Attachment 8
Reports on the Technical Seminars for FD Officers

Training on Forest Monitoring Tools

Date: 20th November 2019

Venue: Ingyin Hall FDHQ, NPT

Agenda:

Time	Event	Person in charge
12:50-13:00	Registration	
13:00-13:10	FDSNR Project, Compo-1 & 2	Mr. Kimura (C/A of the Project)
13:10-13:40	Topic1: Identification of gullies (1) Outline of the process of gully identification	Ms.Ya Minn (National Expert of Compo-2)
13:40-13:55	Q and A	
13:55-14:25	Topic1: Identification of gullies (2) Demonstration of the process of gully identification	Ms.Ya Minn (National expert of Compo-2)
14:25-14:40	Q and A	
14:40-15:00	Tea Break	
15:00-15:30	Topic 2: Planning of erosion control with model cases of the countermeasures	Mr. Imai (Expert of Compo-2)
15:30-15:45	Q and A	

Lecturers: Mr Yuzuru Kimura, Daw Ya Minn, Mr Hideki Imai

Participants: FDHQ, FRI, Shan FD, Shan IWUMD, CFDTC, Forest School, UFES, (Total 35 participants), and observer from JICA Yangon Office

Objective:

The main objective of the seminar is to introduce the process and results of the project activities relating to erosion control and monitoring of suspended sediment in the major rivers, particularly the topics below.

- Identification of existing gullies
- Planning of erosion control measures with model cases gully erosion control
- Monitoring of suspended sediment in the rivers with utilization of the monitoring data

Major reflection by participants:

- Explanation of how to identify the gully in GIS software is not so difficult, but we understand that it is very time consuming. Actually Comp-2 team spent around one month with 3 staff members for analyzing four catchment areas of Inle lake.
- Through the question and answer, IWUMD officers understood the difference between the stabilization of slope foot and sediment trap. Both are similar in construction form (check dam) but functions are quite different.
- Total estimation cost of soil conservation work in catchment area is huge. Prioritization in target area and type of works is very important.

Contents of next batch:

- Water discharge monitoring
- TSS monitoring
- Precipitation monitoring
- Core sampling (in-land)
- Core-sampling (Inside lake)
- Trail camera monitoring
- Field-based laser measurement for gully
- Integration of monitoring data and analysis

Photo Album:

Group photo

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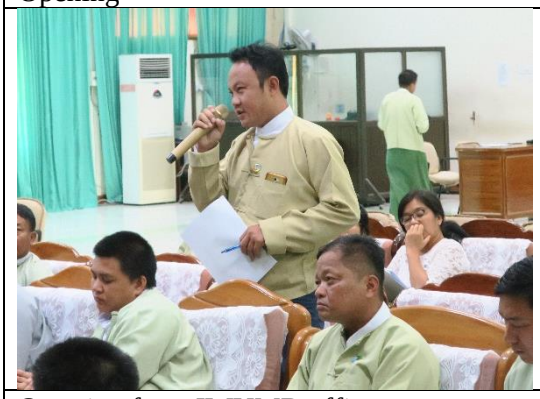
<tr><td>  </td><td>  </td></tr>
<tr><td>Question from IWUMD officer</td><td>Construction work designing</td></tr>
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Report on Soil Conservation Woks Seminar
~ (Part-2) Sediment Monitoring ~

Date: 18th December 2019

Venue: Ingyin Hall FDHQ, NPT

Agenda:

Time	Event	Person in charge
12:50-13:00	Registration	
13:00-13:10	FDSNR Project, Compo-1 & 2	Mr. Kimura (C/A of the Project)
13:10-13:40	Topic 1: Sediment Transportation	Mr. Kei Suzuki (Expert of Compo-2)
13:40-13:55	Q and A	
13:55-14:25	Topic 2: Sedimentation Analysis	Mr. Kei Suzuki (Expert of Compo-2)
14:25-14:40	Q and A	
14:40-15:00	Tea Break	
15:00-15:30	Topic 3: Other advanced technologies	Mr. Kei Suzuki (Expert of Compo-2)
15:30-15:45	Q and A	

Lecturers: Mr. Yuzuru Kimura, Mr. Kei Suzuki

Participants: FDHQ, FRI, Shan FD, Shan IWUMD, CFDTC, Forest School, UFES, (Total 38 participants)

Objective:

The main objective of series of seminars is to introduce the process and results of the project activities relating to erosion control and monitoring of suspended sediment in the major rivers. Subsequent to construction works related lectures of Part-1, river

monitoring and sediment estimation works are reported from Comp-2 expert. Detailed contents are as follows,

- Water discharge monitoring
- TSS monitoring
- Precipitation monitoring
- Core sampling (in-land)
- Core-sampling (Inside lake)
- Trail camera monitoring
- Field-based laser measurement for gully
- Integration of monitoring data and analysis

Major reflection by participants:

- Studied that discharge - TSS correlation as a major index of each catchment area, and its effectiveness for river stream evaluation. The other hand its limitation of usage should be understood.
- 3D laser scanner has potential of technological innovation not only for soil conservation works but also forest survey.
- Expect more knowledge input from the project.

