualitative information gathered during focus group discussions and interviews revealed a clear distribution of activities regarding cultivation of rice and vegetables. While men tend to do the 'hard work' such as preparing the land, both for rice and vegetable cultivation, women tend to do other work such as transplanting the rice or looking after the vegetables. Women have more responsibility for vegetable cultivation, especially when vegetables are grown in smaller quantities for self-consumption. Women are also largely responsible for selling vegetables, suggesting that attempts at promoting vegetable cultivation, and particularly at developing marketing skills, should focus on women.

However, a clear distinction has to be made between households that grow vegetables mainly for self-consumption and households where vegetables are cultivated for commercialisation. The research shows that most farmers that decide to grow vegetables in large volumes for commercialisation are older men. On the other hand, in households where vegetables are grown only in garden plots, women have a stronger say in what is grown and how.

During observations, students also found that women are more involved in growing vegetables than men (see Tables 3 and 4) because in many households during the dry season men migrate to the city, or to neighbouring countries like Vietnam and Thailand, where they can earn a higher income selling their labour. This leaves women for long periods of time in charge of the household, and more specifically in charge of the day-to-day care of vegetables. This sees women frequently benefitting from training in vegetable cultivation when men are away working.

Table 3: Typical distribution of activities (women)

Rainy Season		**Dry Season**	
5:15-6:00 am	Get up and prepare breakfast		
6-7 am	Clean the house and surrounding area, do other housework, and have breakfast	6-7:30 am	Get up, clean the house, feed the animals, clean the dishes, cook, and take out the cows from the cowshed
7-11 am	Go to the rice field	7:30-11 am	Prepare to sell sugar cane juice at the primary school, or go to sell vegetables at the market
11 am-12 pm	Come back home and prepare lunch and feed the animals	11 am-12 pm	Come back home, cook lunch, daughter or family members help to feed the pigs
12-2 pm	Take a nap	12-1 pm	Have lunch and prepare for selling sugar cane juice at the local school, or watch TV
2-6 pm	Go to the rice field	1-4 pm	Sell sugar cane juice at the primary school, or work on their vegetable field to clear the weeds, level the soil for vegetable plantation, and others
6-7 pm	Come back home, prepare dinner, and feed the animals	4-5 pm	Come back home and prepare dinner, children help feeding the pigs, put the cows into the cowshed
7-8 pm	Have dinner, chat with other family members, watch TV	5:30-8:30 pm	Have dinner, relax, chat with other family members, watch TV
8 pm	Go to bed	8:30 pm	Go to bed

The study also revealed that farmers rely heavily on neighbouring farmers and international NGOs to obtain information on agricultural techniques (see Table 42). Farmer groups and associations, and input

sellers are also an important source of information. According to farmers, government extension services play a much less of a role in providing them with information. Further analysis (see Table 43) shows that this trend persists among farmers over all of the surveyed communes.

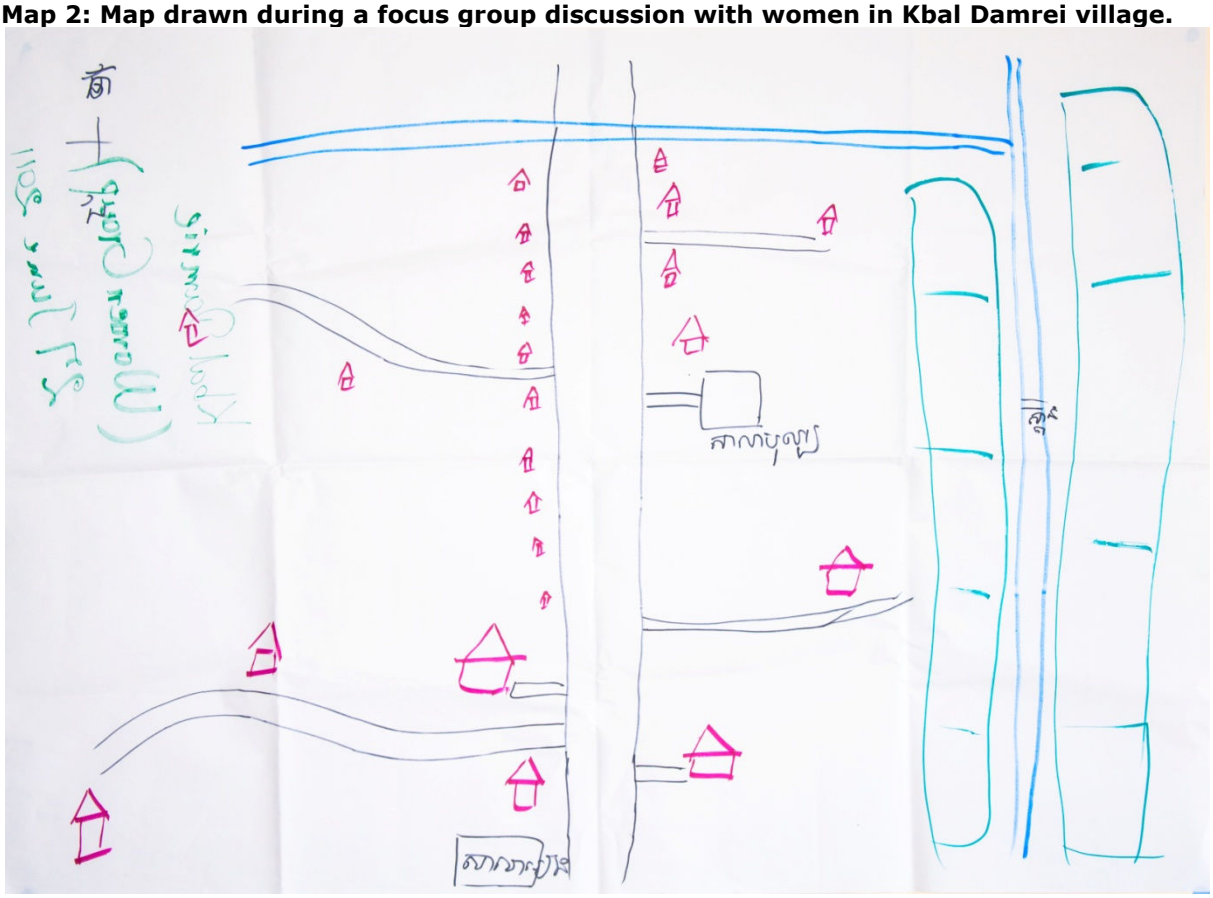
Table 4: Typical distribution of activities (men)

Rainy Season		**Dry Season**	
3:30-6:00 am	Get up and go to plough the rice field	5-6:00 am	Get up, feed the poultry and pigs, and take out the cows from the cowshed
6-7 am	Feed pigs at home, prepare to go to work, and have breakfast	6-7 am	Have breakfast and prepare to go to work
7-11 am	Go to work, except on weekends when men help the family prepare the vegetable field and do other housework, and some go to work in the rice field	7-11 am	Go to work, or go to sell vegetables at the market, or some go to cultivate their dry rice fields
11 am-2 pm	Have lunch and take a nap	11 am-2 pm	Have lunch and take a nap
2-5 pm	Go to work or go to work in the rice fields	2-5 pm	Go to work, or do other work like working on their vegetables
5-6 pm	Come back home to feed the animals, bring the cows into the cowshed	5-6 pm	Come back home to feed the animals, bring the cows into the cowshed
6-7 pm	Relax and have dinner with the family	6-7 pm	Relax and have dinner with the family
7-9 pm	Chat and watch TV	7-9 pm	Chat and watch TV
9 pm	Go to bed	9 pm	Go to bed

However, focus group discussions revealed that farmers do not always ask their neighbours directly about agricultural techniques. What they often do is 'observe' what neighbouring farmers do, and only ask questions about their agricultural practices if there is a good relationship between them. However, there is also a strong need for conformity. Farmers feel the need to be 'like other farmers', and will copy them if the majority of other farmers are behaving in a particular way. Farmers clearly fear being different, as this may be associated with increased risk.

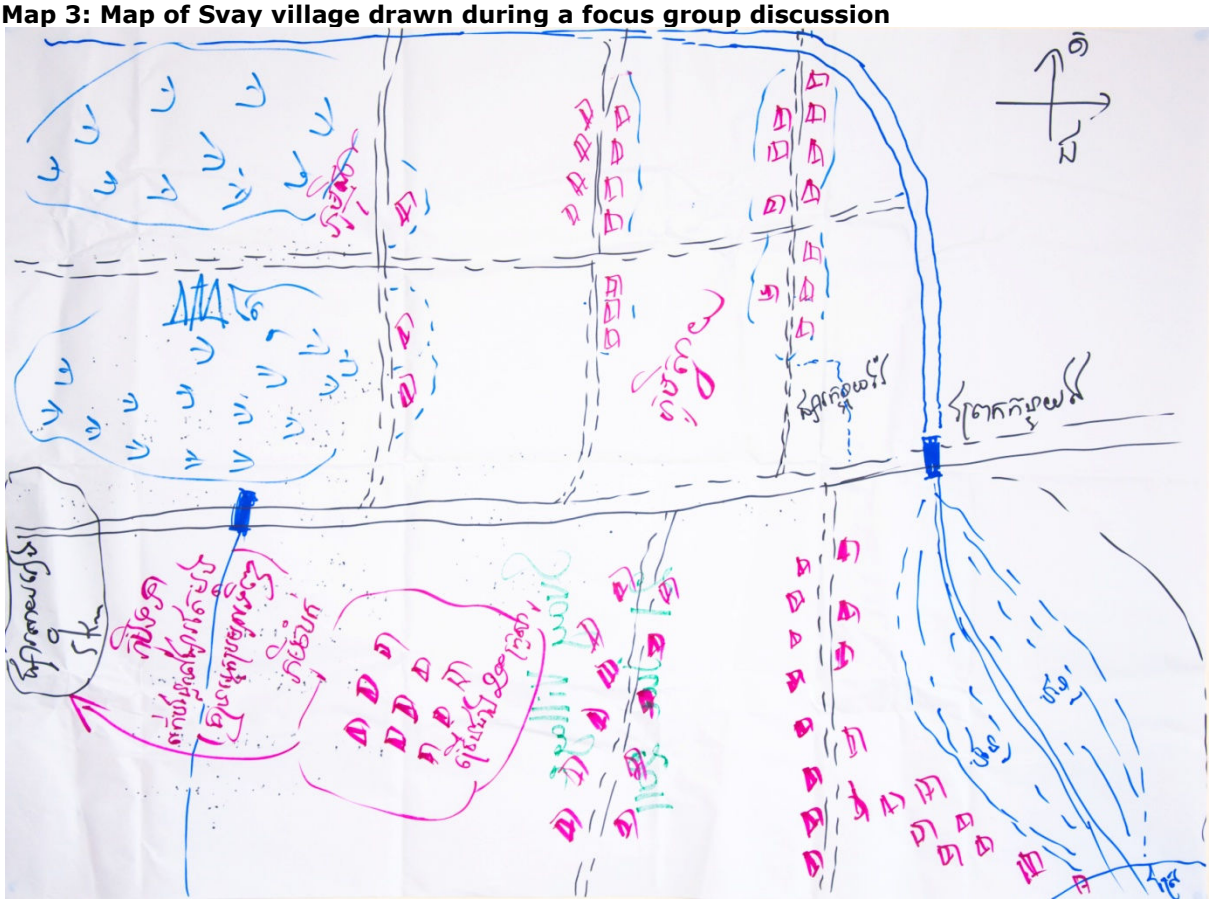
For instance, the maps of villages drawn by farmers show that farmers who practice certain agricultural techniques or behaviours tend to live close to each other. For example, farmers who grow vegetables at home frequently live next to each other, while farmers who do not grow vegetables at home, or who participate in other work or activities, such as those who work for the government, also live next to each other. This is sometimes due to other factors besides conformity, such as the type of terrain (high versus low land), or their location in relation to a main road, which facilitates access to collectors and/or transportation of vegetables to markets. However, in many cases during focus group discussions, farmers arrived at the conclusion themselves that this happens because they copy each other.

Map 2: Map drawn during a focus group discussion with women in Kbal Damrei village.



Map 2 shows that houses where vegetables are grown (in red) are mainly those closest to the main road through the village. Fewer households that live further away from the main road grow vegetables. Map 3 shows that farmers who grow vegetables (in red) frequently live close to each other in clusters. Farmers who do not grow vegetables also live close to each other. There are further factors associated to this, such as access to water and markets, but again farmers agreed that farmers tend to copy each other.

Map 3: Map of Svay village drawn during a focus group discussion



A degree of pride or hidden competitiveness also impedes many farmers to openly discuss better ways to cultivate rice and vegetables. In focus group discussions farmers claimed that they were not always comfortable asking each other about agricultural techniques. Women claimed that men, "only shared their secrets about growing vegetables when they got drunk". It seems that farmers are reluctant to share their ideas about growing vegetables successfully, but at the same time want to fit in with the group.

