VEGETABLE GROWING ECONOMIC ANALYSIS, 2013

AGRISUD INTERNATIONAL

Agriculture Diversification and Malnutrition Alleviation in Siem Reap Peri-Urban Area

Cambodia, November, 2013

Project Overview

Vegetable producer in Kok Dong Krabei Real

Since 2011, Agrisud has been implementing its project named Agriculture Diversification and Malnutrition Alleviation, in the periphery of Siem Reap. The project is funded by Conseil Général des Hauts de Seine (CG92). It supports 320 rural households to develop and diversify their agricultural activities such as vegetable growing, chicken and pig.

Vegetable Growing Activity

Vegetable growing is a common agricultural activity in Siem Reap periphery besides rice cultivation. Vegetable production is ensured by very-small family farms. It remains very seasonal (more production in the early dry season) and poorly diversified. Imports from neighboring countries and other provinces is the main source of supply to address the weaknesses of local production.

In addition, near Siem Reap city, the survival of small family farms is increasingly challenged by the reduction of agricultural surfaces because of the increasing urban pressure.

In this particular context, the project, "Agriculture Diversification and Malnutrition", aims at supporting small family farms by disseminating technical innovations, sustainable and economically efficient agricultural models, allowing them to maintain their activity. Indeed, by intensifying and diversifying their production, local producers are progressively acquiring food self-sufficiency, get regular income and also improve the supply of local markets.

The project's activities are implemented to reach out three main objectives :

* Increasing local agricultural production and boosting farmers' incomes through the dissemination of agro-ecology practices and sustainable agricultural models,
* Improving agricultural product marketing through post-harvest management techniques implementation and market linkage development,
* Reinforcing agricultural value chains through farmers group creation and collective initiatives development.

Chili harvest in Kok Dong, Krabei Real

Special points of interest:

- WHAT IS TES ?
- PROJECT TECHNICAL AND ECONOMICAL RESULTS
- LESSONS LEARNT AND CONCLUSION

Supporting activities implemented :

- Vocational training
- Material support
- Technical advising
- Farm management advising
- Producers group structuring
- Farmer exchange visits
- Value-chain reinforcement
- Marketing development

What is TES (Technico-Economic follow-up System) ?

⇒ *It is a monitoring system based on the regular collection and analysis of technical and economic data among* ***a sample of beneficiaries,*** *over a given period.*

⇒*The data are processed and analyzed by the monitoring and evaluation officer, shared with the project team and returned to farmers to ensure farm economic management advising.*

⇒ *In the longer term, the TES provides information to assess the technical and economic gains achieved by farmers and to conduct periodic comparisons.*

Since June 2011, the TES has worked with a sample of 32 vegetable producers. The important information collected from farmers and registered per cropping cycle in the database are :

Technical Information :	**Economical Information :**	
• Crop • Planting date • Cultivated surface m^2 • Harvest date (end) • Cycle duration • Harvested quantity kg • Sold quantity kg	**Expenses :** Seeds Organic Manure Chemical fertilizers Irrigation Temporary labor Others Total expenditures	**Incomes :** • Unit selling price/kg • Total income • Profit • Profit/m^2

Criteria for sample selection

☑ Within the 8 villages of the two communes targeted by the project (Puok and Krabei Real).

☑ Reflecting the diversity of farm size.

In total, the TES sample works with 32 households among the project beneficiaries.

Labor Force

Only temporary labor is taken into account. Family labor is not considered.

1. Expenditures

Crop:.....Planting Surface.....Number of Cycles.....

Date	Total of Expenditures				
	Soil Preparation	Seed	Labors	Transportation	Remarks
Total					

Date	Irrigation	Fertility	Pesticide	Other	Remarks
Total					

Expenditures follow-up sheet

2. Income

Crop.....