Photo Album:

Group photo

	
Opening	Introduction of project activities
	
Presentation by Mr Suzuki	Explanation of monitoring equipments
	
Question from FD staff	Question from UFES instructor

Attachment 9
Reports on the Results of River Monitoring

Results of river monitoring in Phase 1

Table of Contents

1. Objectives of the river monitoring

1.1. Objectives of the monitoring and overview

In integrated watershed management (herein after referred as IWM), it is important for various people living upstream, middle and downstream to mutually understand their interests and use sustainable natural resources. To that end, it is essential to understand the issues and the current situation taking place in the watershed based on quantitative and scientific data, and to use them in future plans for tackling the issues.

In other words, river monitoring is an essential element for the implementation of IWM. Therefore, the purpose of river monitoring is to obtain quantitative and scientific data necessary to promote IWM, share it with the relevant stakeholder, and it is used for fostering a common understanding.

In order to achieve this purpose, the sediment discharge, which is the major challenge of the project, will be observed and the amount of sediment discharge will be quantified, the sediment production and movement will be visualized, and the sedimentation status of discharge will be quantified. The overall outline is shown in the figure below.

Table-1 Items of river monitoring

Monitoring items	Subjects	Objectives
Water Level	4 major rivers	Basic data for estimation of water discharge and total SS
Velocity	4 major rivers (Same position of water level observation)	
Cross-section profile	4 major rivers (Same position of water level observation)	
Precipitation	3 places (Include water sampling position)	Supplemental information about rain event
SS [1] analysis in water sample	Kalaw river	SS intensity data for total SS estimation
Fix position and time frequency picture	3 places	Process into continuous images and visualize the current situation
C-14 dating and particle analysis for sediment	6 places	Estimation of sedimentation rate through dating

[1] SS: Suspended Solids

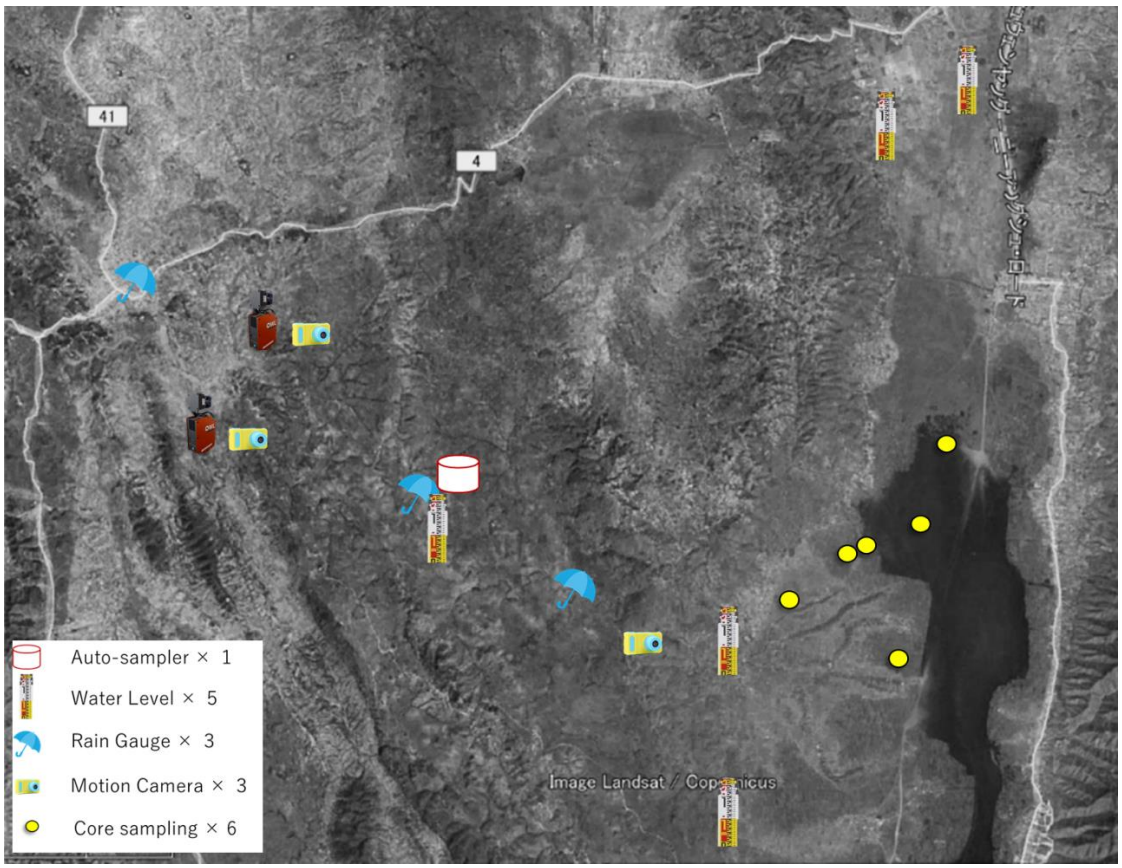


Fig- 1　Location and items of monitoring

1.2. Estimation of Total Suspended Solids

In river monitoring, various basic data are collected and analyzed individually or in combination to understand the current situation. The main observation items of river monitoring are the water discharge corresponding to seasonal and temporal changes in each river and the discharge of suspended solids (SS) contained in it. In order to obtain this data, basic data such as water level, flow velocity, river cross-sectional area, SS per unit volume during rainfall (hereinafter "SS intensity") are required.

The procedure flow from individual basic data collection to the combination of SS outflow analysis and final calculation is shown below.