Female farmers also claim that they only gather formally to discuss agricultural or other issues when a foreign organisation, or NGO, comes to facilitate discussions among them, or during social and religious festivities. This lack of space and time for women to meet is a key issue regarding vegetable cultivation, as women are largely in charge of growing vegetables at home. If they do not have time or space to meet and discuss their agricultural practices, among other issues, they cannot share successful experiences or ways to overcome problems.

The average number of times per year that farmers have contact with other individuals and organizations for agricultural purposes varies (see Table 44). Surveyed farmers have more contact with international NGOs (22.5 per cent), other farmers (20.4 per cent), input sellers (16.5 per cent), and farmer groups and associations (14.2 per cent) for agricultural purposes than with other individual agencies.

Further analysis to examine the different actors that farmers contact for agricultural purposes by communes shows that farmers from different communes contact different types of individuals and agencies. Most farmers, regardless of their commune, tend to contact NGOs for agricultural information. Farmers also tend to contact other farmers, yet this varies between communes. Farmers in Svay Ang and Svay Yea commune, for example, contact other famers more than those in other communes, while farmers in Svay Chek have the least contact with other farmers. Meanwhile, farmers in Kampong Chamlong commune tend to contact farmer groups/associations more than those in other communes. Farmers in Svay Yea are more likely to contact input sellers, collectors and traders compared to other communes. Farmers in Svay Ang and Kampong Chamlong are more likely to contact government extension agencies, provincial government offices/district government offices compared to farmers in other communes.

The frequency of contact with other individuals and organisations to discuss agricultural appears to be related to land size, control attitudes, distance to market, knowledge of and attitudes to growing vegetables. Analysis shows that farmers who have a higher frequency of contact with other organisations tend to have larger land sizes, have more positive attitudes towards vegetable growing, live closer to markets, have better knowledge of vegetable growing than other farmers. This suggests that having a dialogue with several organisations helps farmers to overcome their risk-aversion by learning about others' experiences and ideas on growing vegetables.

The survey found that farmers cooperate with other farmers mainly to harvest rice and to a lesser extent to harvest vegetables (see Table 46). Almost 34 per cent of famers cooperate with other farmers to harvest rice, while only around 17 per cent of farmers cooperate with others to harvest vegetables. Almost 15 per cent of farmers also cooperate to transport rice, while only 6.5 per cent cooperate to purchase inputs for vegetable cultivation. The reason for this is that farmers usually only have small plots of land at home where they cultivate vegetables, and vegetable cultivation is largely seen as a personal or familial activity to supplement the family diet, and only incidentally to supplement income. As a female farmer mentioned during a focus group discussion, "Each has to see to their own".

During observation, one student also found that farmers prefer to sell their vegetables on their own, rather than cooperating to find collectors or customers. Farmers claim that taking vegetables to the market individually is a waste of time and money, but there is nothing else they can do because they do not trust each other. A female farmer argued, "If we ask someone else to take our products to the market, we cannot be sure if the price they get for the produce is the same as what they tell us".

Farmers cooperate mainly with relatives (30.6 per cent to grow rice and 19.7 per cent to grow vegetables), and to a lesser degree with neighbours (22.5 per cent to grow rice and 11.6 per cent to grow vegetables) (see Table 47). During focus group discussions, female farmers frequently claimed that everybody in the family helps to grow vegetables. Cooperation with other farmers who are members of their same cooperative or association is almost negligible.

Farmers claim that they do not cooperate because other farmers do not want to cooperate (lack of trust) and because they do not have time to cooperate (see Table 48). During focus group discussions, farmers claimed that they barely have time to look after their own rice fields, let alone cultivate wet season vegetables or help others. Furthermore, (mainly female) farmers openly acknowledged that there is very little trust between them and that they would not be able to cooperate to cultivate vegetables. Investments in time saving rural infrastructure, in particular those that help women save time (i.e. better equipment to cook or to wash clothes), could free up valuable time for female farmers to focus on wet season vegetable cultivation and, perhaps with some facilitation, in cooperating with each other.

Advantages and disadvantages of growing vegetables

Table 5 presents the advantages and disadvantages of growing vegetables, reported by farmers during focus group discussions. These findings are similar to those found by students during observation in villages, where additional advantages include improved communication among villagers due to seed sharing, training on vegetable cultivation, increased knowledge on marketing, more things to do at home (for the household benefit), families staying together, and higher status within the village.

Table 5: Advantages and disadvantages of growing vegetables

Advantages	Disadvantages
• Extra income (saving money from buying vegetables for consumption) • Household consumption (easy access to 'clean' vegetables) • Being healthier (less-chemical fertilizer, exercise, and more vegetables for daily consumption) • More money to send children to school • Wealthier • Less migration to the cities especially for women if they decide to grow vegetables • Self-development and better knowledge • Sometimes vegetables can be exchanged for rice • Some vegetables can be used as food for animals (pigs, cows, and poultry)	• Difficult to grow vegetables (insects, fertilizer, watering and maintaining the plot) • Farmers need to be hardworking • Need to sell them at the market by themselves because there is no collector to buy from villagers who produce little amounts • Need for more agricultural inputs • Limited technical knowledge to make vegetables more profitable • Raising and selling animals is more profitable

Source: Focus Group Interviews

Table 6 presents the problems and obstacles to growing vegetables mentioned by farmers during focus group discussions and observations. Among them are problems with insects, lack of capital for agricultural inputs, lack of water sources during the dry season, limited markets for vegetables, and price fluctuations. However, farmers seem unaware of several potential challenges to growing vegetables, such as quality and volume. They were also unaware or distrusting of some solutions to their problems, such as buying a water pump to water their vegetable gardens and rice fields, increasing cooperating to market their products, engaging with collectors to find ways to sell more, among others.

Table 6: Problems and obstacles to growing vegetables

Problems for farmers currently growing vegetables	Obstacles preventing farmers from growing vegetables
• Lack of vegetable markets • Very little income because they grow vegetables for consumption only • Insect infestation (both on rice and vegetables) • Rice field is far from home • Inefficient use of pesticides (some insects cannot be killed) • There are not many farmers that put into practice what they have learned from local organisations • Lack of sharing information and trust among vegetable producers • Some people are too 'lazy' to grow vegetables	• Small plots of land for growing vegetables • Lack of capital for agricultural inputs: fertilizer, seeds • Lack of labour • Lack of water sources during the dry season • Collectors only buy vegetables from farmers who produce them in higher quantities, usually model farmers that can produce between 200-500kg of vegetables • Lack of knowledge related to vegetable growing (technical skills, such as the use of plastic, irrigation drips, etc.) • Too much water during the rainy season damages vegetables (only specific vegetables can be grown during the rainy season) • Large fluctuations in the price of produce • Lack of security and safety to grow vegetables in the rice fields (people steal vegetables, animals eat the vegetables) • Difficult to sell vegetables in Svay Rieng market (money to pay for a space to sell, cleaning services, security, police and others) • Growing vegetables needs more time and more sources of input which is more difficult to get than selling labour where they can earn money directly with low risk

Geographical information

Survey results show that most surveyed farmers (75 per cent) live less than 1 km away from a main road. More than 14 per cent report living between 1-2 km from a main road and only 10 per cent reported living more than 2 km away from a main road (see Table 49).

The perceived distance from farmers' households to the closest market shows that more than half of respondents (56 per cent) claim to live less than 2 km away from the closest market, while 27 per cent live more than 3 km away from their closest market (see Table 50).

When comparing the perceived distance to market and median income, there is a significant difference between the perceived distance to market and income during the wet season, meaning that the further the distance to the closest market, the higher the average income (see Table 52). On the other hand, during the dry season farmers who live closest and furthest to markets have the highest income. These results are naturally counterintuitive and must be taken with caution, as the differences in income are not significant.

Marketing

Both female and male heads of households sell their vegetables to the same customers (see Table 54). Market clients (through a stall) are the main customers of households, followed by friends and neighbours, and market vendors. Collectors come a low fourth, most likely due to the low volume of produce for sale by individual farmers.

Further analysis of vegetable selling by location and by gender of the head of household shows that both male and female headed households follow a similar pattern, where the majority of households mostly sell their vegetables at home, followed by the provincial market, the district market, and directly to the collector. Village markets and commune markets play a smaller role (see Table 55).

It is interesting to note that market clients are still the most important customers for vegetables, given that in focus group discussions farmers complained about the difficulties of selling vegetables in the market, mainly because of costs and fees at the market, including fees demanded by police. Farmers claim that police ask them for excessive fees both when travelling to the market and to set up a stall in the market, forcing them to sell to vendors or to neighbours door to door.

The further away a household is from the market, the more important market clients and market vendors are as a first option to sell their produce (see Table 57). On the other hand, farmers who live closer to markets report that they sell their vegetables primarily to friends and neighbours. This counterintuitive finding may indicate that people who live close to markets find there is too much competition and prefer to sell their produce in the vicinity of their homes, where there may be more transit of people or concentration of houses. Meanwhile, people who live far away from markets, and may be more isolated, rely more heavily on selling their produce in the market.

It is also possible that households close to markets make use of the higher population density for direct sales, thus bypassing the corruption of police and high market stall fees. On the contrary, this would mean that households further away from markets have no option but to sell through market stalls as they are more likely to live in sparsely populated areas. If this is true, farmers located further away from markets are suffering more from loss of time, transportation costs to markets, and corruption.

When looking at the main customers of vegetables (Table 58), friends and neighbours (36 per cent) are more important customers than market clients (22 per cent) and vendors (19 per cent). This was clearly reflected during focus group discussions where most farmers claimed to sell vegetables to other villagers, frequently in exchange for other products. This is not the case, however, for the few farmers that grow larger quantities of vegetables. For these farmers, who grow more than 200 kg per season, collectors such as IVY play a significant role. Several farmers claim that collectors are eagerly looking for more farmers who produce vegetables in large quantities and of good quality (see Box 2), indicating that markets are available if more farmers were to invest in cultivating larger quantities of vegetables.

Box 2: Farmers and collectors

Farmers producing large quantities of vegetables—over 200 kg per season—usually sell their vegetables to collectors who pick up their produce several times a month from the farm gate. These farmers usually sell their produce to the same three or four collectors, who they have often known for many years.

Farmers claim to have little opportunity to negotiate prices with collectors who usually all offer similar prices. Despite having some level of trust they do not obtain credit or advances from collectors, partly because collectors themselves have a limited availability of cash. See Case Study in Box 1.

Source: Discussions with farmers during focus group discussions and survey, June 2011

Further analysis of the variation in locations for selling vegetables by commune shows that farmers in all five communes rely heavily on selling vegetables at home. However, farmers in some communes, i.e. Svay Chek, rely more on selling vegetables in their village, while those in Kampong Chamlong sell more in provincial markets. Farmers in Svay Chrum commune rely heavily on the district market, while in Svay Yea and Svay Chrum communes, collectors play only a significant role in the sales of vegetables of surveyed farmers.

Surveyed farmers in each commune were also asked about the different ways they transport their products to markets (see Table 59). While farmers in most communes use a bicycle as a means of transporting products to markets and clients, farmers in Kampong Chamlong and Svay Chek tend to use their motorbikes for transport. This is consistent with the finding that surveyed households in these two provinces ranked highest in levels of income.

Female farmers travel to neighbouring villages to sell their vegetables door to door. They refuse to cooperate to do this, for example by sharing transportation costs or tips about the locations of the best buyers, because they openly claim it would lead to cheating, opportunistic behaviour and problems. One female farmer said, "It is not in my interest to tell other farmers where I can find good clients. They have to find them on their own". However, they all go to the same villages to sell their vegetables, again revealing the tension between competition and conformity.

Distrust also comes in to play when female farmers were probed about why they do not collaborate to sell to collectors, for example by putting their produce together to make larger quantities. They also argue that the men are responsible for doing that, although they may be able to do it better themselves. This example points again to the lack of facilitation skills among farmers, who in several villages claim it is too difficult and complex to organise in this way. They also argue that the distance between houses in the village makes it impossible to bring the produce together. However, they tend to ignore other obstacles in selling to collectors, such as the importance of quality, which farmers growing vegetables on a larger scale acknowledge.

Sources of information

Market vendors and input sellers

Farmers usually learn about produce prices directly from market vendors (see Table 60). In some cases, farmers call their friends to see which market vendor or collector is offering the highest prices, though commonly they will usually take whatever price is offered. On some occasions, if they feel that the price offered by buyers is low, they will store their vegetables for several days in the hope that prices will raise. However, given the lack of proper storage facilities, vegetables can only be stored for a limited time.

A similar situation occurs with the price of inputs (seeds, fertilisers etc.). Farmers do not check prices in advance and accept any price that is offered by the input sellers. Input sellers also appear to be a valuable source of information for farmers regarding which inputs are best and how to use them. This is particularly the case for farmers buying inputs in Vietnam, who claim that input sellers there are very knowledgeable and provide them with useful information on inputs and their use. There seems to be some degree of trust in this relationship when compared to input sellers within Cambodia.