Date	Quantity Harvested (Kg)	Quantity Sold (kg)	Selling Price (R/kg)	Total Income (R)	Remark		
					Wholesale	Retail	Market
Total							

Harvest and Income follow-up sheet

Data are monthly computerized in an Excel file

Farmer Name	Commune	Village	Crop	Planting date	Month of Planting	Surface (m2)	Seeds	Organic manure	Chemical Fertilizers	Pesticides	Irrigation	Temporary Labor	Others
Chhen Moth	Krabei Real	Kraseing	salad	23-08-11	Aug-11	200	10,000	0	15,000	0	0	0	0
Chhen Moth	Krabei Real	Kraseing	cucumber	25-11-11	Nov-11	450	12,000	40,000	80,000	36,000	0	0	0
Chhlang Saroth	Krabei Real	Kraseing	salad	20-07-11	Jul-11	80	6,000	0	3,000	6,500	0	0	0
Chhlang Saroth	Krabei Real	Kraseing	mustard green	15-08-11	Aug-11	40	3,000	0	3,000	4,400	0	0	0
Chhlang Saroth	Krabei Real	Kraseing	morning glory	23-08-11	Aug-11	40	40,000	0	6,000	7,600	0	0	0
Chhlang Saroth	Krabei Real	Kraseing	morning glory	04-07-11	Jul-11	80	30,000	0	1,500	0	0	0	0
Chhlang Saroth	Krabei Real	Kraseing	salad	20-06-11	Jun-11	80	5,500	0	3,000	7,000	0	0	0
Chhlang Saroth	Krabei Real	Kraseing	salad	27-11-11	Nov-11	80	5,500	0	4,500	5,400	0	0	0
Chhlang Saroth	Krabei Real	Kraseing	salad	30-01-12	Jan-12	100	5,500	0	16,800	8,600	0	0	0
Chhlang Saroth	Krabei Real	Kraseing	morning glory	20-03-12	Mar-12	200	9,500	0	12,200	6,000	0	0	0

End date of harvest	Harvest Month	Cycle duration (day)	Quantity sold (kg)	Quantity self consumed (kg)	Quantity stored (kg)	Quantity harvested (kg)	Yield kg/m2	Selling-Price	Total income	Gross Margin	Margin/m2	Margin/m2/day
22-09-11	Sep-11	30	54	2	0	56	0.28	2,411	135,000	110,000	550	18.3
02-01-12	Jan-12	38	800	0	0	800	1.78	500	400,000	232,000	516	13.6
10-08-11	Aug-11	21	0	0	0	0	0.00		0	-15,500	-194	-9.2
20-09-11	Sep-11	36	0	0	0	0	0.00		0	-10,400	-260	-7.2
20-09-11	Sep-11	28	234	0	0	234	5.85	1,200	235,000	181,400	4,535	162.0
27-07-11	Jul-11	23	273	0	0	273	3.41	746	203,600	172,100	2,151	93.5
23-07-12	Jul-12	399	135	0	0	135	1.69	2,574	347,500	332,000	4,150	10.4
12-01-12	Jan-12	46	275	0	0	275	3.44	1,682	462,500	447,100	5,589	121.5
16-03-12	Mar-12	46	65	0	0	65	0.7	2,000	130,000	99,100	991	21.5
15-04-12	Apr-12	26	600	0	0	600	3.0	770	462,000	434,300	2,172	83.5
10-09-11	Sep-11	57	81	0	0	81	1.80	1,600	126,600	98,000	2,178	38.2
15-09-11	Sep-11	73	54	0	0	54	0.54	2,000	108,000	86,300	863	11.8
15-09-11	Sep-11	24	62	0	0	62	0.83	1,300	80,600	58,300	777	32.4

Vegetable growing technical and economical results for the project period

An analysis of the whole TES database has been conduced in September 2013 to assess vegetable producers' performance evolution during the project. This analysis covers all cropping cycles set up and harvested by 30 producers within the sample, from June 2011 to September 2013 (**28 months of follow-up**).

Sample global results

1. Global technical results	
Number of cropping cycles practiced	491 cycles
Average number of cropping cycle per beneficiary	16 cycles
Average duration of one cropping cycle	60 days
Total cultivated surface	10.1 Ha
Average cultivated surface per beneficiary over the period	3383 m^2
Average cultivated surface per beneficiary per cycle	207 m^2
Average cultivated surface per beneficiary per month of cropping	168 m^2
Total quantity harvested	176 T
Quantity sold	175.3 T
Quantity self-consumed	0.7 T
Quantity stored	0.1 T
Average quantity harvested per beneficiary per cycle	358.4 kg
Average quantity harvested per beneficiary per month of cropping	291.4 kg
Average yield (all crops together)	2.0 kg/m^2

Maintenance of wax gourd plot

2. Global economical results	
Global turnover	54 079.9 $
Total costs	9 597.4 $
Global profit	44 482.5$
Average profit per beneficiary per month of cropping	73.6 $
Average turnover per m^2	0.53 $
Total costs per m^2	0.09 $
Average profit per m^2	0.44 $
Average selling price (all products together)	0.48 $/kg