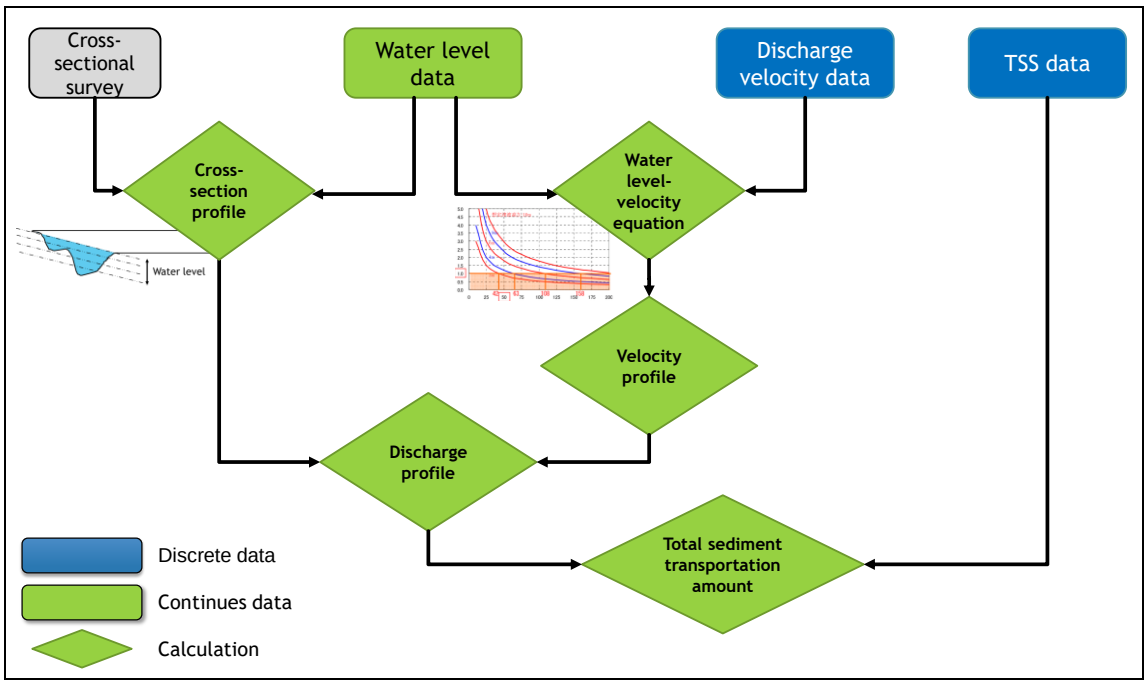


Fig-2 Flow chart of TSS estimation

1.3. Visualization of sediment production and transportation site

As mentioned earlier, the purpose of river monitoring is to foster a common understanding among the people in the basin, and for that purpose it is necessary to quantitatively grasp the amount of sediment discharge, which can be a major challenge. In addition to this, identification of sediment production sources and elucidation of sediment production mechanisms in the upstream region are also important factors.

In the Kalaw river basin targeted by this project, it has been clarified that the gully erosion distributed in the upstream is the main source of sediment movement. Here, as one of the ways to convey the mechanism of sediment production in an easy-to-understand manner, we will record the development process of gully erosion, which is the source of sediment production, as a video and share it with people involved in watershed management. In addition, the problem is visualized in the same way for the route along which the produced sediment transports. In particular, it is estimated that the limestone cave that exists on the way to the Kalaw River inflowing into Inle Lake has a great influence on the transportation of sediment, but the river phrenological condition and change is still unknow. Since it has not been clarified, the visualized information is considered to be effective in discussing the integrated watershed management of the Kalaw River.

1.4. Estimation of sediment speed

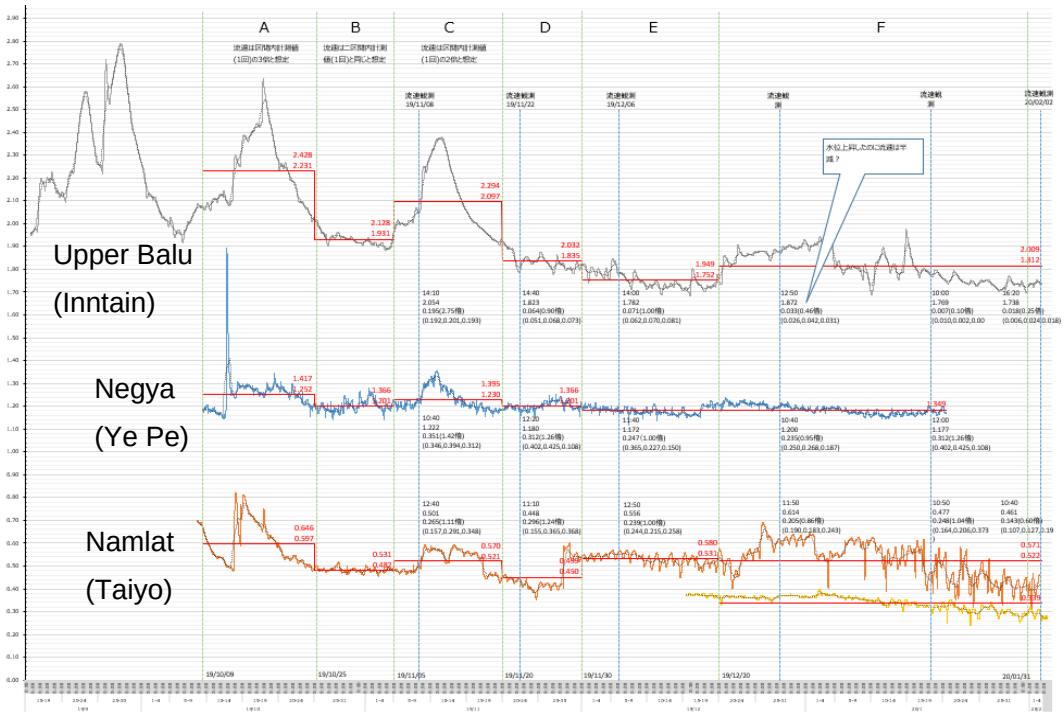
Sediment produced in the upstream of the Kalaw River flows into the alluvial fan through a limestone

