

Grow Against the Flow: Scaling off-season vegetable innovations to increase farmers' income and improve nutrition in Cambodia and Lao PDR

Qualitative Study Results



Photo: Tomato farmer in Kampong Cham province, Cambodia

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1 Introduction

Off-season technologies such as seed varieties, grafting, rain shelters, and water-saving can help farmers to continue vegetable production for more months of the year. Yet, the use of off-season technologies in Southeast Asian countries including Cambodia is limited. The Grow Against the Flow (GAF) project (2020-2023) aims to scale off-season technologies to 100,000 households in Cambodia and Lao PDR. The project defines the off-season as the dry period between March and May and the wet season between June and October. The regular vegetable growing season is the period from November to February. This project uses demonstration sites in selected locations in the two countries to show farmers the benefits of improved cultivars, IPM practices, protective structures, and water conservation technologies for off-season vegetable production. The project is implemented by the World Vegetable Center (WorldVeg) and partners including the General Directorate of Agriculture, Cambodia (GDA), International Development Enterprises (IDE), and East-West Seed (EWS) Foundation.

This qualitative study was conducted in Cambodia with the objective **to understand the reasons for farmers to adopt (or not adopt) off-season vegetable production practices**. The results will be help validate and interpret the findings from the quantitative baseline survey that was conducted in 2021. This baseline collected data on key outcome variables against which the impacts of the project can be assessed, including the adoption of off-season technologies and hectares under vegetable production by season.

Overall, the baseline survey showed that about 100% of sampled farmers already grew crops in the wet season while 80% already grew vegetable crops in the dry season. Variations across countries were observed for crop growing in the main season with 73% of Cambodian farmers and 96% of Laos farmers growing crops in the regular season. Of the three vegetables targeted by the project, yardlong bean and brassica were common as compared to tomato. Specifically, 63% of farmers in Cambodia grew yardlong bean while 31% in Laos did. Brassica was grown by 50% and 65% of farmers in Cambodia and Laos respectively while only 6% of the surveyed farmers in both countries grew tomato. The qualitative study sought to understand the opinion of farmers regarding the importance of these three vegetable crops relative to other vegetables and why they choose to grow these in the off-seasons.

In terms of the use of off-season technologies, the baseline survey revealed that more than 90% of the sampled households in Cambodia and Laos used at least one off-season technology. Popular off-season technologies included improved seed varieties, followed by investment in water storage and the use of composted manure. Sticky traps, plastic tunnels and pheromones were rarely used. We aimed in this study to get farmers' opinions on the use of off-season technologies and explored technologies that farmers learnt, used and shared to validate the quantitative baseline findings.

The baseline survey further sought to understand constraints faced by farmers in the production of vegetables in the off-season. The respondents identified 13 constraints. High incidences of pests and diseases are a common constraint in the dry and wet seasons as well as low yield and low selling price. The indication about low selling prices is interesting as we expected it to be high during the off-season and the main incentive for farmers to benefit from the adoption of off-season technologies promoted by the GAF project. We probed for an explanation of the role of prices and other constraints during qualitative data collection.

2 The Grow Against the Flow project

The GAF project uses a farmer-trainer approach to scale innovations on the following topics: 1) quality seed, land preparation, seedling, mulching, bed making and grafting; 2) transplanting, spacing, water management, and low external input; 3) plant nutrition, fertilizer and application, pest and disease identification and management; and 4) safe and efficient use of pesticide. A list of all off-season practices disseminated by the project is provided in **Table 1**.