Eggplant harvest in Po Pis, Krabei Real

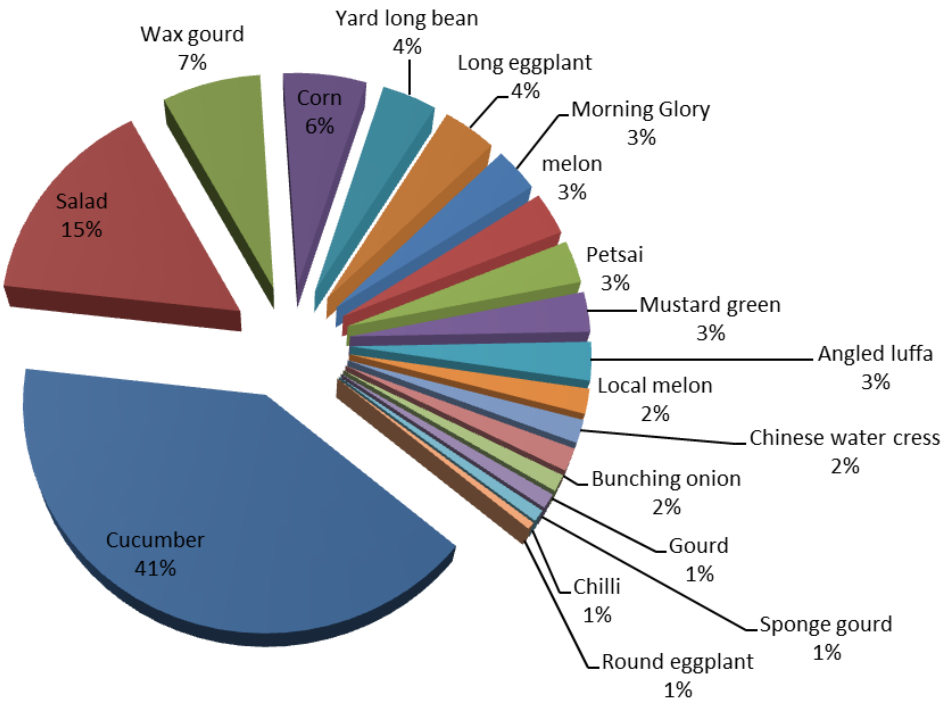
Diversity of the crops practiced

Crop	% of farmers that have implemented the crop
Salad	77%
Cucumber	73%
Petsai	70%
Mustard green	57%
Morning glory	50%
Wax gourd	47%
Yard long bean	40%
Chinese water cress	33%
Long eggplant	30%
Bunching onion	20%
Sponge gourd	17%
Angled luffa	17%
Chilli	13%
Corn	13%
Tomato	13%
Bitter gourd	13%
Parsley long	13%
Basil leaf	13%
Small round eggplant	10%
Round eggplant	10%
Gourd	10%
Pumpkin	10%
Amaranth	10%
Chinese kale	7%
Local melon	7%
Tang ou	7%
Ridye gourd	7%
Hot basil	7%
White radish	3%
Watermelon	3%
Swatow mustard	3%
Plock choy	3%
Chi chay	3%
Mint	3%
Green basil	3%
Sweet potato	3%