cave on the way and flows into the Inle Lake through the flow path between the floating gardens. Soil samples were taken from the riverbed, the bottom of the channel and inside of lake to clarify how much sedimentation is progressing from the fan to the Inle Lake and how much sedimentation is occurring inside the Inle Lake. Then, the deposition rate is clarified by performing dating analysis.

2. Estimation of TSS discharge from the Kalaw river

2.1. Water level

Of the Kalaw River (Thandaung)[2], Namlet River (Taiyo), Negya River (Yepe) and Upper Balu River (Inntain), the Kalaw River is a bridge pier replacement work, so only a water level gauge is installed on the new pier and data is not observed. In addition, as replacement work was started on the Upper Balu River as of March 2020, a water level gauge was relocated to the pier of the temporary bridge. The following shows the observation results of the three rivers.



Source: JICA Project Expert Team (2020)

Fig-3 Times-series water level data for three rives

Although the observation period is limited to the dry season, the Upper Balu River has the deepest water depth according to the observation results, followed by the Negya River and the Namlat River in that order. In every river, water level rises and falls is observed every day. Especially in flower

[2] Point name in brackets

cultivation that is developed along the Negya River, the water level drops in daytime hours due to water intake for agricultural activity and back to the natural water level in nighttime due to water intake is not operated.

2.2. Water flow velocity

The flow velocity was measured manually at the location where the water level gauge was installed. At each point, 50 cm from the water surface was used as an observation point at the river center, the left bank, and the right bank. A part of the flow velocity data is shown below.

Table-2 Results of water flow velocity in three monitoring points（Units：m/s）

Date	Place	Time	Depth (cm)	Left	Middle	Right
8/Nov/2019	INNTAIN	10:43	50	0.346	0.394	0.312
22/Nov/2019	INNTAIN	12:22	50	0.402	0.425	0.108
6/Dec/2019	INNTAIN	11:45	50	0.365	0.227	0.150
28/Dec/2019	INNTAIN	10:44	50	0.250	0.268	0.187
18/Jan/2020	INNTAIN	12:00	50	0.402	0.425	0.108
2/Feb/2020	INNTAIN	Uninstalled on 20 January, 2020				
8/Nov/2019	TAIYO	14:10	50	0.192	0.201	0.193
22/Nov/2019	TAIYO	14:42	50	0.051	0.068	0.073
6/Dec/2019	TAIYO	14:05	50	0.062	0.070	0.081
28/Dec/2019	TAIYO	12:52	50	0.026	0.042	0.031
18/Jan/2020	TAIYO	10:00	50	0.010	0.002	0.008
2/Feb/2020	TAIYO	16:20	50	0.006	0.024	0.024
8/Nov/2019	YEPE	12:40	50	0.157	0.291	0.348
22/Nov/2019	YEPE	11:15	50	0.155	0.365	0.368
6/Dec/2019	YEPE	12:55	50	0.244	0.215	0.258
28/Dec/2019	YEPE	11:53	50	0.190	0.183	0.243
18/Jan/2020	YEPE	10:56	50	0.164	0.206	0.373
2/Feb/2020	YEPE	10:39	50	0.107	0.127	0.194