Table 1: Selected off-season technologies promoted by the Grow Against the Flow project

No.	Technology	Yardlong bean	Leafy brassicas	Tomato
1	Following crop rotation	✓	✓	✓
2	Flooding soil before planting	✓	✓	
3	Keeping weed under control	✓	✓	✓
4	Using early planting date	✓		
5	Planting tall crops in the border of the field to act as barriers	✓	✓	✓
6	Applying nitrogenous fertilizer	✓	✓	✓
7	Applying composted farmyard manure	✓	✓	
8	Using improved seed varieties	✓	✓	✓
9	Treating seeds before sowing	✓	✓	✓
10	Using raised beds	✓		✓
11	Applying neem oil over seedlings	✓	✓	✓
12	Covering seedling trays	✓	✓	✓
13	Using pheromone lures/traps	✓	✓	✓
14	Using yellow plastic or straw mulch	✓	✓	✓
15	Using yellow/blue sticky traps	✓	✓	✓
16	Using trellis/staking	✓		✓
17	Using biopesticides/natural pesticides	✓	✓	✓
18	Investing in water use and storage	✓	✓	✓
19	Using hormones or plant regulators	✓	✓	✓

3 Methods

The study was done in March 2022 and covered two provinces in Cambodia: Kampong Cham and Tboung Khmum. East West Seed and WorldVeg consultant who trained farmers identified villages for FGDs. In the end, six villages were selected and two of the villages consisted of farmers with low levels of participation in terms of adoption of technologies as perceived by East West Seed and the WorldVeg consultant. Details of participants are provided in **Annex 1**. The FGDs consisted of 5-7 farmers each and took about one and a half hours. Efforts were made to ensure FGD participants differed in their socioeconomic characteristics (e.g., economic status, sex, age) and that adopters and non-adopters attended separate group discussions. Participants age ranged between 24 and 68 years and included 21 men and 18 women. Key informants were identified in each province focusing on those that are knowledgeable of vegetable production and marketing in the areas. The informants included experts in vegetable production and marketing,

namely government officers, lead farmers and a trader and took about 30-45 minutes per interview.

The questionnaire (**Annex 2**) was translated into Khmer and the translated interview guides were piloted to make sure the questions were understood in the way intended, and adjustments were made accordingly. The questionnaire and the study protocol were reviewed internally by the Institutional Biosafety and Research Ethics Committee of the World Vegetable Center.

All discussion points were noted down on flip charts and notebooks, and audio recordings were taken. The first author held meetings with the notetaker and facilitator at the end of each day to reflect on the discussion and improve the notes. Thematic analysis was done using a document in Word to develop codes and Excel to derive thematic concepts.

4 Results

4.1 Important vegetables

We sought to understand the important vegetables for farmers in Kampong Chan and Tboung Khmum provinces while considering the role of yardlong bean, brassica including choysum, pakchoy and tomatoes which are promoted by the project. The most important vegetables as mentioned by farmers during FGDs were cucumber and yardlong bean. The importance of these crops arises from the fact that they are grown throughout the year and fetch good prices, especially in the wet season. This is in line with our expectation but contradicts with our baseline findings which show higher price per kg of yardlong bean during the regular season compared to the off-season.

Bitter melon and brassicas were considered important too but they require intensive management practices, are susceptible to pests, have low yields and are seasonal. Brassicas for instance is grown mainly in the dry season. Tomato, which is a focus crop for the project, was one of the least important crops to farmers. Most farmers said they do not produce this crop and, in some areas, it was never grown before. Some of the farmers who tried growing it within the project thought that it is laborious, has low yield, and is not marketable while some other farmers saw potential if production is well managed. This finding corroborates our baseline findings which

showed low adoption of tomato growing. Other vegetables of minor importance to farmers are bell pepper, wax gourd, water spinach and eggplant.

4.2 Challenges of off-season vegetable production

Farmers considered off-season vegetable production challenging for various reasons including climatic, resources, marketing, and crop choice.

Regarding climatic factors, temperatures are high and water is insufficient in the dry season and there are increased reports of pest infestations making production of vegetables like yardlong bean and brassica difficult. In the wet season, flood is the main concern with farmers reporting poor performance of brassica and cucumber. Similar to the dry season, increased incidents of pests is a key issue in the wet seasons. Vegetable crops, particularly brassica, are highly susceptible to pest attacks. Water scarcity and floods are other important challenges for farmers.