Salad harvest in Krabei Real


Yard long bean harvest, Krabei Real

Distribution of cultivated surfaces



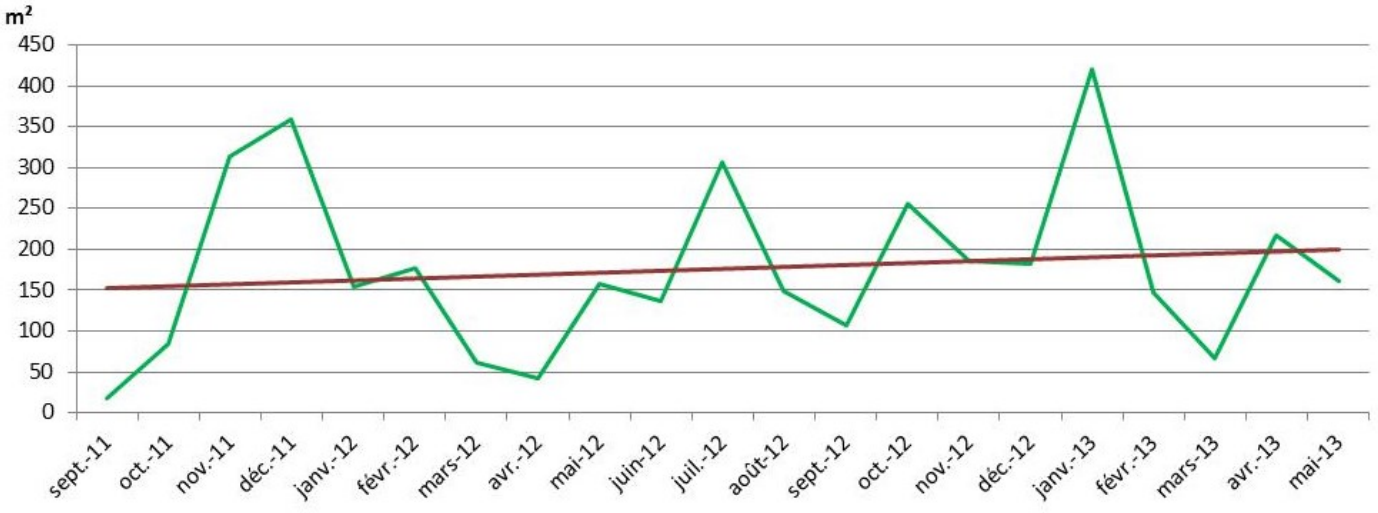
Overall cultivated surfaces distribution within the TES sample

Over the project period, cucumber is the most important crops in terms of cultivated surfaces : 41% of the cultivated surface. Producers highlighted that cucumber can be easily cultivated with less diseases and set up over large plots. The harvest is plentiful and the demand is constant. Thus, it brings significant cash flow over a very short time. Cucumbers less well calibrated can also be sold for being processed as fermented.

Comparing to the beginning of the project, surfaces dedicated to salad production have decreased reflecting the fact that farmers switched to other more profitable crops.

Wax gourd and corn also holds an important place. They are generally grown on rice fields during the dry season.

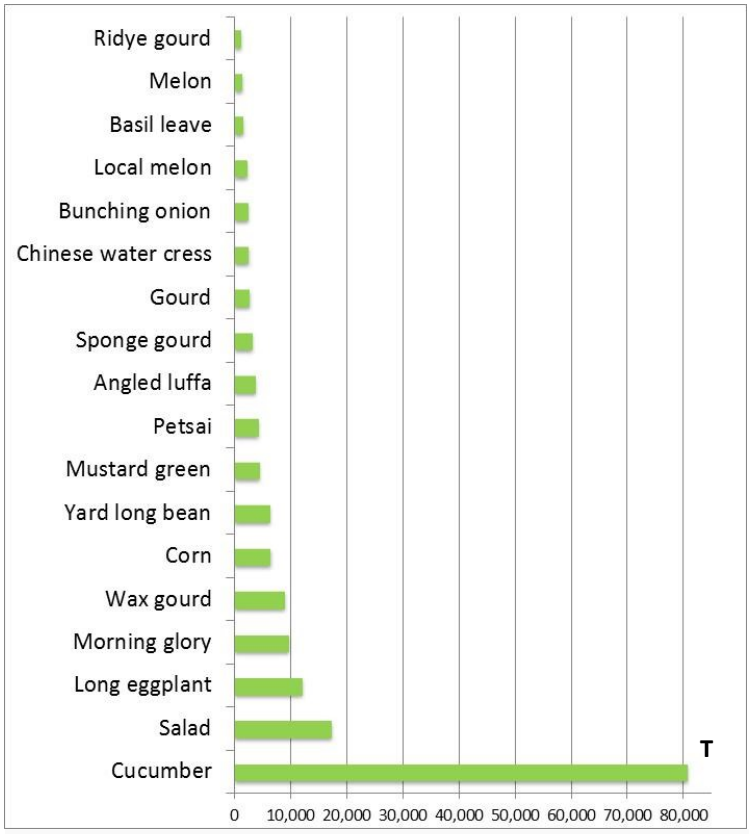
Evolution of cultivated surfaces



Average cultivated surface per farmer per month of cropping

The average cultivated surface per farmer per month has overall increased (+33% on 28 months). This can be explained by an intensification of the vegetable growing activities. The number of vegetable cycles cultivated per an household per year remains almost the same so we can assume that the increase is probably due to the crop diversification and cropping on larger plots. Thus, many farmers use their rice in the dry season to establish cultures of cucumber, local melon, corn or wax gourd.