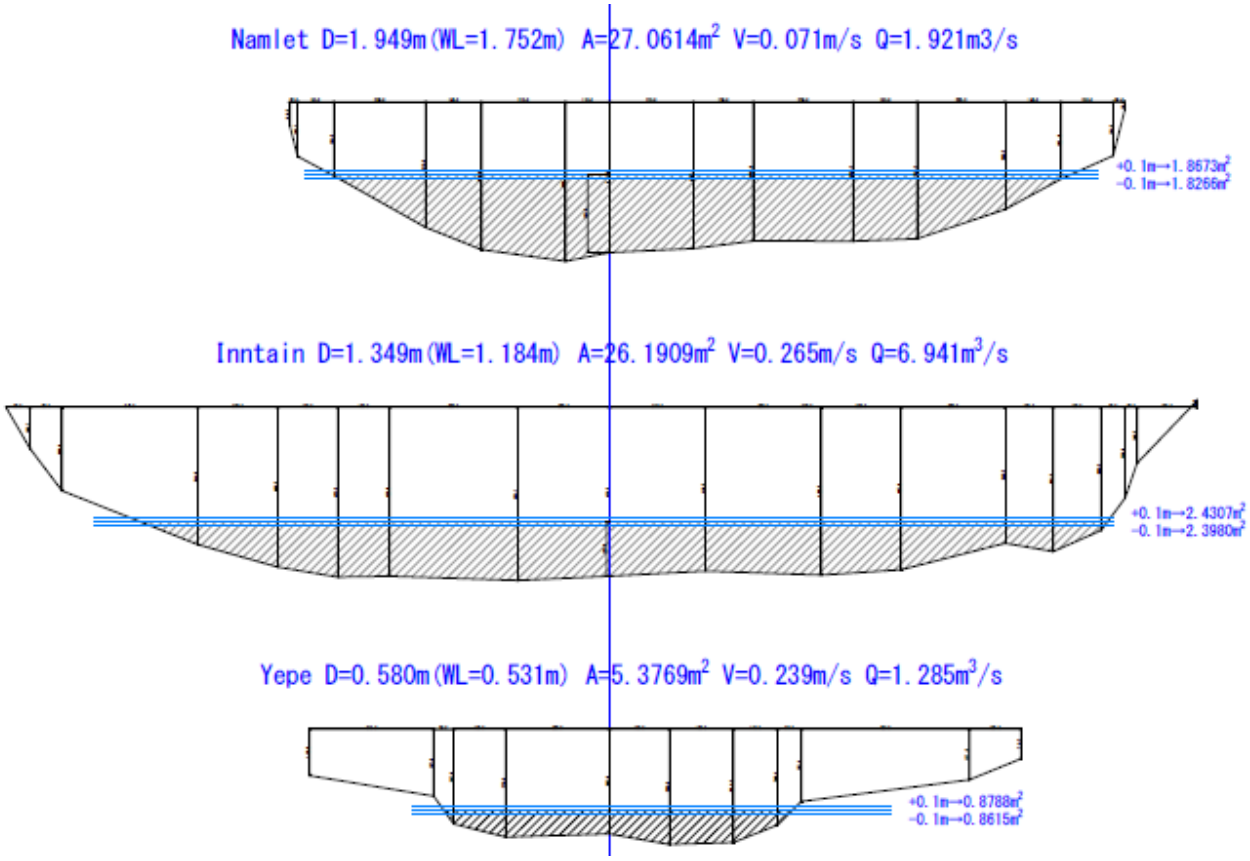
Source: JICA Project Expert Team (2020)

According to the observation results, the Upper Balu River (Inntain) has the highest flow velocity, followed by the Nager River (Yepe) and the Nam Lat River (Taiyo). Of the three locations on the right bank, the center of the river, and the left bank measured in each river, the location with the fastest flow velocity is different for each river, and it is presumed that the shape of the river affects the flow velocity distribution.

In addition, in the NamLat River, it was observed that the flow velocity decreased although the water depth increased. Usually, it is said that there is a positive correlation between an increase in water level and an increase in flow velocity. The reason for this is that backwater from Inle Lake may have occurred at the current water level observation position during a rainfall event, and it is necessary to consider relocation of the water level gauge.

2.3. Cross-section profile of monitoring site

In order to obtain the discharge from each river, it is necessary to clarify the cross-section profile corresponding with precipitation data. The results of the river cross-section survey conducted on three rivers except Kalaw River (Thandaung) are shown below.



Source: JICA Project Expert Team (2020)

Fig-4 Results of cross-section area survey

（WL：Water level、A：Area：V：Velocity、Q：Water discharge

The shaded area in each cross-section shows the water level at the time of survey, but the river cross-sectional area changes depending on the water level.

2.4. SS intensity unit

2.4.1. Objectives of SS monitoring

Suspended solids contained in water discharging out of rivers vary greatly depending on seasonal changes due to rainfall. Although the time-series discharge rate can be calculated from the basic information described above, it is necessary to observe the SS intensity in a time-series manner in order to understand the SS quantity contained in discharge water. For that purpose, it is necessary to obtain a water sample and measure the SS weight by laboratory experiments.

2.4.2. Monitoring method and monitoring site

Clarify time series SS intensity using an autosampler that acquires a fixed amount of sample water from a river triggered by an index such as a regular or rainfall event (Figure 5)