Further analysis explored whether the locations at which farmers sell their vegetables differ between farmers who have previously attended training and farmers who have received no training (see Table 61). There is a significant variation among farmers who sell at home, indicating that those who have received agricultural training tend to sell their vegetables at home more than those who have not received training.

One farmer who grows large quantities of vegetables argued that he received a lot of knowledge from seed providers in Vietnam (see Box 3). He claims that most farmers in Vietnam trust their input sellers because they provide good advice. In contrast, not all farmers are convinced about the usefulness of advice provided by input sellers in Cambodian markets. Some farmers claim that vendors will only promote "their products" or the most expensive inputs, without providing useful information on how to use them.

Box 3: The influence of Vietnamese farmers and sellers in Chea Russei Village

Chea Russei village is located in Kampong Chamlang commune on the border with Vietnam. Most households in the village produce enough rice annually for self-consumption, producing up to 5-6 tonnes of rice per hectare. There are about 10 vegetable producers who could produce an average of 200-250 kg of vegetables daily during the dry season. This amount decreases to around 100 kg per day during the rainy season due to flooding.

Some farmers have a large surplus of rice that they sell to collectors from Vietnam, who offer better prices than Cambodian markets. One farmer receives money around three days to one week in advance from rice collectors in Vietnam. He claims to have a good relationship with several collectors there because they have known each other for many years. However, the collectors do not offer longer term advances ("because the collector has no money") and, similarly, the farmer does not offer credit to the collector. Instead, he asks for payment as soon as the collector has sold the rice, usually within a week.

Farmers in Chea Russei village learn about new cultivation techniques, the price of agricultural inputs, and other agricultural-related information from input sellers in Vietnamese markets. Some sellers also tell them how to best use the seeds. In addition, some farmers learn new agricultural techniques from Vietnamese friends, who advise them on how to grow vegetables. The Cambodian farmers believe they can obtain better yields by following their instructions.

A community leader argued that Vietnamese vegetable producers are different from Cambodian farmers. He argued that "they have more technical knowledge on vegetable cultivation", and "receive more support and incentives from governmental and nongovernmental organizations", such as micro finance to provide loans to farmers, support with transportation, and assistance from agricultural students from universities or specialists to visit and monitor their plots.

He acknowledged that Vietnamese farmers have a culture of sharing ideas and experiences. He often found them in the coffee shop discussing and sharing experiences on agricultural issues, including vegetable production.

This farmer admires Vietnamese farmers because they cultivate vegetables in their rice fields in both the wet and dry seasons to supply to the local market and additional markets in Cambodia. However, when asked why other farmers in Chea Russei village are not willing to cooperate like Vietnamese farmers, participants in a focus group discussion responded that it is difficult for Cambodian farmers to cooperate because they only produce small yields. They do not trust each other enough to cooperate, and fear that a conflict could arise from lack of transparency and opportunism.

The close proximity of the village to Vietnam appears to influence the perceptions and knowledge of Cambodian farmers. However, this knowledge does not translate into action due to underlying issues of trust, cooperation and risk.

Source: Focus group discussion, Chea Russei village, 29 June 2011.

Due to the lack of trust that farmers have in Cambodian input sellers, farmers rely heavily on NGOs (through training) and their friends and neighbours as sources of information on how to use agricultural inputs and new agricultural techniques. Over 37 per cent of surveyed farmers report that NGOs are their main source of information, followed by friends (25 per cent), and family (13 per cent). Only 7 per cent claim that other famers are a main source of information, while an even smaller 2 per cent report that market vendors are a key source of information (see Table 62).

A few farmers claim that they like the inputs sold by FBAs/IDE. They argue that with the products sold by FBAs they know their prices in advance and that the products they sell are high quality. However, for the most part IDE is better known by surveyed farmers for its training, rather than for the FBA network of sellers. Sometimes, farmers argue that FBAs are far from where they live.

Media

The survey reveals that most households (81 per cent) have a TV and a lower proportion (48 per cent) has a radio (see Table 63). Furthermore, about half of surveyed households watch or listen to programmes related to agriculture. However, qualitative data gathered during focus group discussions suggests that farmers are a lot more prone to watch TV programmes on agricultural topics than listen to radio programmes.

One successful farmer, who grows and sells both rice and vegetables in the dry and wet seasons in a village near the border with Vietnam, argues that farmers prefer to watch TV programmes as it is much more informative and easy to understand. He claims that TV programmes on agricultural issues is one of the main reasons why farmers in Vietnam and Thailand are more successful at growing vegetables, although other factors such as access to credit and training also play a role. He suggests that if Thai or Vietnamese TV programmes on agricultural issues could be translated into Khmer and shown on local TV, this would have a huge impact on encouraging more Cambodian farmers to grow vegetables.

Training

The main providers of training among surveyed farmers are NGOs (57 per cent) (see Table 64), including SNV, IDE, IVY and Generosity. During focus group discussions and observations, farmers also mentioned receiving training from CERES and Children Fund Cambodia. Farmer groups and associations, such as CFAP, and government extension services are also among the providers of training mentioned by farmers, albeit to a lesser extent at 11 per cent and 10 per cent respectively. This highlights the vulnerability and dependency of farmers on new knowledge from foreign development partners. However, this information should be taken with caution as the main database from which the survey was sampled is largely composed of beneficiaries of international NGOs.

Most respondents claim that they always follow what they learn in training. However, conversations with farmers and focus group discussions reveal that farmers usually only follow part of what they learn, frequently the parts that involves the least investment and risk. If the measures they adopt show some positive results, then they proceed in taking further steps. However, most farmers are reluctant to accept that unless they take several measures at once, the results they obtain will be negligible. Their risk-averse attitude prevents them from fully venturing into new ways of doing things.

Furthermore, farmers who have received training claim that other farmers ask them about their learning and that they put into practice what they share. However, during focus group discussions farmers claimed that they do not always openly share what they learn. They usually start by observing what trained and successful vegetable growers do and try to imitate it themselves. Only later, if they have problems or cannot figure out by themselves what the trained farmers are doing, will they ask for help. Farmers also claim that, when they ask trained or successful farmers about how to grow vegetables, they will not always reveal all their 'secrets'.

This highlights again how farmers largely see each other as competitors for limited (local) markets. Farmers perceive that the demand for their vegetables is limited and that if others near them are successful at growing vegetables, they will lose some of the market share and/or the prices of vegetables will go down due to oversupply.

Analysis of whether training has an impact on the intention of surveyed farmers to grow vegetables (see Table 65) shows that there is no significant difference in farmers' intention to grow vegetables between those who have received and those who have not received training on wet season vegetable cultivation. This means that receiving training does not significantly increase the sampled farmers' intentions to grow vegetables.

This result must be taken with caution, given that discussions with farmers suggest something different. Farmers insist that they want to receive more training, although several groups of farmers claim the training they receive for free is of low quality. When probed about why they do not pay for good quality training themselves, instead of accepting the free training they do not like, they claimed that they do not have the money or do not want to spend it on training. This example points to the strong dependency mentality among farmers, largely created by development partners themselves. They expect and even demand free training, as well as inputs and other support from international development organisations (see Box 4). However, they do not expect the same from local NGOs or the government, claiming they do not have the funds or interest to support them.

Box 4: A woman demanding free seeds

During a focus group discussion with women, one woman asked for free seeds. We claimed that we were not allowed to give away free seeds or any other free gifts apart from refreshments. We explained that their contribution to the focus groups would help development partners to better understand their needs and improve their programmes. We tried to explain that participating in a focus group discussion is like a long-term investment, where her views would help to provide benefits in the future.

However, the woman was not satisfied with this explanation. She claimed that many organisations come and ask them for information and that they never get anything in return, implying that only the development organisations benefit from these activities. She even claimed that she would rather get cash than refreshments.

Although this was an extreme case, it reflects a clearly widespread view among surveyed farmers that they deserve to receive things for free and that organisations are frequently 'using' them for their own benefit. Changing this mentality is a key issue for their more committed participation in development interventions.

Source: Focus group discussion, June 2011.

When asked how farmers would use additional support, such as access to more credit, inputs, grants, or better irrigation, they unanimously claimed that they would use it to grow more rice. **This is a key finding of this research**. Farmers see themselves first and foremost as rice growers. Vegetable cultivation is still largely perceived as a complementary activity to supplement food and income that will be carried out when farmers are not growing rice. They believe that their best option is to grow rice, for economic, nutritional and cultural reasons ("a farmer grows rice"). This makes sense in cultural and economic context in which farmers live, and has also been highlighted in other studies (see Jensen and Miller, 2011). Changing this belief and self-perception is likely to be the key to changing the behaviour of farmers.

Other farmers

A significant proportion of surveyed farmers claim that other villagers ask them about vegetable cultivation techniques, and of those who do, a large proportion pay attention to their opinions on vegetable production. This is an interesting finding because in focus group discussions farmers claimed that they do not ask each other regularly about vegetable production. And even when they do, several farmers claim that successful vegetable growers do not like revealing all the details about how they achieve success.

On the other hand, female farmers, who have an important role in vegetable cultivation, have very limited opportunities to gather and discuss their problems and challenges with growing vegetables. During focus group discussions female farmers argued that they only meet when there are social and religious ceremonies and when external organisations bring them together. This is largely due to lack of

time (see Tables 3 and 4 for the daily diary of activities of women and men) and habit. This is an important constraint because they have a limited opportunity to exchange ideas and successes.

Copying other farmers is an important and engrained habit in the surveyed communities. Farmers tend to watch and copy each other before openly asking for advice. With this closed attitude, it can take longer to establish changes and to introduce improvements, compared to when ideas and problems are shared more openly.

Knowledge about vegetable cultivation

During the survey, the following statements were read to respondents to test their knowledge on vegetable cultivation:

1. It is good to grow one kind of vegetables in the same plot many times
2. Chemical pesticides do not have a bad effect on predators
3. It is always possible to collect seeds from vegetables of hybrid varieties
4. Natural pesticides can kill all varieties of insects
5. Cabbage can be grown only in November and December

While most farmers responded to statements 1, 2 and 3 correctly, less than half of farmers responded to statement 4 correctly, and most farmers responded to statement 5 incorrectly (see Table 66).

The study then examined the relationship between knowledge and practice to see whether farmers with knowledge of vegetable cultivation are growing vegetables themselves. Based on the five questions above that were asked to farmers to test their knowledge on vegetable growing, a multiple regression examined factors associated with farmers' knowledge of growing vegetables, namely training status, gender, age of household, education of household head, education of spouse and exposure to media (see Table 67). The results indicate that being male, having a higher educational level as the head of household and having greater exposure to media are significantly associated with greater knowledge of growing vegetables.

This is consistent with data gathered through qualitative methods. Although female farmers and other members of households seem to have more responsibility in vegetable growing at home, data suggests that men have more access to knowledge about vegetable growing through training and their own networks. Men also claim to watch TV shows on agricultural issues, which influence their thinking and behaviour. Finally, it seems that age and experience have a strong influence on the knowledge that farmers, especially men, have about vegetable growing.

Based on the five questions testing famers' knowledge of vegetable cultivation, further analysis was conducted to see what type of training provider has a positive impact. The results (presented in Table 68) show that only training provided by international NGOs and by Provincial Government Offices have a significant impact on farmers' knowledge of growing vegetables. These were also mentioned during focus group discussions and observation as having the biggest impact on farmers. However, some farmers claim that some of the training provided by international NGOs is of bad quality. Furthermore, many farmers are reluctant to put into practice what they learn in training, despite the fact that they consider it good.

Surveyed farmers are trapped between the benefits of top-down, supply-driven technology and knowledge transfer approaches and the lack of useful bottom-up initiatives. While they claim that training from INGOs and Provincial Agricultural Extension Offices is sometimes of poor quality, they request more and better training by the same organisations. At the same time, they are reluctant to pay for better training themselves and expect it to be free.

Analysis also looked at the relationship between training and income. If a farmer received training from an NGO, for instance, is their income higher than those who did not? (See Table 69). The results show that farmers who receive training from NGOs and the provincial level government office are more likely to have a higher income than the rest. However, one should be cautious about the causality of this relationship, as it could mean that farmers who receive training from INGOs get a higher income or that farmers with a higher income engage in training with INGOs in the first place.

On the other hand, the impact of farmers' organisations and local agricultural extension offices is limited among surveyed farmers. Farmers appear to join them as a response to the hierarchical structure of rural Cambodian society or as a low-cost way to obtain knowledge and support, but with limited expectations. This was demonstrated throughout this study by the fact that farmers rarely mentioned their names or programmes, even when prompted.

Beliefs

A number of likert-type scales were designed as part of the survey to understand beliefs and attitudinal variables of surveyed farmers. One of the findings (see Table 70) shows the beliefs of surveyed farmers regarding trust within their communities. Almost 75 per cent of respondents agree or strongly agree with the statement that most people in their village are honest and can be trusted. However, 76 per cent also agree or strongly agree with the statement that a person has to be alert otherwise someone else might take advantage of them.