Distribution of the production

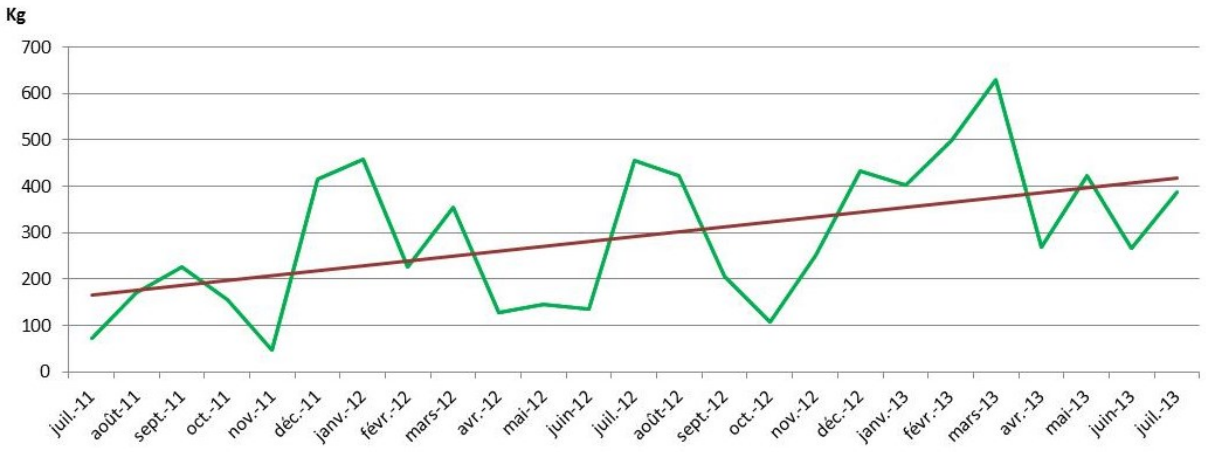


Production over 1 ton within the TES sample over project period

Cucumber collect in Kok Dong, Krabei Real

As pointed out before, this graph shows the prevalence of cucumber in terms of production volume : 80 T over the project period. Other important productions are represented by: Salad, Eggplant, Morning glory, Wax gourd and corn.

Evolution of the production



Monthly average production per farmer from July 2011 to July 2013

Overall, there is a positive and constant evolution of agricultural production over the months of follow-up (+100%). The production is linked to the season. At the beginning of the dry season, the production is quite high from December to March, when the water resource is available and temperatures favorable. The production goes down in April/May when the water resource is scarce and temperatures high and from September to November with heavy rains and floods.

Crops technical results

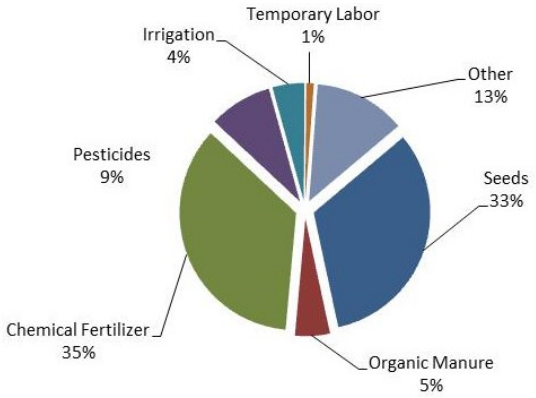
Crop	Nb of cycles implemented	Average cultivated surface per cycle (m^2)	Average cycle duration (day)	Yield (Kg/m^2)
Chilli	6	137	210	0.6
Cucumber	73	547	52	2.0
Long eggplant	19	197	110	3.2
Morning glory	48	65	36	3.1
Mustard green	36	78	36	1.6
Petsai	33	90	38	1.4
Salad	87	172	45	1.2
Sponge gourd	6	173	71	3.0
Yard long bean	28	135	75	1.7
Small round eggplant	3	70	118	0.7
Wax gourd	23	296	76	1.3
Round eggplant	4	128	74	1.0
Gourd	4	293	105	2.2
White radish	1	60	42	1.8
Watermelon	1	3000	53	0.4
Pumpkin	5	84	102	2.1
Corn	14	409	67	1.1
Tomato	4	56	83	2.4
Chinese kale	3	43	53	1.6
Bunching onion	17	95	70	1.5
Local melon	2	875	77	1.2
Bitter gourd	4	86	91	2.1
Chinese water cress	27	60	36	1.5
Angled luffa	10	269	92	1.4
Swatow mustard	1	200	51	4.4
Plock choy	2	63	27	1.0
Parsley long	4	27	210	3.1
Tang ou	3	72	92	1.0
Amaranth	7	42	62	1.6
Basil leaf	4	89	104	4.1
Ridye gourd	4	75	108	3.6
Chi chay	2	60	74	1.2
Mint	1	68	149	2.4
Hot basil	2	20	76	0.8
Green basil	1	25	49	0.4
Sweet potato	1	117	49	0.6