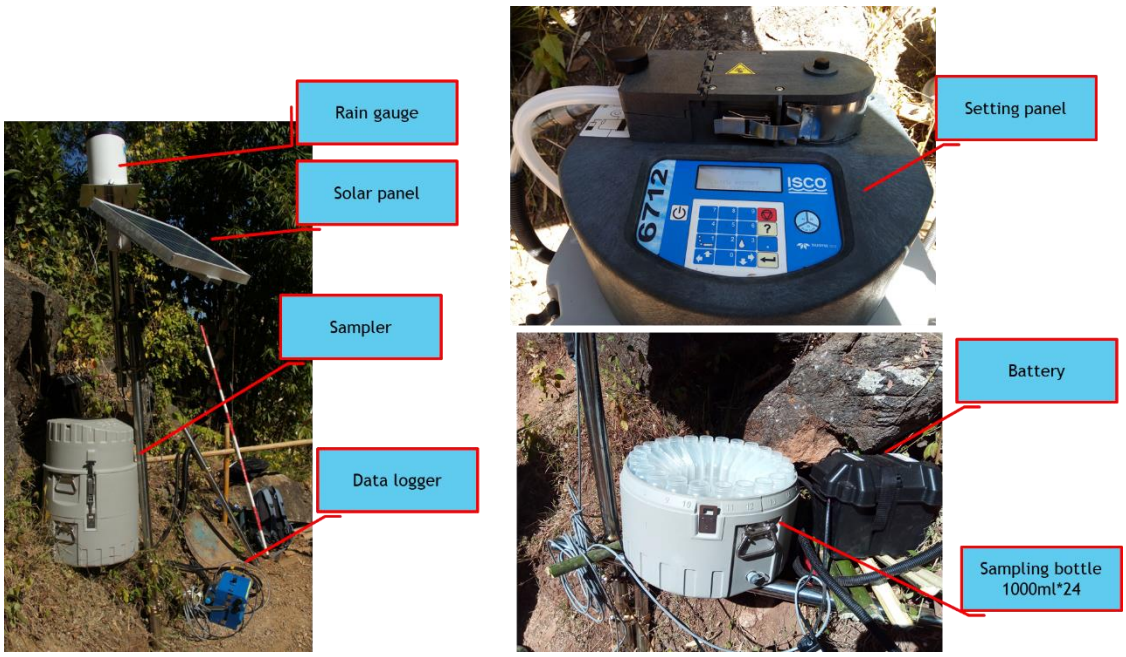


Fig-5 Auto water sampler

The autosampler (gray tank in the photo on the left) contains 24 containment vessels (plastic tank in the photo on the bottom right). Water sampling tube extends from the main body of the auto sampler to the river and collects water using the pressure of air. Since there is no power supply at the water sampling point, the system is equipped with solar power generation and the attached battery is charged so that an independent power supply network can be built. Set the water sampling interval and other settings on the panel on the top of the main unit (pictured above right).

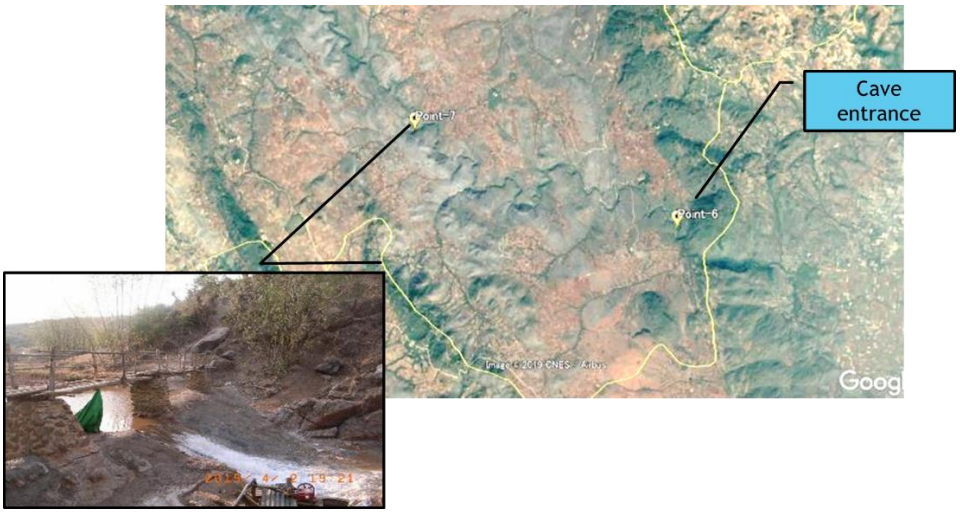


Fig-6 Location of water sampling

Although the water sampling point should be as downstream as possible from the Kalaw River, the cross section of the river should be relatively stable, and access sidewalks should be provided to facilitate water sampling. The sits that meet these conditions were designated as water sampling points (Fig. 6).

2.4.3. Analysis of SS intensity

Observation was conducted during the dry season up to begging of rainy season, and it was expected that the SS concentration would remain stable at a low level in dry season. Therefore, the water sampling interval was set to 1 bottle (500ml)/day until 18th July. After this day, sampling interval has been changed to 2 bottle (500ml)/day. The SS intensity analyzed by the laboratory experiment is shown below.

Table-3 SS intensity by sampling date (example)

Sr.No	Sample Name	Result（mg/l）
1	2020..01.08	5.0
2	2020..01.08	8.0
3	2020..01.08	<0.0
4	2020..01.08	17.0
5	2020..01.08	1.0
6	2020..01.08	4.5
7	2020..01.08	6.5
8	2020..01.08	4.5

Source: JICA Project Expert Team (2020)

As a result, daily basis SS intensity has been collected from 7th January 2020 up to 18th July 2020 and water sampling activity are still ongoing.

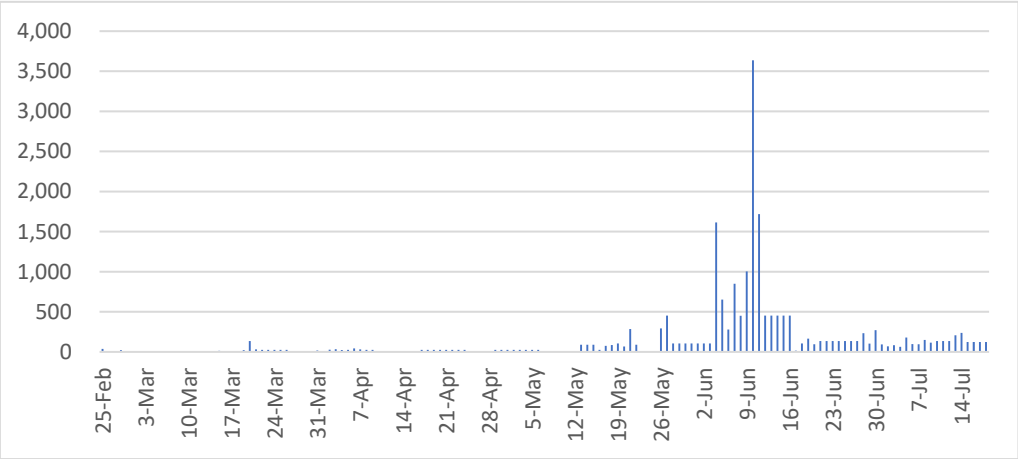


Fig-7 Daily observation result of SS intensity (Unit:mg/l)

2.5. Estimation of TSS discharge in combination with basic data

The water discharge was estimated by combining the above-mentioned water level and flow velocity, and the river cross section profile. The total SS can be obtained by multiplying the water discharge and corresponding SS intensity data.