A large proportion of respondents (over 80 per cent) say that they pay attention to the opinions of others in their village, while 94 per cent believe that most people in the village would be willing to help them if needed. The majority of people (65.2 per cent) have an optimistic view that the village has prospered over the last five years and a large proportion of respondents (98.3 per cent) feel accepted as members of their village. However, it is important to take these results with caution, as their reliability is low. There is often a tendency among less-educated respondents to have a bias toward acquiescence, that is to consistently answer "agree" even when they don't know whether they do agree or not (Iarrossi, 2006: 64).

With regard to beliefs in destiny, the findings show that less than half (41 per cent) of respondents agree or strongly agree with the statement that fate or *Veasna* determines their current socio-economic situation (see Table 71). A smaller proportion of respondents (27.5 per cent) believe that things are arranged in life. Only 26.1 per cent of respondents believe that their present fate is the result of karma. Just over 8 per cent of respondents believe that they have to accept whatever comes in their life. However, almost 60 per cent believe that human strength cannot change destiny. Finally, only 17 per cent of respondents believe it is in their destiny to grow vegetables.

Enquiries about attitudes towards growing vegetables show that a surprisingly small 1.4 per cent of respondents agree or strongly agree with the statement that growing vegetables is potentially good for a farmer like them (see Table 72). Furthermore, only seven respondents (3 per cent) thought that farmers who grow vegetables are successful. Finally, the majority of respondents, or 57 per cent, believe that growing vegetables is a big risk.

Another factor that this study measured is the perceived norms by farmers. Almost 96 per cent of respondents believe that all farmers should grow rice (see Table 73). An even higher proportion (96 per cent) believes that farmers should diversify and grow other crops, while 86 per cent of respondents agree or strongly agree with the statement that farmers who grow vegetables are successful. A lower, but still large, proportion (66 per cent) believes that farmers who grow vegetables are richer than others. A slightly larger proportion (76.4 per cent) also believes that farmers who grow vegetables are more powerful than others. Finally, 63.7 per cent of respondents believe that farmers should grow what other farmers grow.

Box 5: Attitude towards chemical fertilisers and pesticides

During focus group discussions and observations we found a widespread deep rooted aversion towards pesticides and chemical fertilizers when cultivating vegetables. Farmers claim that vegetables sold in markets (particularly those imported from Vietnam) are usually cultivated with lots of pesticides that sometimes have health implications for family members. Furthermore, they do not trust the vegetables produced by their neighbours as they claim not to know how much pesticides they have used. Farmers argue that this is one of the main reasons why they grow vegetables at home; they all claim not to use chemical fertilizers when they grow vegetables in their plots at home. They believe that they are healthier (less diseases at home) since they started cultivating their own vegetables.

Surprisingly, they do not have the same attitude towards the use of chemical fertilizers when growing rice. Surveyed farmers are happy to use chemical fertilizers for rice cultivation and are also happy to consume rice that has been grown with the use of chemical fertilizers. They even claim that they would use more chemical fertilizers to increase yields if they had more money to buy them.

This irrational aversion to chemical fertilizers seems to be a result of adverts and comments presented in the media. Some comments from farmers indicate that there have been widespread media reports about the high level of chemical fertilizers and pesticides in fruits and vegetables produced in Vietnam. However, this widespread fear of chemical fertilizers and pesticides seems to be a result of farmers' ignorance about how to properly use them when cultivating vegetables, and their knowledge/belief that other farmers also do not know how to use them properly when cultivating vegetables.

It is also possible that the decision of farmers to apply little fertiliser is economically motivated, given that fertiliser is costly and credit to obtain it is relatively expensive and perceived as risky.

Source: Focus group discussion, June 2011.

When measuring perceived behavioural control, a considerable 95.7 per cent of respondents believe that they can grow vegetables if they want to (see Table 74). Another 94 per cent agree with the statement that they are capable of growing vegetables if they want to, while 95 per cent are confident that they can grow vegetables. Around 88 per cent feel they have the resources and skills to do so. Finally, 94 per cent of respondents believe it is mostly up to them whether or not they grow vegetables.

With regard to surveyed farmers' intentions to grow vegetables, 88 per cent of respondents say they have thought of growing vegetables before (see Table 75). Almost 99 per cent of respondents say they would like to grow vegetables, while almost 99 per cent of respondents say they intend to grow vegetables in the next year.

Overall, most farmers see vegetable growing first and foremost as a way to supplement their diet, and secondly as a potential way to earn an extra income, rather than as an economic activity in itself. Furthermore, farmers think that 'farmers who grow vegetables' are:

- not necessarily richer than farmers who do not grow vegetables
- healthier than other farmers
- more intelligent than other farmers
- more hard-working than other farmers, without implying that other farmers are lazy.

It is important to understand that the benefits that farmers perceive or expect from growing vegetables are usually not direct economic benefits, i.e. higher income. Most farmers see vegetable growing as a way to obtain other benefits, such as an improved diet, better health, allowing the family to stay in the village together or for longer periods of time, among others. These can, however, have an indirect economic impact, such as less ill-health and lower medical costs within the family, and extra income from selling surplus vegetables.

It is also important to understand that for the surveyed farmers growing rice has much more than just an economic meaning. Growing rice has a strong cultural meaning. Hence, promoting the image of successful role models in vegetable cultivation could slowly change the perception that farmers are successful only when they grow rice.

Furthermore, to encourage farmers to grow vegetables to sell involves a change in their mentality and self-perception. Most farmers do not see themselves as large-scale producers, and accumulating wealth does not seem to be a priority. At present, most surveyed farmers seem content with finding ways to satisfy their basic needs. For alternative sources of income they look at less risky means such as migrating to the city in search of casual work as labourers or *moto dup* (motorcycle taxi) drivers.

However, farmers and villages that have substantially increased their production of vegetables (such as Thmol village) see the social and economic benefits of this increase, such as less family members migrating to the city and access to other resources, i.e. money to pay for school or health expenses. Hence, when trying to encourage farmers to grow vegetables, it is important to emphasise the social and economic benefits obtained by those who have grown them on larger scales, as well as emphasising how the self-perception of farmers has changed.

5 Conclusion

The findings from this study show that the determinants for farmers to grow vegetables during the dry and wet seasons, and on small and large scales, are multiple. Factors such as knowledge, access to markets and market information, social connections, age, gender, training and assets, all play an important role in farmers' willingness to cultivate vegetables.

The findings confirm that a large proportion of surveyed farmers do not want to switch from rice cultivation to vegetable growing. This is not due to lack of confidence in vegetable cultivation, given that the majority of farmers currently grow vegetables on a small scale at home and are increasingly aware of the health and nutritional benefits. Rather, they do not see the potential economic benefits of growing vegetables on a larger scale, or perceive higher risks associated with it in comparison to large-scale rice cultivation.

Farmers who do grow vegetables tend to grow them in garden plots during the dry season. In the wet season, vegetable cultivation decreases because farmers are busy working in the rice fields. Frequent flooding of garden plots, which causes significant damage to crops, further discourages farmers from growing vegetables in the wet season. Only a small number of farmers grow vegetables all year round for commercialisation, irrigating their fields with pumps during the dry season. While other farmers could do the same if they had better irrigation systems, the findings indicate that this would not convince farmers to switch. Farmers would rather grow more rice because they see it as a better and more secure investment. Growing rice also has a strong cultural meaning and is seen as part of their 'identity' as farmers.

Copying one another is an important aspect of farming life in rural Cambodia. Farmers do not want to 'be different' to their neighbours so they try to conform to others around them. This is also evident with vegetable cultivation; when a critical number of farmers start growing vegetables, others follow.

Most farmers have limited awareness of issues that could impede their capability to grow vegetables at scale, such as lack of knowledge on how to access to information about markets, negotiate with collectors, grow vegetables on a larger scale, and keep records of finances. The obstacles farmers highlight are few, and include poor irrigation, lack of time and labour. While farmers who grow vegetables on a larger scale have found ways to overcome some of these issues, it is difficult for them to share their experiences with others, due to a high level of fear and risk-aversion among farmers.

Farmers have a limited, but rational, understanding of the law of supply and demand. They do not want to grow the same vegetable (either individually or collectively) as a way to specialise and increase the volume of sales because it would make them vulnerable to price fluctuations and push the prices of vegetables down. They consider it indispensible to grow a variety of vegetables to protect the land. However, the quality of cultivated vegetables is uneven, creating additional challenges for marketing and potential buyers. Many farmers fail to see beyond their local markets and low purchasing power, which ultimately discourages them from producing more.

These beliefs make sense in the context in which the farmers currently operate. That is, farmers produce small quantities of vegetables for self-consumption and sell the surplus among neighbours and in local markets where vendors buy limited amounts of vegetables. They know that by growing several types of vegetables, they can sell those that currently fetch the best market price. However, they have limited understanding that by producing large amounts and less varieties of vegetables individually or collectively, they could attract buyers, and, even if prices go down, they will still make a profit.

Surveyed farmers face significant market challenges, including limited information, poor contract enforcement, limited protection against risks, and high transportation and transaction costs. Transactions are not based on trust, which would otherwise facilitate transactions in the absence of a reliable contract enforcement system. Search costs are high because there is no readily available information, and most transactions are small with highly personalised payment arrangements, usually with no credit. Furthermore, quality is uneven, farmers are unaware of government standards, and there is a lack of transparency in relationships between both sellers and buyers.

In many cases, the perceived absence of markets stems from low purchasing power in local markets. The undeveloped market demand for outputs at the local level discourages farmers from producing more, as does the lack of awareness about other existing possibilities. This is set against the need for seasonal financing that micro finance institutions do not appear to address. Large shares of outputs are destined for subsistence, which does not generate cash to cover purchased inputs and labour.

Another important factor affecting farmers' behaviour is the aversion that they have towards cooperation. This deeply rooted fear impedes their ability to see the potential benefits of working together. They also struggle to understand the coexistence of cooperation and competition. For example, while farmers can cooperate to grow vegetables, they can compete to sell them, and while they can grow vegetables individually, they could cooperate to market them.

An additional challenge to cooperation is the fear of opportunistic behaviour. Farmers mentioned countless times that other farmers 'would' steal or cheat if the opportunity arose, although no specific examples could be provided. This type of behaviour is exacerbated by poor implementation of the rule of law and a context in which the authorities usually act in a discretionary way, if they act at all. Furthermore, there is no social system of rules and norms, including punishments, to deter opportunistic behaviour. As a consequence, the fear of opportunistic behaviour and a lack of control of it is an evident deterrent to cooperation.

The absence of a conflict resolution system is a further obstacle to cooperation. At present, farmers have no way to resolve common disputes, other than through hierarchy or violence. Fear of confrontation means that farmers avoid potential conflict by not engaging in any cooperation at all. An informal system to solve conflicts could help farmers to lose their fear of opportunistic behaviour and stimulate cooperation.

With regard to training and sharing of knowledge, surveyed farmers are trapped between the benefits of top-down, supply-driven technology and knowledge transfer approaches, and bottom-up initiatives. While farmers benefit from the training provided by INGOs and the provincial department of agriculture, local NGOs have a lesser impact on farmers' knowledge, according to quantitative and qualitative sources. Farmers express a need for better and more frequent (free) training on vegetable cultivation. Yet this conflicts with the fact that they are reluctant to put into practice all their acquired knowledge due to risk aversion.

The findings suggest that innovations and best practices will spread through a mix of structured replication, encouraged by INGOs and local NGOs, and spontaneous replication, whereby farmers themselves spread innovations and best practices to other farmers both within and outside their own villages without the direct support or assistance from external organisations. This will happen largely as a result of the strong will or need of farmers to conform, and to a minor degree by farmers' acknowledgement of the potential benefits of growing vegetables for commercialisation. These two mechanisms are complementary, and may contribute to larger-scale adoption of new practices and increased vegetable cultivation, both for self-consumption and for commercialisation.

From a gender perspective, there is a clear distribution in households growing vegetables for self-consumption and those that grow vegetables for commercialisation. Women have a more important role and more responsibility in growing vegetables at home, largely for self-consumption. While other family members in these households contribute to growing vegetables, the men tend to migrate for labour during the rainy season. In surveyed households where vegetables are grown for commercialisation, however, it is mainly older men who are responsible for their cultivation, frequently receiving help from other household members. In these households, male farmers migrate less because they have work and income all year round.

This study has found that poor technical knowledge on vegetable cultivation is not the main or most important determinant for a farmer's decision to cultivate vegetables, at least for self-consumption. Rather, there are a number of inter-related factors that deter farmers from growing, or growing more, vegetables. This suggests that any support and activities aimed at encouraging farmers to cultivate vegetables, both for self-consumption and commercialisation, need to involve a number of different actors and a wider spectrum of knowledge. This includes knowledge on financial management of small-scale farms, management of savings and loans, marketing services, access to information and prices from suppliers and purchasers, basic nutrition, home garden production, and postharvest processing. While this may require a reassessment of current support and funding, the opportunities to increase positive outcomes on household income and nutrition are many.

6 Recommendations

The following recommendations should be tailored to two types of farmers, those farmers that grow vegetables in large quantities for commercialisation and farmers that mainly grow vegetables for self-consumption. This will help to ensure that the specific needs of farmers are addressed.