Wax gourd growing on rice field in the dry season

Watermelon cropping on rice field in the dry season

Cropping costs

Item of expenditures	Amount Riels/m²
Seeds	124
Organic manure	18
Chemical fertilizers	134
Pesticides	33
Irrigation	17
Temporary labor	4
Other	48
Total	**378**



On average farmer spend 378 Riels per m² of cropping. The most important costs are seeds and chemical fertilizers. Seeds are generally bought from an input suppliers rather than produced directly at the farm. They allow farmers to benefit from higher germination rate and better yield. Organic manure comes most of the time directly from the farm and in this case is not considered as a cost. The expenditure item "Other" which reflects the purchase of equipment illustrates the increased diversification to crops requiring little equipment investment (tutors, net) as cucumber, yard long bean, gourds ...

Crops economical results

Crop	Costs/m² (Riels)	Income/m² (Riels)	Margin/m² (Riels)	Margin/m²/ day (Riels)
Parsley long	146	11,421	11,275	53.7
Tang ou	73	8,506	8,433	91.7
Basil leaf	674	6,370	5,696	54.8
Bunching onion	1,763	6,218	4,455	63.4
Ridye gourd	415	4,383	3,968	36.8
Chinese kale	273	3,896	3,623	67.9
Amaranth	108	3,608	3,500	56.5
Long eggplant	298	3,599	3,301	30.0
Sponge gourd	352	3,546	3,195	44.9
Chinese water cress	176	3,145	2,969	82.1
Salad	230	2,785	2,555	57.7
Yard long bean	465	2,978	2,512	33.5
Tomato	709	3,184	2,476	29.8
Pumpkin	220	2,555	2,335	23.0
Mustard green	237	2,568	2,331	65.2
Hot basil	13	2,295	2,283	30.0
Morning glory	485	2,735	2,250	62.8
Bitter gourd	862	3,264	2,030	22.2
Round eggplant	387	2,168	1,781	24.2
Plock choy	96	1,824	1,728	64.0
Chilli	307	1,885	1,591	
Petsai	151	1,661	1,510	39.9
Chi chay	229	1,703	1,473	19.9
Gourd	516	1,949	1,432	13.6
Corn	286	1,666	1,380	20.5
Local melon	158	1,476	1,318	17.1
Angled luffa	399	1,599	1,200	13.0
Cucumber	465	1,638	1,172	22.5
Wax gourd	296	1,423	1,127	14.8
Small round eggplant	194	1,201	1,007	8.6


Phsar Leu market, Siem Reap city

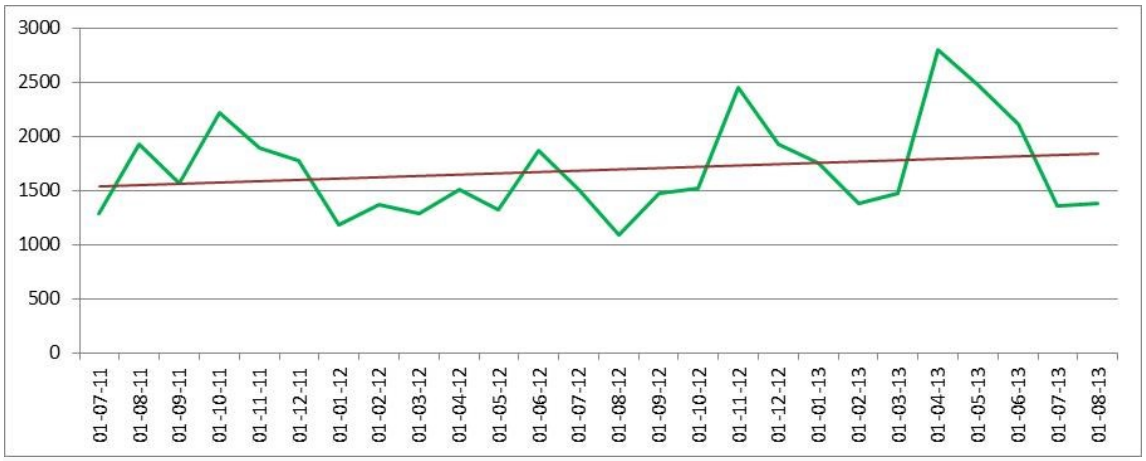
In the table beside, only the crops that more than 1 cycle was practices are shown.