2.5.1. Estimation of total water discharge by monitoring periods

The water discharge of each river was estimated using the water level data, flow velocity data, and cross-section data shown above. Because of flow velocity data is discontinuous, it was decided to aggregate the periods in which the water levels tended to be similar from Figure 3 and classify them as periods A to F for convenience (Table 4).

Table-4 Water discharge from three rives by monitoring periods

Site	Period			Water Level (m)	Cross section area (m2)	Velocity (m/s)	Discharge (m3/s)	Days	Distarge by Period and total (m3)
		Start	END						
Namlet	A	19/12/1	19/12/19	1.949	27.0614	0.071	1.921	19	3,153,514
	B	19/12/20	20/2/1	2.009	28.1769	0.019	0.535	44	2,033,856
	C	19/11/20	19/11/30	2.032	28.6084	0.064	1.831	11	1,740,182
	D	19/11/5	19/11/19	2.294	33.7151	0.390	13.149	15	17,041,104
	E	19/10/25	19/11/4	2.128	30.4330	0.195	5.934	11	5,639,674
	F	19/10/9	19/10/24	2.428	36.3784	0.585	21.281	16	29,418,854
	Total discharge								**59,027,184**
Inntain	A	19/12/1	19/12/19	1.349	26.1909	0.247	6.469	19	10,619,510
	B	19/12/20	20/2/1	1.349	26.1909	0.265	6.941	44	26,386,906
	C	19/11/20	19/11/30	1.366	26.6018	0.312	8.300	11	7,888,320
	D	19/11/5	19/11/19	1.395	27.3050	0.702	19.168	15	24,841,728
	E	19/10/25	19/11/4	1.201	26.1909	0.351	9.193	11	8,737,027
	F	19/10/9	19/10/24	1.417	27.8402	1.053	29.316	16	40,526,438
	Total discharge								**118,999,929**
Yepe	A	19/12/1	19/12/19	0.580	5.3769	0.239	1.285	19	2,109,456
	B	19/12/20	20/2/1	0.571	5.2987	0.199	1.054	44	4,006,886
	C	19/11/20	19/11/30	0.499	4.6777	0.296	1.385	11	1,316,304
	D	19/11/5	19/11/19	0.570	5.2900	0.530	2.804	15	3,633,984
	E	19/10/25	19/11/4	0.531	4.9508	0.265	1.312	11	1,246,925
	F	19/10/9	19/10/24	0.646	5.9550	0.795	4.734	16	6,544,282
	Total discharge								**18,857,837**
Grand total discharge by 3 rivers									**196,884,950**

Source: JICA Project Expert Team (2020)

As a result, Inntain shows the largest water discharge, followed by NamLat and Yepe.

2.5.2. Estimation of TSS discharge by monitoring periods

In order to calculate the TSS discharge from the water discharge data, it is necessary to arrange the SS intensity of each period (A to F). As mentioned above, since only very limited data can be collected in this project, the data provided by Mr.Yuzuru KIMURA, who was dispatched as a chief advisor for this project, will be used as a proxy value.

Table-5 SS intensity applying table by monitoring site and monitoring periods（Units：mg/ｌ）

Period	Start	End	NamLat	Inntain	YePe
Period-1	9 October 2019	24 October 2019	100	120	200
Period-2	25 October 2019	4 November 2019	100	120	200

Period	Start	End	NamLat	Inntain	YePe
Period-3	5 November 2019	19 November 2019	7	28	59
Period-4	20 November 2019	30 November 2019	7	28	59
Period-5	1 December 2019	19 December 2019	7	28	59
Period-6	20 December 2019	1 February 2020	7	28	59

Source: JICA Project Expert Team (2020)

By combining this basic unit and the discharge by period and by river shown above, we estimated the TSS discharge.

Table-6 SS discharge by rivers and monitoring periods

Site	Period	Days	SS (mg/L)	Total Discharge (m3)	Total SS discharge (ton)	SS discharge per day (ton/day)
Namlet	Period-1	16	100	29,418,854	2,942	183.9
	Period-2	11	100	5,639,674	564	51.3
	Period-3	15	7	17,041,104	119	8.0
	Period-4	11	7	1,740,182	12	1.1
	Period-5	44	7	2,033,856	14	0.3
	Period-6	19	7	3,153,514	22	1.2
Inntain	Period-1	16	120	40,526,438	4,863	303.9
	Period-2	11	120	8,737,027	1,048	95.3
	Period-3	15	28	24,841,728	696	46.4
	Period-4	11	28	7,888,320	221	20.1
	Period-5	44	28	26,386,906	739	16.8
	Period-6	19	28	10,619,510	297	15.6
Yepe	Period-1	16	200	6,544,282	1,309	81.8
	Period-2	11	200	1,246,925	249	22.7
	Period-3	15	59	3,633,984	214	14.3
	Period-4	11	59	1,316,304	78	7.1
	Period-5	44	59	4,006,886	236	5.4
	Period-6	19	59	2,109,456	124	6.6

Source: JICA Project Expert Team (2020)

As a result, in 116 days of monitoring from 9th October, 2019 to 1st February, 2020, it was estimated that 3,674 tons of Namlat, 7,864 tons of Inntain and 2,211 tons of SS of Yepe were discharged, and a

total of 13,749 tons of SS were discharged from the three rivers.