Provide improved, more pluralistic and inclusive advisory services for farmers that allow them to access and share knowledge in a more participatory and horizontal way.

Reassess the impact of local farmers' organisations and local agricultural extension offices.

The impact of farmers' organisations and local agricultural extension offices is limited among surveyed farmers. Local organisations need to develop better facilitation and knowledge transfer skills as well as a better understanding of the knowledge needs of farmers, so that they can provide a more hands-on approach to training, including co-developing training courses and implementation methods with farmers. Rather than a traditional top-down approach a more participatory approach to learning and knowledge sharing could encourage farmers to grow vegetables. This would require, however, that INGOs become more open to adapting their training to local needs and ways of learning and that local organisations develop better facilitation and knowledge transfer skills.

Continue to encourage farmers to attend training provided by INGOs and the Provincial Department of Agriculture as well as learning from model farmers.

Farmers recognise the benefits of training provided by INGOs and the Provincial Department of Agriculture, as well as the success of some programmes supporting model farmers (sponsored by IVY or IDE, for instance). However, they are reluctant to copy them, claiming that they would need the same kind of support to replicate their success. In order for farmers to implement what they learn, training needs to be tailored to different audiences to ensure it is relevant. For example, specific modules can be provided for farmers producing vegetables on a larger scale or for those willing to increase their scale of production. In this way, farmers' specific needs and questions can be addressed, such as how to access working capital, negotiate with collectors, or find specific technical knowledge. Other modules can be prepared for farmers willing to grow vegetables for self-consumption only. This training should include topics such as bookkeeping and financial literacy, and proper use of chemical and organic fertilisers.

Promote the development of horizontal and participatory peer-to-peer initiatives to transfer knowledge between farmers, in addition to traditional training methods.

a) Empower farmers who grow large quantities of vegetables to share their experiences and knowledge with other farmers in their communities.

Local facilitators are key to the success of information dissemination. For this to happen, however, incentives need to be created to encourage farmers to participate and share their knowledge with others through participatory activities. Public recognition of successful farmers among their communities can help to reduce the existing risk-aversion of other farmers to vegetable cultivation through identification with successful farmers.

b) Facilitate informal meetings between farmers to stimulate discussions and share experiences on agricultural issues.

Groups of male farmers and groups of female farmers should be encouraged to meet periodically, i.e. weekly or biweekly and with no alcohol involved, where they can discuss their agricultural experiences, including challenges and successes. Initially, this needs to be facilitated, as most farmers do not currently see the benefits of sharing information and mutual success, and are suspicious of each other. Delegating authority and organisational responsibility to selected farmers in villages can ensure long-term sustainability and ownership. It would be important to encourage discussion about agricultural issues, but also to allow discussion on other relevant topics. Developing the leadership skills and encouraging participation in such meetings of village chiefs or other charismatic leaders in villages could also help to encourage other farmers to grow vegetables.

Farmers with different characteristics, i.e. age, income, level of experience, and degrees of success cultivating vegetables, should participate in these sessions. Less experienced, wealthy or successful farmers will learn from others. Isolating groups of farmers based on level of income or success in

growing vegetables would only limit the spread of knowledge. Farmers living in villages close to Vietnam should be encouraged to socialise with Vietnamese farmers to exchange information and experiences.

As the primary members of households who grow vegetables mainly for self-consumption in garden plots, it is particularly important to promote the development of informal meetings for women. While women presently have limited time to meet, they cannot see the potential benefits of meeting with other farmers in order to discuss agricultural and other issues. Their current habit is to meet one-to-one every now and then, although they rarely use this time to discuss agricultural issues. Promoting a weekly or biweekly informal meeting where they can relax and talk can help to stimulate knowledge sharing and experiences on better ways to grow vegetables. In some cases, this will require an investment in small-scale rural infrastructure, or support to redistribute their daily activities in order to free up time.

At the same time, women need to learn about the importance or potential benefits of such gatherings. A starting point is to get them interested in meeting by organising attractive activities, such as activities for children or babysitting, with some refreshments. Facilitating the formation of solidarity groups can also be a way to attract women to these groups and encourage them to gather regularly. It is important to remember, however, that at present women only meet when they are gathered together by an external facilitator, usually a foreigner. It will therefore take some time for women to arrange these meetings by themselves without an external facilitator, until the benefits become clear and act as an incentive for the meetings to continue. A way to support this is to distribute responsibilities among female villagers, perhaps involving the village or deputy village chief, and to monitor their activities regularly.

c) Develop and refine successful approaches to vegetable cultivation locally.

Successful approaches to vegetable cultivation can be developed locally and refined through more intensive interaction of farmers with technicians, rather than supplied by research and extension programmes as standardised packages. Participatory research and activities can help to communicate farmers' demands to those providing research and extension services. Farmers must help evaluate, refine, and disseminate locally adapted techniques, which are costly to them.

Improve farmers' access to knowledge through different communication channels, including radio, television and mobile phones.

Farmers want and need to access new knowledge on vegetable cultivation. While neighbours and friends are the most important (informal) source of information on vegetable cultivation for farmers, along with (formal) training from INGOs and the Provincial Department of Agriculture, there are other sources of information on vegetable cultivation that could be pursued more intensely. These include radio and TV programmes, and extension services based on mobile phones, such as text messaging. These information services can be complementary to more traditional ways of transferring knowledge, such as training and field schools. This can also include a communication campaign aimed at changing the traditional idea of the 'successful farmer' by presenting farmers who grow vegetables as good role models to follow.

Provide clear information on the health impact and proper use of chemical fertilizers as an aide to growing vegetables.

Farmers need to receive clear and simple information on the environmental and health consequences of using chemical fertilizers and pesticides. This should be accompanied by information on the correct use and realistic impact of organic fertilisers when cultivating vegetables, which is currently the preferred option by farmers.

Improve links between farmers and input suppliers.

Better links with input suppliers should be developed at the local level because farmers currently distrust Cambodian input suppliers. This could include training a limited number of input suppliers in how to assist farmers and recommend the best products and knowledge on vegetable cultivation. Input suppliers should also be invited to trainings with farmers to develop informal relationships and to allow them to understand farmers' needs. Farmers living in villages close to Vietnam should be encouraged to socialise with Vietnamese input sellers as a way to learn from them.

Strengthen the links between value chain actors through closer contact and exchange of experiences and needs. This should also lead to sharing risks more evenly among different stakeholders.

Stimulate market linkages by linking small-scale farmers with collectors.

Encouraging farmers to talk to collectors, through personal introductions or informal information sessions, could build their awareness of the economic benefits of growing more vegetables. Allowing collectors to talk to farmers about risk, markets beyond the local level and their own assessments of vegetable markets, will also help to change their perceptions about these issues.

Frequently, female farmers travel to neighbouring villages to sell their vegetables door to door. While this activity is time consuming, women refuse to cooperate with their neighbours due to lack of trust. Thus, organising women so that they agree with collectors on meeting at a single collecting point where women could sell their produce individually could help them reduce transportation costs and time. In this way, women could ensure that they are all getting the same price for their vegetables and could eventually negotiate minimum prices. This can help collectors buy higher volumes of quality vegetables and can contribute to more transparent transactions and increase trust among female farmers that would slowly facilitate the development of trusting relationships. For this mechanism to work successfully, however, it would require that female farmers have some basic knowledge of vegetable quality and negotiating skills.

Link small-scale farmers with market vendors.

Farmers and market vendors could benefit from better relationships. For farmers, improved relationships with market vendors could lead to a more stable relationship (rather than the current arms-length low trust relationship) where prices and terms could be negotiated. Market vendors can also be a source of reliable market information.

Farmers would be more capable of negotiating prices and terms with market vendors if they were better organised. Organising farmers into groups so they can regularly negotiate with and sell to market vendors should be encouraged. To overcome the lack of trust, this could start with small groups of (preferably female) farmers, so that they can observe each other's behaviour and safeguard against potential dishonesty.

Support the development of a micro credit scheme for women.

A microcredit scheme aimed specifically at women and linked to training on vegetable growing can improve small scale vegetable cultivation. This scheme could also provide a space where women could gather and begin to develop networks to share experiences. This study showed that a large proportion of households have a loan and that a significant amount of credit is used to acquire agricultural inputs. When women have a significant say in the decision about loans within the household, as this study found, this suggests there is a demand for credit from women. Women would benefit from training on loan management so that they are able to effectively plan loan repayments. Findings also suggests that exploring the possibility of co-developing a micro insurance system could help farmers overcome their fears and protect themselves better against weather or pest-related problems. As there are already NGOs providing micro credit in the region, working with an existing scheme that already has the infrastructure and knowledge in place to provide micro credit to women would reduce implementation costs and avoid duplicating strategies. There is a need for seasonal financing that existing micro finance institutions do not appear to address. It is therefore key to communicate this gap to micro finance institutions and explore working with them to find solutions.

Support the creation of village storage banks for female farmers.

Village rice storage banks can benefit small-scale producers who lack the economies of scale to make it worthwhile to invest at the individual level. They can be particularly important for women who often grow crops for their household food security and lack effective means to store their production without losses. However, it is important to address the problems of governance and lack of trust found in existing rice banks. Encouraging female-only governance structures may also help them to interact more and share experiences, but may require some training on financial literacy, bookkeeping and general management skills, along with a clear definition of rules and norms.

Support the development of an informal conflict resolution system.

An informal system to solve conflicts could help farmers to lose their fear of opportunistic behaviour and stimulate cooperation. This system would need to i) teach farmers how to negotiate and discuss disagreements; ii) develop a system of rules of behaviour, including punishments or consequences for those who break the rules; iii) make sure that the rules and punishments are respected; and iv) have a designated and skilled mediator who is well respected in the community.

Provide farmers with access to more innovative financial and market information services to reduce perceived risks and transaction costs.

Explore the use of information technology for increased access to market information.

The use of information technology by surveyed farmers for agricultural purposes is at present limited. Encouraging farmers to use the information technology they have at hand, i.e. mobile phones, to access and share information could be an important first step. Providing farmers with information on existing mobile banking infrastructure can also be beneficial. Mobile banking is far safer than storing wealth in the form of livestock or by keeping cash at home. Furthermore, mobile phones can be used for crop insurance and other more sophisticated uses, which can be explored and developed in collaboration with relevant partners.

Help farmers to understand and manage risk through information and training.

Farmers feel that vegetable cultivation is risky and indeed they do bear most of the risk in diversification away from rice growing. Clear and specific activities could be developed to reduce both real and perceived risks of growing vegetables. This can include developing better market information and financial risk-management programmes, and finding ways to spread the risk along the value chain, for example with buyers or collectors also assuming some risk i.e. advance payments and crop insurance.

Help farmers reduce their exposure to risk.

Explore the co-development of micro insurance schemes, supply chain risk-management funds and shared investment in vegetable cultivation improvement. In particular, financial risk can be reduced through crop and livestock insurance that is offered to farmers to protect them against unexpected losses in earnings from production and/or market shocks. Recently, index insurance has been shown to help farmers protect against bad weather while encouraging them to grow vegetables. Index insurance addresses information and moral hazard problems by providing insurance based on regional indices, with indemnities based on area yields or weather information. An example of this type of insurance product is insurance for a crop that is indexed to a certain level of rainfall. In this case, the indemnity paid on the policy relates only to rainfall. Farmers still have incentives to tend their crops to the best of their ability, and information is constant for the insurance company and the farmer. This is particularly evident in the aftermath of Cambodia's severe flooding during 2011.

As mentioned above, village rice storage banks can also benefit small-scale producers who lack the economies of scale to benefit from investing as an individual. They can be particularly important for women who often grow crops for household food security and lack effective means to store their production without losses. Although women mainly engage in small scale vegetable production, if they are successful in selling their produce, men may change their views on large scale vegetable cultivation and be more willing to grow vegetables themselves. Thus, helping women to successfully grow and sell vegetables can have long-term positive effects on the wider adoption of vegetable cultivation.