It is a very useful tool to advise farmers on making their cropping calendar with a regard to more profitable production. However, direct economic benefit is not the only criteria to take into account. Thinking about agronomic issues is also important to favor the better crops association and rotation for maintaining soil fertility and prevent pests attacks.

For vegetables, the best margins per m² are reached for aromatic herbs : such as Parsley long, Tang ao, Basil leaf, and Bunching onion.

Leaf vegetables have in general a better profitability with their shorter cycle duration. Thus, they are favored by farmers producing in the peri-urban areas where the access to market is easiest. Many cycles can be set up quickly one after another on the same plots.

Selling prices and evolution

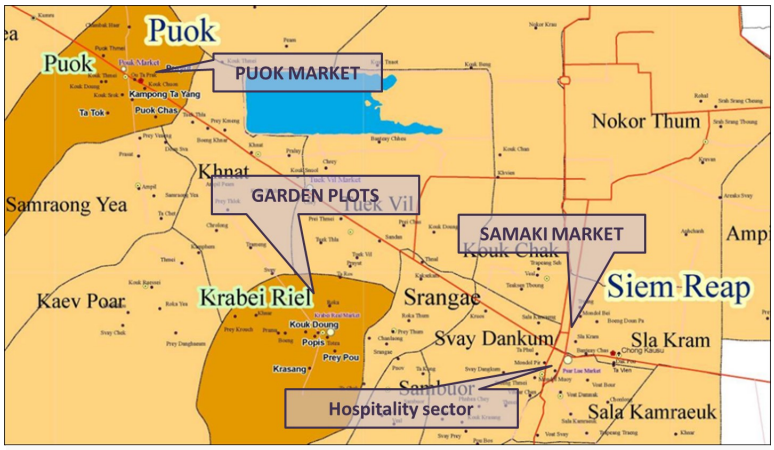


Average selling price evolution for the 10 main produced crops

The graph above illustrates a positive trend in average selling prices of the 10 main crops produced in the target area : Cucumber, Salad, Long Eggplant, Morning glory, Wax gourd, Corn, Yard long bean, Mustard green, Petsaï and Angled luffa.

In general prices of vegetables vary daily at the local market and may even change several times during the same day depending on the volume of products' supply.

Prices also follows the production season : they are higher when the production becomes scarce in October-November during heavy rains and floods in the late dry season in April- June