The availability of key resources poses a threat to off-season production. Lack of input was mentioned frequently during the interviews. Farmers and key informants said that seeds, especially for tomato, are not easily available and the cost of fertilizer and plastic cover is high. Labour and capital are hard to get especially in the wet season as resources are allocated to rice production. This is challenging because some off-season practices like raised beds require much labour to implement.

Market constraints were highlighted during the interviews. Competition between locally produced vegetables and imports from Vietnam was a great concern for farmers. Farmers and key informants observed that brassica and tomatoes were imported in large quantities. Interviewees indicated that imported vegetables were cheaper than local ones and appeared fresh thus attractive to consumers. Lack of coordination among farmers is an important market factor mentioned by key informants. Farmers do not want to join groups and associate cooperatives with poor performance. This means that farmers cannot capitalize on bargaining power and economies of scale.

As for the type of crops, farmers pointed out that brassica is challenging to grow in the wet season and yardlong bean is challenging to grown in the dry season. According to one of the key informants, brassica requires intensive management and high investment cost thus many small

farmers are hesitant to grow this crop. Tomato is not grown in the off-season yet as it is considered a new crop and practice for most farmers. Some farmers said they are afraid and not confident to grow tomato. They also consider tomato growing a laborious activity requiring hard work and time while market demand and income are low.

4.3 Technology adoption

Several training events on off-season practices have been conducted through the project and we sought to understand farmers' knowledge, use and sharing of practices. The most popular practices that farmers learned included land preparation practices like raised beds and nursery establishment, pest management including safe use of pesticides, fertilizer application, insect traps, and trap crops; water management practices such as drip irrigation and others like plastic cover and tomato grafting. Technologies least mentioned were organic fertilizers, insect scouting and the use of insect nets.

Drip irrigation for yardlong bean and brassica production is commonly used already. In one of the FGDs, all farmers indicated to use this technology. Farmers like drip irrigation and consider it as good, convenient, and effective because it saves water, time, and cost – resources that are difficult to find during the off-season. For instance, previously, farmers spent a lot of time and labor watering with cans and applying fertilizer but this has changed with the use of drip irrigation. Another practice widely used is raised planting beds and plastic covering. The main reason is that once the initial investment is made, these technologies can be used for three other seasons and for different crops. Plastic covering is good for weed management thus saving time and labor.

The least used practices are nursery establishment and tomato grafting. During the FGDs, farmers indicated that nursery establishment is a problem because of low seed germination. Regarding grafting, we found that it is a new technology that farmers learned through the project which explains why most of them are not using it yet. In fact, in most groups, only one farmer did tomato grafting. Others reported that they were observing other farmers before they introduce the practice to their farms. One of the key informants noted that grafting material is not locally available and farmers do not want to incur the cost of buying it.

Some practices have been applied partially. For instance, pest management, fertilizer application and safe use of pesticides are partly used because farmers do not fully remember the practice requirements or because of ignorance. For instance, it was mentioned that although farmers were taught to spray pesticides once per week, some sprayed yardlong bean every two days to prevent pest attacks.

Regarding sharing information about the practices learned, farmers enjoyed teaching others in their village and from other villages about drip irrigation, raised beds, fertilizer application and pest management. Interestingly, farmers shared information even on less practiced technologies like tomato grafting and nursery establishment. One of the groups shared information on nursery establishment with about 40 farmers from other villages while in another focus group, participants said that about 20-30 farmers came from other villages to learn about grafting and other technologies.

4.4 Training events

The participants of FGDs indicated that they attended most of the training events organized by the project. The reasons for attending were to improve knowledge, learn new technologies, interact with other farmers, and for economic benefits such as improving production and income. Some farmers had sent their spouse or relative to attend the training when they did not have time to attend themselves or if they had little interest in the new technologies.