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8. Tables

Table 7: Average age of respondents

(N)	Mean (SD)	Range
(231)	45.88 (11.31)	18 - 77

Table 8: Number of people interviewed by gender

Gender of respondent	% (N)
	(232)
Female	55.6 (129)
Male	44.4 (103)

Table 9: Gender of the head of household

	% (N)
	(233)
Female	31.3 (73)
Male	68.7 (160)

Table 10: Marital status of head of household

	% (N)
	(231)
Single	0.9 (2)
Married	87.9 (203)
Separated	1.7 (4)
Window(er)	9.09 (21)
Divorced	0.4 (1)

Table 11: Number of family members

	% (N)	Mean (SD)	Range
	(228)	5.46 (1.97)	1 - 13
1	0.4 (1)		
2	2.6 (6)		
3	7.5 (17)		
4	25 (57)		

5	21.9 (50)		
6	19.3 (44)		
7	8.8 (20)		
8	7.9 (18)		
9	3.1 (7)		
10	1.3 (3)		
12	1.8 (4)		
13	0.4 (1)		

Table 12: Number of adults (available labour) in the household

	Adult males	Adult females	Total
	% (N)	% (N)	% (N)
	(229)	(232)	
1	37.6 (86)	35.8 (83)	72.53 (169)
2	35.8 (82)	29.7 (69)	64.81 (151)
3	19.2 (44)	27.2 (63)	45.92 (107)
4	5.2 (12)	5.6 (13)	10.73 (25)
5	1.3 (3)	0.9 (2)	2.15 (5)
6	0.4 (1)	0.4 (1)	0.86 (2)
7	0.4 (1)	0.4 (1)	0.86 (2)

Table 13: Number of children (under 15) in the household

	Male	Female
	% (N)	% (N)
	(124)	(114)
1	67.7 (84)	71.9 (82)
2	28.2 (35)	21.1 (24)
3	3.23 (4)	5.3 (6)
4	0.8 (1)	1.8 (2)

Table 14: Educational level of head of household and spouse

	Head of HH	Spouse of HH
Educational level	**% (N)**	**% (N)**
	(232)	(209)
None	9.9 (23)	12.9 (27)
Primary	47.4 (110)	45.5 (95)
Secondary	29.7 (69)	25.4 (53)
High school	12.5 (29)	12 (25)
Technical school		0.5 (1)
Others	0.4 (1)	3.8 (8)

Table 15: Public role of head of household

Public role of head of household	**% (N)**
	(231)
Farmer	78.4 (181)
Village chief	0.9 (2)
Deputy village chief	1.7 (4)
Commune councillor	0.9 (2)
Teacher	3 (7)
Village based healer/village health worker	1.7 (4)
Other	13.4 (31)

Table 16: Years living in the village

	(N)	**Mean (SD)**	**Range**
Years living in this village	(219)	34.59 (16.51)	1 - 77

Table 17: Annual household income

	Annual household income	**% (N)**
		(232)
1	**Less than $500(less than 2 million)**	**45.7 (106)**
2	$500- $1000 (2 million to 4 million)	32.8 (76)
3	$1000- $1500 (4 million to 6 million)	14.2 (33)
4	$1500- $2000 (6 million to 8 million)	3 (7)

5	More than $2000(more than 8 million)	4.3 (10)

Table 18: Monthly household income per season – dry season*

		% (N)
		(232)
1	Less than $100 (400,000R)	26.7 (62)
2	$100 - $200 (40-800,000R)	20.7 (48)
3	$200 - $300 (80-1,200,000R)	20.3 (47)
4	$300 - $400 (120-1,600,000R)	9.1 (21)
5	$400 - $500 (160-2,000,000R)	5.6 (13)
6	More than $500 (>2,000,000R)	17.7 (41)

*(See T-Test on Table A2.2)

Table 19: Monthly household income per season – rainy season*

		% (N)
		(226)
1	**Less than $100 (400,000R)**	**49.1 (111)**
2	$100 - $200 (40-800,000R)	25.7 (58)
3	$200 - $300 (80-1,200,000R)	10.2 (23)
4	$300 - $400 (120-1,600,000R)	2.2 (5)
5	$400 - $500 (160-2,000,000R)	4 (9)
6	More than $500 (>2,000,000R)	9 (20)

*(See T-Test on Table A2.2)

Table 20: Estimated daily income

Daily Income	**(N)**	**Mean (SD)**	**Range ($)**
Income daily – dry ($)	(17)	7.32 (7.27)	2.00 – 32.5
Income daily – wet ($)	(22)	5.73 (5.80)	1.25 - 25

Table 21: Average profit per week

Average profit per week	**(N)**	**Mean (SD)**	**Range ($)**
Profit per week –dry ($)	(192)	17.52 (29.08)	0.75 – 262.5
Profit per week –wet ($)	(185)	12.31 (34.52)	0.5- 375

Table 22: Paired Samples t-tests comparing profit per week in DRY and WET seasons

	Wet season **Mean (*SD*)**	**Dry season** **Mean (*SD*)**	***t*** **value**	***p*** **value**
Profit per week	49,227.03 (138090.3)	71,572.43 (118,241.5)	-5.21	<.001

N =185; Response: Profit is reported in Riel ranging from as low as 2,000R to as high as 150,000R, thus higher scores mean higher profit earned per week.

Table 23: Median monthly income per commune

Name of commune	**Income**		
	N	**Median** **Dry season**	**Median** **Wet season**
Svay Chrum	48	1	2
Chek	**44**	**5**	**3**
Kompong Chomlong	48	3	2
Svay Ang	48	3	1
Svay Yea	44	2	1
Total	232	3	2

Table 24: Median monthly income per village

Name of the villages	Income		
	N	Median Dry Season	Median Wet Season
Kbal Damrie	11	2	1
Svay Year	11	2	1
Prey Plong	11	2	1
Kien Tasiev	11	2	1
Trobek	14	1	1
Khmut	9	3	2
Beoung Veng	13	1	1
Svay chrum	12	2.5	1
Cheas Russey	12	2	1.5
Ta Saang	12	4	3
Veal Lmeut	**12**	3	2.5
Ta Chey	6	1.5	2
Svay	16	3.5	2
Thmol	**12**	6	5.5
Cham Bok	10	5	3
Tor Tea	12	3	2.5
Kandal	12	3	1
Svay Ang	12	1.5	1
Korl	12	2.5	2
Khnol Khang Tbong	12	3	1
Total	232	3	2

Table 25: Main sources of income per season

	Dry season (Nov-May)		**Wet season (Jun-Oct)**	
Main source of Income per season, Dry season (Nov-May)	**(N)**	**Median**	**(N)**	**Median**
Rice*	(61)	2	(47)	2
Vegetables	**(209)**	**1**	**(157)**	**2**
Palm trees	(5)	2	(2)	1.5
Small livestock (poultry, pigs, etc.)	**(157)**	**2**	**(123)**	2
Large livestock (cows, buffalo, etc.)	(15)	2	(6)	**2.5**
Fishing and Aquaculture	(5)	2	(11)	2
Day labour	**(34)**	2	**(43)**	1
Remittances	**(65)**	2	**(66)**	1
Job	(39)	2	(42)	1.5
Other activities	(75)	2	(58)	2

*It is a common recurrence that farmers do not report rice as their main source of income, unless they are openly asked about it. In this case, although enumerators were told to ask farmers, it is clear that they did not always do so. Furthermore, in some cases farmers do not always earn an income from rice cultivation, as they merely use it for self-consumption.

Table 26: Average size of plots by commune

Name of commune	**Summary of land size scores**		
	N	**Mean**	**SD**
Svay Chrum	47	.41	.27
Chek	45	.41	.41
Kompong Chomlong	48	.36	.38
Svay Ang	48	.25	.15
Svay Year	44	.30	.21
Total	232	.34	.30

Table 27: Average plot size by village

Name of the villages	Summary of score land size		
	N	Mean	SD
Kbal Damrie	11	.33	.28
Svay Year	11	.28	.17
Prey Plong	11	.22	.14
Kien Tasiev	11	.36	.21
Trobek	**14**	**.44**	.32
Khmut	8	.43	.33
Beoung Veng	**13**	**.45**	.23
Svay chrum	12	.32	.19
Cheas Russey	12	.27	.18
Ta Saang	12	.28	.14
Veal Lmeut	12	.39	.28
Ta Chey	**6**	**.70**	**.91**
Svay	17	.31	.23
Thmol	12	.35	.29
Cham Bok	**10**	**.58**	.61
Tor Tea	12	.40	.42
Kandal	12	.21	.15
Svay Ang	12	.30	.17
Korl	12	.28	.17
Khnol Khang Tbong	12	.20	.11
Total	232	.34	.30

Table 28: Average size of cultivated land

	(N)	Mean (SD)	Range (ha)
Land for cultivation (ha)			
Plot 1 (house plot)	(183)	0.16 (0.19)	0.0005 – 1
Plot 2	(220)	0.37 (0.3)	0.002 – 2.35
Plot 3	(185)	0.45 (1.13)	0.003 – 15
Plot 4	(131)	0.32 (0.26)	0.02 – 2.4
Plot 5	(76)	0.26 (0.19)	0.01 – 1
Plot 6	(36)	0.28 (0.21)	0.05 – 0.95

Table 29: Size of cultivated land by categories – Plot 1

Size of Cultivated Land	N	Per cent
1: minimum-.10	109	59.56
2: .10-.20	36	19.67
3: .21-.30	10	5.46
4: .31-.40	8	4.37
5: .41-max	20	10.93
Total	183	100

Table 30: Independent group t-test between cultivated land and gender of the head of household

	Female HH Mean (*SD*)	Male HH Mean (*SD*)	*t* value	*p* value
Cultivated Land	.30 (.20)	.33 (.28)	-.80	.42

N = 231

Table 31: Land tenure

	Owned with title	**Rented**	**Shared**	**Total**
	% (N)	**% (N)**	**% (N)**	**% (N)**
Total	(272)	(22)	(5)	
Plot 1 (house plot)	94.38 (84)	3.37 (3)	2.25 (2)	100 (89)
Plot 2	91.46 (75)	6.10 (5)	2.44 (2)	100 (82)
Plot 3	89.39 (59)	9.09 (6)	1.52 (1)	100 (66)
Plot 4	91.89 (34)	8.11 (3)	0.00	100 (37)
Plot 5	82.35 (14)	17.65 (3)	0.00	100 (17)
Plot 6	75.00 (6)	25.00 (2)	0.00	100 (8)

Table 32: Bivariate correlations between income categories and land size and family variables

	Cultivated land	Land size	Income	Adult male	Adult female	Family members
Cultivated land	-					
Land size	**.32*** **	-				
Income	.07	.10	-			
Adult male	.01	.05	.01	-		
Adult female	.16*	.02	.08	**.35*** **	-	
Family members	.10	.06	.05	**.62*** **	**.72*** **	-

Note: *p< .05; ***p <.001

Table 33: Loans

	% (N)
Do you have a loan?	(233)
No	38.6 (90)
Yes	61.4 (143)
How many loans?	**% (N)**
	(251)

One loan	57 (144)
Two loans	29.9 (74)
Three loans	13.2 (33)

Table 34: Average value of loans

	(N)	Mean (SD)	Range ($) R
Loan value, first ($)	(144)	293.06 (373.84)	(2.5 – 2000) 10,000-8,000,000
Loan value, second ($)	(74)	341.32 (550.89)	(5 – 4000) 20,000-16,000,000
Loan value, third ($)	(33)	268.79 (390.52)	(2.5 – 2000) 10,000-8,000,000

Table 35: Use of loans

	First loan	Second loan	Third loan
	% (N)	% (N)	% (N)
	(225)	(109)	(45)
Agricultural inputs	**24 (54)**	**25.7 (28)**	**26.7 (12)**
Livestock purchase or veterinary expenses	12.9 (29)	19.3 (21)	15.6 (7)
Medical/Health expenses	9.3 (21)	6.4 (7)	6.7 (3)
Non agricultural expenses	8.9 (20)	8.3 (9)	8.9 (4)
Schooling expenses	4 (9)	4.6 (5)	6.7 (3)
Social/religious celebration	1.8 (4)	2.8 (3)	0
Consumption	12.9 (29)	6.4 (7)	11.1 (5)
Other	26.2 (59)	26.6 (29)	24.4 (11)

Table 36: Provider of loan

Provider	First loan	Second loan	Third loan
	% (N)	% (N)	% (N)
	(143)	(72)	(34)
Microfinance Institution	**47.6 (68)**	**45.8 (33)**	**29.4 (10)**
Trader	2.1 (3)		
Relative/Friend	**18.9 (27)**	**18.1 (13)**	**23.5 (8)**
Bank	8.4 (12)	12.5 (9)	14.7 (5)

Other	**23.1 (33)**	**23.6 (17)**	**32.4 (11)**

Table 37: Who decided to get the loan?

	First loan	**Second loan**	**Third loan**
	% (N)	**% (N)**	**% (N)**
	(141)	(71)	(32)
Head of household	12.1 (17)	9.9 (7)	18.8 (6)
Spouse	**48.9 (69)**	**39.4 (28)**	**50 (16)**
Older children	0.7 (1)	1.4 (1)	3.1 (1)
Between all the family	36.9 (52)	49.3 (35)	28.1 (9)
Other	1.4 (2)		

Table 38: Chi-square test of 'first loan decision maker' by commune (e.g., does the type of decision maker differ by commune?