Markets where farmers sell their products

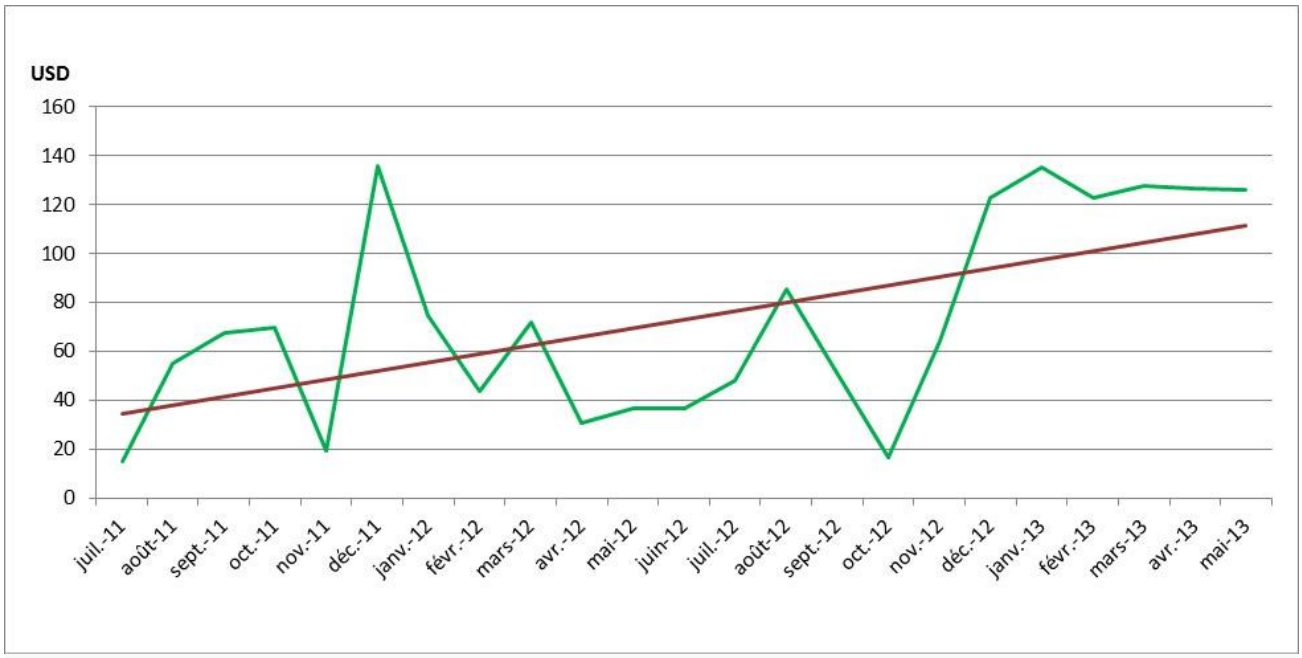
The project target area is located in the outskirts of Siem Reap city, which gives the opportunity to producers to access directly to market and benefit from higher selling prices.

During the period of high workload, they prefer to deal with a collector, that will buy products at the farm and sell them at markets. Collectors negotiate the price before purchase and then take a margin from 200 to 300 Riels per kg when they sell.

The project has also supported farmers to establish short-supply chains, enabling them to sell their products directly to the Hotels and Restaurants. Thus, they can also benefit from higher and stable prices.

Crops	Average selling price Riels/kg
Amaranth	2358
Angled luffa	868
Basil leave	1863
Bitter gourd	1515
Bunching onion	4720
Chi chay	1502
Chili	4493
Chinese kale	2148
Chinese water cress	1951
Corn	1519
Cucumber	908
Gourd	776
Green basil	4480
Hot basil	3000
Local melon	1090
Long eggplant	1133
Melon	654
Mint leaves	6625
Morning Ggory	985
Mustard green	1794
Parsley long	3726
Petsai	1662
Plock choy	2149
Pumpkin	1607
Ridye gourd	1498
Round eggplant	2121
Salad	2888
Small round eggplant	1939
Sponge gourd	1541
Swatow mustard	902
Sweet potato	2083
Tang ou	9132
Tomato	1004
Wax gourd	1088
White radish	248
Yard long bean	2115

Margin evolution



Monthly average margin per farmer over the project period

This graph shows an overall increase of the farmer profit per month from 40$ at the beginning to more than 100$ in May 2013 (+150%).

Several factors may explain this increase made by producers:

⇒ ***A global increase of cultivated surface*** *during a year and the setting-up of cropping cycles on larger plots,*

⇒**A higher level of technical skills** which provides more favorable yields and greater production,

⇒ **An increased diversification** towards higher valuable crops and establishment of cropping calendars taking into account market information,

⇒ **An increase of selling prices** thanks to the development of marketing channels and the limitation of intermediaries and direct access to market.

Lessons learnt and conclusion

The TES is an important tool for monitoring regularly producers performance and provide them an appropriate advising on farm economic management. Indeed, thanks to trainings and technical support producers gradually master ITK for vegetable cultivation. However, it remains an important step to overcome to be able to improve farm's economic performance and market access.
Thus, the project regularly organizes cropping planning workshops with producers that give an opportunity to share information from the TES : technico-economic performance of crops cultivated, evolution of the production, price evolution and products availability at village scale….

After such workshops , producers understand :

⇒ **the interest to take into account market demand during** the establishment of cropping calendar by inquiring directly buyers,

⇒ **the need to refer to technical and economic results** from previous years to identify the most profitable crops, periods of production scarcity and those where prices are more favorable,

⇒ **the importance of a shared vision across the village** to provide an adequate, regular and diversified vegetable offer.