4.5 Gender aspects regarding off-season technology adoption

The project aims to bridge the gender gap in vegetable production and marketing by using off-season practices. Our interviews revealed that off-season practices encourage women's involvement in vegetable production. Previously, women rarely did irrigation, but with drip irrigation it is easy for them and saves time and labor for fetching water. Similarly, using plastic cover saves time and labor for weeding. In most FGDs, participants appreciated that with new practices, women have more time to take care of their homes, do business like selling vegetables, or engage in other farm work including animal rearing. One key informant noted that women used the time saved to earn extra income from farm and non-farm work. Not only women benefit but men also do. A male focus group participant said, "I just open the [electric] pumping machine, my wife can control the drip system; then, I have more time to do other work". The

benefits of the practices for youth are less clear because only few youth engage in farming as many have migrated to cities in search of formal employment and education.

4.6 What support do farmers need?

Farmers would like to get support in accessing quality inputs like seeds and water sources. This, according to them, can be achieved by establishing linkages with input providers and financial providers to access loans for investment. More training to clearly understand and remember off-season technologies like tomato grafting, fertilizer application, and pest and water management is required. Farmers suggested that some of the ways to improve training are through regular farm visits by extension staff, providing access to information through mobile applications and providing training materials to lead farmers. Key informants felt that providing training to the government staff can also improve farmers' access to information.

Market support is needed especially in improving linkages with reliable buyers. Some participants are interested in contract farming for yardlong bean citing that they have had good experience previously with such arrangements in other vegetables like wax gourd, melon, and eggplant. In addition, farmers and key informants suggested that the government could introduce policies to stabilize vegetable prices and control vegetable imports. Further, it was suggested that business clusters can be initiated to help farmers overcome marketing challenges. Through such clusters, farmers can have more bargaining power through collectively negotiating for better terms of payments with buyers and economies of scale through buying bulk inputs and selling produce together.

4.7 Opportunities

Prices of vegetables fluctuate depending on demand and supply but generally, prices are high in off-seasons and during key celebratory holidays like the Ancestors holiday in September and October. Most farmers agreed that they obtain high prices for yardlong bean in the wet season across the months of August to November. Similarly, vegetable prices are high in the dry season, for instance, in one of the FDGs farmers quoted a price of US\$ 0.5 for a kg of brassica. One of the respondents said that they harvest low amounts of cucumber in May-July (wet season) but get a high price. Clearly, price is the key motivation for vegetable production in the off-season.

Geographical factors also seem to play a role in vegetable production in the off-season. In the highland area, there is less flooding during the wet season making the area conducive for vegetable growing. Farmers there fetch higher prices in the wet season because of limited supply as their counterparts along the riverbanks cannot grow due to floods. During the dry season, it is easier for farmers at the riverbanks to grow because they have access to water for irrigation. These farmers obtain high prices in dry seasons since the supply is low given the low production in highland areas. By learning these dynamics, farmers can maximize production in different seasons.

5 Conclusion

This study was conducted in Kampong Cham and Tboung Khmum provinces in Cambodia to seek farmers' opinion regarding off-season vegetable production. A total of six focus group discussion and six key informants were conducted. Farmers reported that cucumber and yardlong bean are the most important vegetable crops because they can be grown throughout the year. Brassicas such as pakchoy and choysum are relatively important but require intensive management and are highly susceptible to pests. The least important vegetables were water spinach and eggplant. Tomato was rarely mentioned because it is a new crop and therefore farmers may not be fully aware of its importance. Those who grew it noted that it requires high labour to grow and manage. It was noted that most farmers need more training on grafting to adopt tomato growing.

Our findings show that pests are a great problem for vegetable production and confirm the baseline findings. We also noted that resources are a key constraint and promoting off-season vegetable growing increases the competition for resources during the wet season when rice production is the dominant activity. Cheap vegetables imported from Vietnam were a great concern for farmers who get lower prices for locally produced vegetables. Perhaps price control by the government could be a pathway to improving prices of local produce thus motivating off-season vegetable production.