Who decided to get the first loan?	**Name of Commune**					**Total**
	Svay Chrum	**Chek**	**Kompong Chomlong**	**Svay Ang**	**Svay Yea**	
Head of household	6	3	5	2	1	17
Spouse	10	17	11	22	9	69
Older children	1	0	0	0	0	1
Between all the family	12	3	19	5	13	52
Other	1	0	0	0	1	2
Total	30	23	35	29	24	141

$\chi^2(16) = 33.63$, $p = .01$

Table 39: Chi-square test of 'second loan decision maker' by commune (e.g., does the type of decision maker differ by commune?—significant results indicate the difference)

Who decided to get the second loan?	**Name of Commune**					**Total**
	Svay Chrum	**Chek**	**Kompong Chomlong**	**Svay Ang**	**Svay Yea**	
Head of household	2	2	3	0	0	7
Spouse	3	12	6	4	3	28

Older children	1	0	0	0	0	1
Between all the family	7	2	14	3	9	35
Total	13	16	23	7	12	71

$\chi^2(12) = 22.07$, $p = .04$

Table 40: Chi-square test of 'third loan decision maker' by commune (e.g., does the type of decision maker differ by commune?—significant results indicate the difference)

Who decided to get the third loan?	Name of Commune					Total
	Svay Chrum	Chek	Kompong Chomlong	Svay Ang	Svay Yea	
Head of household	2	2	2	0	0	6
Spouse	3	7	2	2	2	16
Older children	1	0	0	0	0	1
Between all the family	2	2	2	1	2	9
Total	8	11	6	3	4	32

$\chi^2(12) = 7.50$, $p = .82$ (non-significant)

Table 41: Who participates in the cultivation of rice and vegetables in the household?

	% (N)
Head of household and spouse	46.32 (195)
Older children (15+)	33.25 (140)
Only the head of household	9.26 (39)
Others	6.41 (27)
Young children (-15)	4.75 (20)
Total	421

Valid cases= 230; missing cases= 4

Table 42: Who do you have contact with for agricultural purposes?

Contact for agricultural purposes	% (N)
	(784)
Other farmers	**20.4 (160)**
Farmer group/Association	14.2 (111)
Input seller	16.5 (129)
Collector/Trader	5.5 (43)

NGOs	**22.5**	**(176)**
Local NGOs	1.9	(15)
FBA	3.3	(26)
Research Organizations	0.5	(4)
Government extension agencies	5.0	(39)
Other government agencies	0.6	(5)
Provincial level government office	2.4	(19)
District level government office	3.1	(24)
Others	4.2	(33)

Table 43: Chi-square test of 'contact with others for agricultural purposes' by commune

	Name of Commune					**Total**	**Chi2/p***
	Svay Chrum	**Chek**	**Kompong Chomlong**	**Svay Ang**	**Svay Year**		
Other farmers	29	22	27	43	39	160	30.59***
Farmer group/ association	25	15	34	26	11	111	22.85***
Input seller	24	24	24	18	39	129	28.88***
Collector/trader	8	6	7	3	19	43	24.45***
NGOs	35	33	44	36	28	176	9.50
Local NGOs	2	2	4	5	2	15	2.33
FBA	0	0	10	11	5	26	22.19***
Research organizations	0	0	1	3	0	4	8.07
Government Extension Agencies	1	1	16	16	5	39	32.91***
Other Government Agencies	0	1	1	3	0	5	5.73
Provincial Level Government Office	0	1	9	7	2	19	16.41**
District Level Government office	1	0	9	9	5	24	15.59**
Others	14	1	3	3	12	33	25.64***

Total	139	106	189	183	167	784	
Cases	47	43	48	48	43	229	

Valid cases=229; missing cases=4; $\chi^2(384) = 491.14$, $p < .001$; ** $p < .01$; *** $p < .001$

Table 44: Average number of times that farmers contact other organisations

	N	Mean	SD	Min.	Max.
Other farmers	157	4.62	1.63	0	6
Farmer group/association	109	4.14	1.78	1	6
Input seller	126	3.15	1.71	1	6
Collector/trader	43	4.25	1.90	1	6
NGOs	172	3.66	1.93	1	6
Local NGOs	16	4.18	1.79	1	6
FBA	24	2.66	1.88	1	6
Research orgs.	6	2.33	1.96	1	6
Gov. extension agencies	37	2.64	1.51	1	6
Other government agencies	4	1.25	.50	1	2
Provincial level government office	17	3.05	2.16	1	6
District level government office	19	3.15	1.92	1	6
Contact number others	31	2.35	1.76	1	6

Table 45: Correlation between 'frequency of contact' and demographic and attitudinal variables

	1	2	3	4	5	6	7	8	9	10	11
1 Freq of Contact	-										
2 Land size	**.18****	-									
3 Cultivated land	.04	**.32*****	-								
4 Income	-.01	.10	.07	-							
5 Norm	-.03	.01	.08	-.04	-						
6 Intention	.12	-.08	-.03	-.11	**.21****	-					
7 Control	**.14***	.08	.08	-.05	**.36*****	**.49*****	-				

8 Dis. to Market	**.16***	.09	-.03	.13	-.02	.05	-.02	-			
9 Trust	.04	-.02	.05	**.15***	**.17****	**.18****	**.33*****	.08	-		
10 Knowledge	**.20****	**.17****	.05	.07	-.01	.01	.11	.12	.10	-	
11 Growing attitudes	**-.13***	-.06	-.10	.04	**-.24*****	**-.22*****	**-.24*****	**-.14***	**-.21****	-.08	-

***p < .001; **p < .01; * p < .05; Freq. of Contact here is a variable averaged from other variables of contact with different type of people and agencies—higher scores indicate greater frequency of contact.

Table 46: What do you cooperate on with other farmers?

	Rice		**Vegetables**	
Cooperate with other farmers to	**%**	**(N)**	**%**	**(N)**
		(277)		
Harvest	**33.9**	**(94)**	**16.6**	**(46)**
Market	3.3	(9)	4.7	(13)
Transport	14.8	(41)	4.0	(11)
Purchase inputs for cultivation	6.5	(18)	8.3	(23)
Other	4.3	(12)	3.6	(10)

Table 47: With whom do you cooperate?

	Rice		**Vegetables**	
	%	**(N)**	**%**	**(N)**
		(320)		
Relative	**30.6**	**(98)**	**19.7**	**(63)**
Friend	4.1	(13)	1.3	(4)
Neighbour	22.5	(72)	11.6	(37)
Another farmer who is part of the same cooperative/association	1.6	(5)	2.8	(9)
Other	2.8	(9)	3.1	(10)

Table 48: If you do not cooperate with others, why?

	Rice		Vegetables	
	%	(N)	%	(N)
		(104)		(156)
Other farmers do not want to cooperate	**26.9**	**(28)**	**23.7**	**(37)**
Other farmers are not trustworthy	2.9	(3)	2.6	(4)
It is risky to cooperate	1.0	(1)	1.3	(2)
There are not clear benefits on cooperating	1.0	(1)	6.4	(10)
We do not have time to cooperate	**34.6**	**(36)**	**39.1**	**(61)**
Other	33.6	(35)	26.9	(42)

Table 49: Distance from the house to a main road

	Distance from your house to a main road	% (N)
		(229)
1	Less than 1 km	75.5 (173)
2	Between 1 and 2 km	14.4 (33)
3	More than 2 km	10.0 (23)

Table 50: Distance from the house to the closest market

	Distance from your house to the closest market	% (N)
		(229)
1	Less than 1 km	30.1 (69)
2	Between 1 and 2 km	26.2 (60)
3	Between 2 and 3 km	16.6 (38)
4	More than 3 km	27.1 (62)

Table 51: Distance to market by village

Village	Distance to Market				Total
	1	2	3	4	
Kbal Damrie	4	3	1	3	11
Svay Year	3	6	2	0	11
Prey Plong	5	5	0	1	11

Kien Tasiev	5	1	0	5	11
Trobek	2	8	4	0	14
Khmut	0	7	2	0	9
Beoung Veng	0	3	10	0	13
Svay Chrum	0	6	6	0	12
Chea Russey	0	0	0	12	12
Ta Saang	0	4	3	5	12
Veal Lmeut	0	0	0	12	12
Ta Chey	0	0	1	5	6
Svay	2	6	0	7	15
Thmol	2	4	4	0	10
Cham Bok	8	1	1	0	10
Tor Tea	0	2	3	7	12
Kandal	11	1	0	0	12
Svay Ang	11	1	0	0	12
Korl	8	2	0	2	12
Khnol Khang Tbong	8	0	1	3	12
Total	69	60	38	62	229

Note: Distance to Market: 1= “Less than 1km” to 4=”More than 3km”.

Table 52: Tabulation between distance to market and income

	Distance to Market	Income		
		N	Median Dry season	Median Wet season
1	Less than 1km	68	**3**	1
2	Between 1 and 2km	60	2.5	1
3	Between 2 and 3km	38	1.5	1
4	**More than 3km**	**62**	**3**	**2**
	Total	228	3	2

Table 53: Correlation between distance to market (km) and income categories

	Income
Market	.13 (p <.05)

Table 54: Main customer (ranked first) of vegetables and gender of the head of household

Main customers (by firstly ranked)	Gender of the head of household		Total	Per cent
	Female	Male		
Market clients	24	56	80	34.78
Friends/neighbours	15	38	53	23.04
Market vendors	10	28	38	16.52
Collectors	9	20	29	12.61
Self-consumption	-	-	18	7.83
Others	2	8	10	4.35
Family	1	1	2	0.87
Total	61	151	230	100

Valid cases= 211; missing cases= 22; χ^2 (56) = 50.20, p = .69; Chi2/p is non-significant for all categories

Table 55: Chi-square tests of vegetable selling by gender of the head of household

Where they sell vegetables	Gender of the head of household		Total	Chi2/p*
	Female	Male		
At home	51	126	177	1.14/1.00
Provincial market	24	61	85	.33/1.00
District market	10	39	49	3.01/.66
Collector	15	30	45	.22/1.00
Village market	11	20	31	.42/1.00
Other(s)	13	14	27	4.52/.27
Commune market	2	8	10	.54/1.00
Farm gate	3	4	7	.52/1.00
Total	129	302	431	
Cass	68	155	223	

Valid cases = 223, missing cases = 10; $\chi^2(38) = 45.54$, $p = .19$

Table 56: Chi-square test of place of sale of vegetables by commune

Where do you sell vegetables?	Name of Commune					Total	Chi2/p*
	Svay Chrum	Chek	Kompong Chomlong	Svay Ang	Svay Year		
Farm gate	0	0	2	5	0	7	14.26**
Sell at home	41	25	32	39	40	177	31.80***
Village market	0	10	4	9	8	31	13.52**
Commune market	0	2	0	5	3	10	9.87*
District market	36	0	1	2	10	49	119.72***
Province market	6	34	44	0	1	85	149.68***
Collector	12	10	7	0	16	45	21.60***
Others	4	2	4	5	12	27	14.21**
Total	99	83	94	65	90	431	
Cases	45	45	47	44	42	223	

Valid cases= 223; Missing cases=10; $\chi^2(152) = 433.96$, $p < .001$

Table 57: Distance to market and main customer of vegetable (firstly ranked)

	Distance to Market (km)				Total	Chi2/p*
	1	2	3	4+		
Market clients	8	26	14	28	76	19.15***
Friends/neighbors	35	5	3	10	53	54.55***
Market Vendor	4	6	15	13	38	19.26***
Collectors	8	14	4	3	29	9.48*
Others	1	5	2	2	10	3.43ns
Family	1	1	0	0	2	1.68ns
Total	57	57	38	56	208	

Valid cases= 207; missing cases= 22; χ^2 (168) = 243.57, p = .000

*** p < .001; * p < .05; ns: non-significant

Table 58: Main customers of vegetables (three most important)

Main Customers	N	Percent of responses	Percent of cases
Friends/neighbours	177	35.69	81.57
Market clients	144	22.98	52.53
Market vendors	93	18.75	42.86
Collectors	64	12.90	29.49
Others	26	5.24	11.98
Family	22	4.44	10.14

N = 217

Table 59: Ways of transporting products to the market

	Name of Commune					Total	Chi2/p*
	Svay Chrum	Chek	Kompong Chomlong	Svay Ang	Svay Year		
Bike	28	23	16	12	23	102	14.09**
Motorbike	17	21	34	5	16	93	25.76***
Collector	12	6	0	0	17	35	40.04**

							*
Other	1	0	6	16	1	24	55.23***
Truck	0	0	0	1	0	1	5.21
Cart	0	0	1	0	0	1	3.27
Total	58	50	57	34	57	256	
Cases	42	42	48	33	39	204	

$\chi^2(48) = 169.90$, $p < .001$; ***$p < .001$; **$p < .01$

Table 60: What are your sources of information about prices of your produce?

Main sources of information (first three ranked)	**N**	**Percent of responses**	**Percent of cases**
Market vendor	167	36.23	73.57
Friends	165	35.79	72.69
Others	53	11.50	23.35
Family	28	6.07	12.33
NGOs	28	6.07	12.33
Farmers	19	4.12	8.37
SMS	1	0.22	0.44
Total	461	100	203.08

N = 227, Missing cases = 7

Table 61: Chi-square tests between places of selling vegetables and training

	Attended Training		Total	Chi2/p*	
Where do you sell vegetables?	**No**	**Yes**			**%**
Home	36	141	177	4.83*	79
Province market	10	75	85	3.12	88
District market	4	45	49	3.79 (.052)	92
Collector	8	37	45	.00	82
Village market	9	22	31	3.33	71
Others	4	23	27	.15	85
Commune market	4	6	10	3.68 (.055)	60
Farm gate	1	6	7	.05	86
Total	76	355	431		
Cases	39	184	223		

χ^2 (38) = 52.04, p = .064

Table 62: What are the sources of information about new agricultural techniques?