Despite off-season production challenges, most farmers grow yardlong bean and brassica because vegetable production is their main source of livelihood. Increasingly, off-season production has generated interest among vegetable farmers because of the knowledge gained

through the project. Farmers appreciated that off-season practices introduced through the project are beneficial because they save water, time, and money, which are difficult to find during these seasons. Drip irrigation and raised beds are the best technologies for farmers because of their multiple uses, that is, they can be used on different crops and in different seasons. For example, raised beds help to conserve water during the dry season but also prevent flooding during the wet season. Technologies with multiple uses can promote adoption and scaling of off-season farming.

6 Suggestions for follow-up

Farmers prefer technologies that have multiple uses meaning that the project could emphasize these to scale production. Pests remain a main challenge. It is recommended to find ways to train and remind farmers about pest management practices. Tomato is a new crop to most farmers and the project will need to sensitize farmers about the benefits of the crop. This qualitative study points out that off-season technologies benefit women but a quantitative evaluation is needed to find out the impact of the project on women empowerment. The study finds that contrary to the baseline findings, off-season production is associated with high prices. It is not clear why but COVID-19 restrictions could have had an impact. The endline survey should get more evidence on off-season vegetable prices.

Annex 1: Details of participants

Focus group discussions

FGD 1: Adopters, Ou Lok Village, Tboung Khumum province		
Date: 21 March 2023		
N	Gender	Age
1	Male	39
2	Male	44
3	Male	52
4	Male	45
5	Male	38
6	Female	42
7	Female	39
8	Female	51
FGD 2: Non-adopters, Sre Spey village, Tboung Khmum province		
Date: 21 March 2022		
1	Male	61
2	Male	44
3	Female	43
4	Male	50
5	Male	50
6	Female	36
FGD 3: Adopters, Dom Nak Chrey Village, Kampong Cham Province		
Date: 22 March 2022		
1	Male	49
2	Female	44
3	Male	68
4	Female	41
5	Male	45
6	Female	38
7	Female	50
FGD 4: Adopters, Sramkaeut Village, Kampong Cham province		
Date: 22 March 2022		
1	Female	55
2	Female	45
3	Male	40
4	Male	35
5	Female	43
6	Male	68
FGD 5: non-adopters, Takoch Village, Kampong Cham province		

Date: 23 March 2022		
1	Male	53
2	Female	50
3	Male	34
4	Female	58
5	Female	45
6	Male	35
FGD 6: Adopters, Srangae village, Kampong Cham province		
Date: 23 March 2022		
1	Male	24
2	Female	56
3	Female	49
4	Male	-
5	Male	35
6	Female	64

Key informant interviews

No.	Position	Sex	Province	Date
1	Lead farmer	F	Kampong Cham	21 March 2022
2	Lead farmer	M	Kampong Cham	23 March 2022
3	Lead farmer	F	Kampong Cham	23 March 2022
4	Government staff	M	Kampong Cham	22 March 2022
5	Government staff	M	Kampong Cham	24 March 2022
6	Trader	M	Tbong Khmum	21 March 2022

Annex 2: Sample questionnaire for FGD

1. Can you tell us about the types of vegetables you produce in this area in different seasons?
2. Why do you choose to grow (or not to grow) tomato, brassica, yardlong bean during the off-seasons?
3. Please tell us about the off-season technologies you have learned and used or not used for tomato, brassica and yardlong bean under the EWS project and tell us the reasons for using or not using.
4. What kind of support do you need to use or continue using off-season vegetable production technologies?
5. Please tell us your sources of information/training on off-season vegetable production technologies?
6. Please share with us your reasons for attending or not attending training organized by EWS for off-season vegetable production.
7. What opportunities or challenges does the adoption of off-season vegetable production present for women and youth?
8. What are your opinions about vegetable imports during off-season in this country?