Main sources of information (first three ranked)	**N**	**Percent of responses**	**Percent of cases**
NGOs	166	37.47	74.11
Friends	109	24.60	48.66
Others	67	15.12	29.91
Family	58	13.09	25.89
Farmers	33	7.45	14.73
Market vendors	9	2.03	4.02
SMS	1	0.23	0.45
Total	443	100	197.77

N = 224, Missing cases = 10

Table 63: Media exposure

	%	(N)
Do you have a TV?		(231)
No	18.6	(43)
Yes	81.4	(188)
If yes, in the past 12 months, have you watched any TV programme related to agriculture?		(218)
No	50.5	(110)
Yes	49.5	(108)
Do you have a radio?		(222)
No	51.8	(115)
Yes	48.2	(107)
If yes, in the past 12 months, have you listened to any radio programme related to agriculture?		(204)
No	60.8	(124)
Yes	39.2	(80)

Table 64: Training

Have you or any member of the household received any training on wet season vegetable cultivation?	**% (N)**
	(232)
No	19 (44)
Yes	**81 (188)**
Provider of the training	(311)
Farmer Group/Association	11.3 (35)
Input Seller	5.8 (18)
Collector	0.6 (2)
NGOs	**56.9 (177)**
Local NGOs	2.6 (8)
Research Organizations	0.6 (2)
Government Extension Agencies	9.7 (30)
Other Government Agencies	0.6 (2)
Provincial Level Government Office	4.8 (15)
District Level Government Office	5.1 (16)
Others	1.9 (6)
Do you always follow what you have learned?	(162)
No	6.8 (11)
Yes	**93.2 (151)**
Do other villagers ask you about vegetable cultivation techniques?	(152)
No	32.2 (49)
Yes	**67.8 (103)**
If yes, do they pay attention to your opinions on vegetable production?	(112)
No	7.1 (8)
Yes	**92.9 (104)**

Table 65: Independent group t-test[5] between training status and intention to grow vegetables

	No **Mean (*SD*)**	**Yes** **Mean (*SD*)**	***t*** **value**	***p*** **value**
Intention to grow vegetables	3.55 (.40)	3.58 (.46)	-.49	.62

Combined number = 232; Training Status: 0 = Has not received training and 1 = Received training; Intention to Grow Vegetables: 1 = Strongly Disagree to 4 = Strongly Agree; A higher score (close to 4) means greater intention to grow vegetables.

Table 66: Number of farmers who responded correctly to the following statements

Statements	**Number of correct responses**	**Percentage of correct** **responses**
It is good to grow one kind of vegetables in the same plot many times	191	
Chemical pesticides do not have a bad effect on predators	151	
It is always possible to collect seeds from vegetables of hybrid varieties	134	
Natural pesticides can kill all varieties of insects	82	
Cabbage can be grown only in November and December	58	
Total	616	

[5] A t-test assesses whether the means of two groups are *statistically* different from each other. For example, does gender (men and women) differ by income (continuous variable)? Significant results, as indicated by p-value of less than .05 or lower (e.g., $p < .05$ or $p < .01$) suggest that the means between two groups are different.

Table 67: Regression coefficients predicting knowledge of growing vegetables from other demographic variables

	B	***SE***	***β***
Training status (1=Trained)	.07	.04	.11
Gender (1=Male)	.11	.03	.24**
Age of household	.00	.00	.04
Education of household head	.06	.02	.19**
Education of spouse	-.01	.01	-.05
Media exposure	.08	.04	.15*

F = 6.41***

R^2 = .16

Training status: 0 = Did not receive and 1 = Received; *p<.05; **p<.01; ***p < .001; F(6, 195) = 6.41, p < .001; N = 202

Table 68: Independent group t-test between training provider and knowledge[6]

Training Provider	**Not Trained Mean (*SD*)**	**Trained Mean (*SD*)**	***t* value**	***p* value**
Farmer Group/Association	.53 (.22)	.55 (.27)	-.35	.73
Input Seller	.53 (23)	.57 (.26)	-.59	.56
NGOs	.46 (.23)	.55 (.23)	-2.20	**<.05**
Local NGOs	.54 (.23)	.45 (.14)	1.08	.28
Research Organizations	.54 (.23)	.40 (.28)	.84	.40
Government Extension Agencies	.54 (.23)	.50 (.22)	.92	.36
Other Government Agencies	.53 (.23)	.80 (0)	-1.63	.10
Provincial Level Government Office	.53 (.23)	.67 (.22)	-2.29	**<.05**
District Level Government Office	.54 (.23)	.55 (.25)	-.25	.80
Others	.54 (.23)	.47 (.24)	.75	.46

N = 213; Response of Knowledge Scores: 0 = Wrong and 1 = Right; the higher the scores (i.e., close to 1) means greater knowledge of growing vegetable.

Table 69: Independent group t-test between training provider and income

	Not Trained	**Trained**	***t***	***p***

[6] The variable "knowledge of growing vegetables" was constructed using the responses of five knowledge questions. For each question, the wrong answer = 0 and the right answer = 1. "Don't know" responses are also considered wrong answers, equaling 0. The number of correct responses was divided by 5 which is the total number of questions asked. This means that the higher the score (which is close to 1), the greater the knowledge.

	Mean (*SD*)	Mean (*SD*)	value	value
Farmer Group/Association	2.43 (1.52)	2.81 (1.63)	-1.33	.19
Input Seller	2.5 (1.58)	2.47 (1.21)	.07	.94
Collectors	2.49 (1.55)	3.00 (.71)	-.46	.64
NGOs	1.78 (.94)	2.64 (1.60)	-3.13	**<.01**
Local NGOs	2.49 (1.55)	2.63 (1.46)	-.24	.81
Research Organizations	2.50 (1.55)	2.75 (.35)	-.23	.82
Government Extension Agencies	2.48 (1.59)	2.57 (1.25)	-.26	.79
Other Government Agencies	2.48 (1.54)	3.75 (2.47)	-1.15	.25
Provincial Level Government Office	2.42 (1.48)	3.53 (2.05)	-2.73	**<.01**
District Level Government Office	2.46 (1.54)	2.91 (1.65)	-1.10	.27
Others	2.50 (1.56)	2.25 (1.13)	.40	.69

N = 212; Response: 1=Less than $100 – 4 = More than $500. Mean value closer to 4 means more income.

Table 70: Trust within the community

Item	Strongly disagree	Disagree	Agree	Strongly agree	Total
Most people in this village are honest and can be trusted	10(4.3%)	49(21%)	111(47.6%)	63(27.1%)	233(100%)
In this village, one has to be alert otherwise someone is likely to take advantage of you	17(7.3%)	38(16.3%)	125(53.7%)	53(22.7%)	233(100%)
I pay attention to the opinions of others in the village	5(2.2%)	41(17.6%)	169(72.5%)	18(7.7%)	233(100%)
Most people in this village are willing to help if you need it	2(0.9%)	11(4.7%)	123(52.8%)	97(41.6%)	233(100%)
This village has prospered in the last 5 years	13(5.7%)	67(29.1%)	109(47.4%)	41(17.8%)	230(100%)
I feel accepted as a member of this village	1(0.4%)	3(1.3%)	106(45.5%)	123(52.8%)	233(100%)

Alpha = .38[7]

[7] Reliability Test based on Cronbach's Alpha: By convention, a lenient cut-off of .60 is common in exploratory research; alpha should be at least .70 or higher to retain an item in an "adequate" scale; and many researchers require a cut-off of .80 for a "good scale."

Table 71: Beliefs in destiny

Item	Strongly agree	Agree	Disagree	Strongly disagree	Total
I believe that fate determines my current socio-economic situation	41(17.6)	97(41.6%)	61(26.2%)	34(14.6%)	233(100%)
I believe that things are arranged in life	60(25.8%)	109(46.8)	40(17.2%)	24(10.3%)	233(100%)
I believe that our present fate is the result of karma	73(31.3%)	99(42.5%)	39(16.7%)	22(9.4%)	233(100%)
I have to accept whatever comes in my life	106(45.5%)	108(46.4%)	11(4.7%)	8(3.4%)	233(100%)
Human strength cannot change destiny	27(11.6%)	70(30.2%)	81(34.9%)	54(23.3%)	232(100%)
It is my destiny to grow vegetables	67(29%)	124(53.7%)	24(10.4%)	16(6.9%)	231(100%)

Alpha = .66

Table 72: To understand attitudes towards growing vegetables

Item	Strongly disagree	Disagree	Agree	Strongly agree	Total
Growing vegetables is potentially good for a farmer like me	145(62.2%)	84(36.1%)	3(1.3%)	1(0.4%)	233(100%)
Farmers who purposely grow vegetables are successful	115(49.4%)	111(47.6%)	7(3%)	0	233(100%)
Growing vegetables is a big risk	19(8.1%)	81(34.8%)	119(51.1%)	14(6%)	233(100%)

Alpha = .26

Table 73: To understand perceived norms

Item	Strongly disagree	Disagree	Agree	Strongly agree	Total
All farmers should grow rice	1(0.4%)	9(3.9%)	51(21.9%)	172(73.8%)	233(100%)
Farmers should diversify and grow other crops	1(0.4%)	7(3%)	104(44.7%)	121(51.9%)	233(100%)

Farmers who grow vegetables are successful	5(2.1%)	28(12.1%)	139(59.9%)	60(25.9%)	232(100%)
Farmers who grow vegetables are richer than others	7(3%)	71(30.5%)	127(54.5%)	28(12%)	233(100%)
Farmers who grow vegetables are more powerful than others	5(2.2%)	49(21.1%)	140(60.3%)	38(16.4%)	232(100%)
Farmers should grow what other farmers grow	32(13.7%)	54(23.2%)	115(49.4%)	32(13.7%)	233(100%)

Alpha = .47

Table 74: To understand perceived behavioural control

Item	Strongly disagree	Disagree	Agree	Strongly agree	Total
I can grow vegetables if I want to	2 (0.9%)	8 (3.4%)	134 (57.5%)	89 (38.2%)	233 (100%)
I am capable of growing vegetables if I want to	1 (0.4%)	13 (5.6%)	127 (54.5%)	92 (39.5%)	233 (100%)
I am confident that I can grow vegetable	2 (0.8%)	9 (3.9%)	110 (47.2%)	112 (48.1%)	232 (100%)
I have the resources and skills to grow vegetables	1 (0.4%)	27 (11.6%)	148 (63.5%)	57 (24.46%)	233 (100%)
It is mostly up to me whether or not I will grow vegetables	4 (1.7%)	11 (4.7%)	132 (56.7%)	86 (36.9%)	233 (100%)

Alpha = .67

Table 75: To understand intention

Item	Strongly disagree	Disagree	Agree	Strongly agree	Total
I have thought of growing vegetables before	8(3.4%)	20(8.6%)	116(49.8%)	89(38.2%)	233(100%)
I would like to grow vegetables	1(0.4%)	2(0.9%)	111(47.6%)	119(51.1%)	233(100%)
I intend to grow vegetables in the next year	0	3(1.3%)	75(32.2%)	155(66.5%)	232(100%)

Alpha = .60

Table 76: Number of family members by age and gender in all villages

Number	Number and Percentage Reporting											
	Adults						Children (less than 15 years old)					
	Male		Female		Total		Male		Female		Total	
1	86	(37.6)	83	(35.8)	169	(72.53)	84	(67.7)	82	(71.9)	166	(95.95)
2	82	(35.8)	69	(29.7)	151	(64.81)	35	(28.2)	24	(21.1)	59	(34.10)
3	44	(19.2)	63	(27.2)	107	(45.92)	4	(3.23)	6	(5.3)	10	(5.78)
4	12	(5.2)	13	(5.6)	25	(10.73)	1	(0.8)	2	(1.8)	3	(1.73)
5	3	(1.3)	2	(0.9)	5	(2.15)						
6	1	(0.4)	1	(0.4)	2	(.86)						
7	1	(0.4)	1	(0.4)	2	(.86)						
Average (SD)	2.00	(1.04)	2.09	(1.05)	2.04	(.86)	1.37	(.59)	1.37	(.67)	1.40	(.55)
Total/Overall	229	(100.0)	232	(100.0)	461	(197.8)	124	(100.0)	114	(100.0)	238	(137.57)

Number	Total					
	Male		Female		Total	
1	170	(73.91)	165	(71.1)	335	(143.8)
2	117	(50.87)	93	(40.1)	210	(90.1)
3	48	(20.87)	69	(29.7)	117	(50.2)
4	13	(5.65)	15	(6.5)	28	(12.0)

5	3	(1.30)	2	(.86)	5	(2.5)
6	1	(.43)	1	(.43)	2	(.9)
7	1	(.43)	1	(.43)	2	(.9)
Average (SD)	1.86	(.82)	1.9	(.93)	1.9	(.67)
Total/Overall	353	(153.48)	346	(149.1)	699	(300)

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