According to the results of the previous survey in 2005, SS discharge from Upper Balu sub-catchment (Inntain is equivalent to this survey) was 16,683 tons in October, 5,100 tons in November, and 1,694 tons in December. Compared to this previous study, the project estimates seem to be underestimated. However, since the intensity of SS measured by Chief Kimura in 2018 was applied to the estimation of SS discharge from 2019 to 2020 in this study, the accurate SS discharge is not estimated.

In the second phase of the project, the SS discharge rate will be accurately clarified based on these observation experiences.

3. Visualization of sediment production and transportation site

3.1. Method of visualization

For visualization, it is common to visualize current situations as still images, but we will work on visualization using the latest equipment and software. Specifically, we used a software that acquires images taken at regular times through a fixed-point camera throughout the year, compresses/mosaic them in a short time movie and visualize seasonal changes.

Since the fixed-point camera has been installed outdoors for a long period of time, it has strong dustproof and drip-proof performance, and we have introduced equipment that is powered by AA batteries.

Fig-8 Outlook of trail camera

The trail camera is equipped with a mode in which shooting is performed at regular time intervals and a mode in which shooting is performed when a moving object is reflected on the camera. Considering the purpose of this time, we used the regular observation mode in which images were taken at intervals

of 10 minutes. A single photo has a file size of about 3MB, and a 64GB SD card is installed in the main unit for data storage, so about 20,000 photos can be taken. That is, with the above-described shooting setting at 10-minute intervals, continuous shooting can be performed for about 150 days.

3.2. Monitoring sites

In the first phase, i) fixed points are set at the limestone cave exit of the Karo River (Fig. 8 below), and ii) the head of the gully at Ein Yar (Fig. 9 above), and iii) KoneNi Village (bottom Fig. 9) that is taking measures against soil erosion. A camera was installed to visualize the developmental mechanism of gully erosion and the river conditions at the cave exit.

Fig-9 Cave exit of the Kalaw river

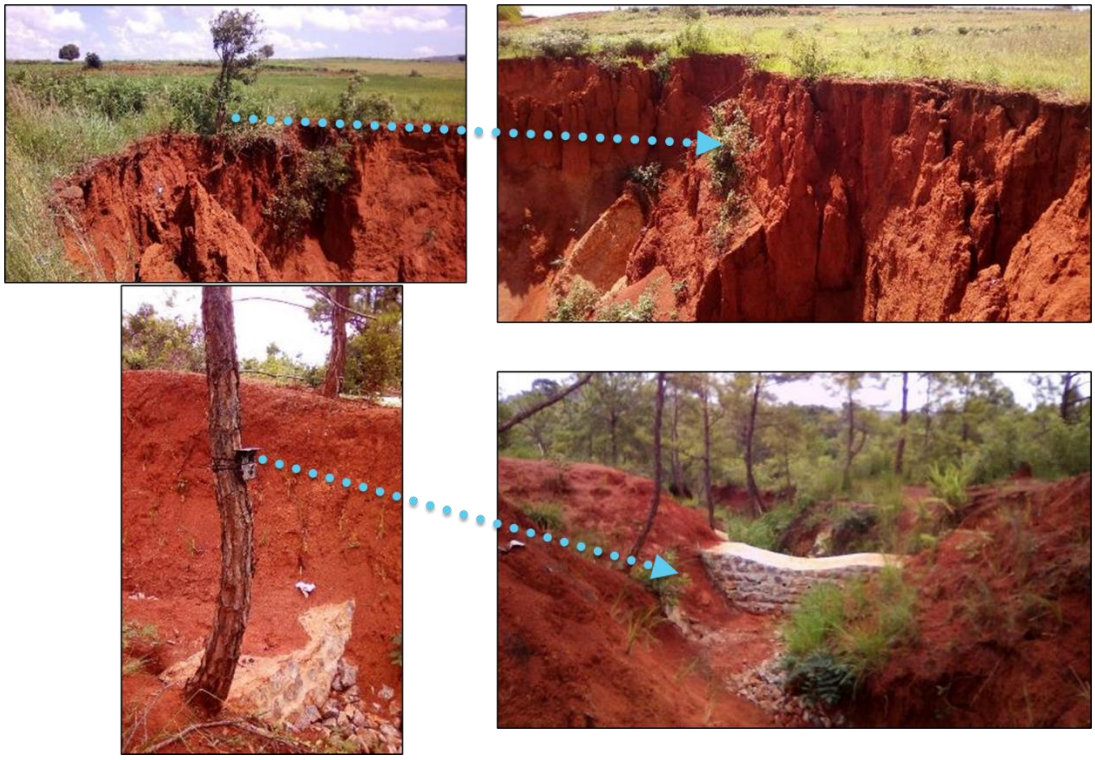


Fig-10 Sediment production site in upper stream of the Kalaw river

（Photo top：EinYar、Photo bottom：KoneNi）

3.3. Results of monitoring

As with other equipment, the installation of fixed-point cameras was delayed due to the acquisition of an import permit, and was installed after September 2019. For this reason, data observation was not possible in the rainy season, and no major changes were captured in the acquired images. In the second phase of the project, a system will be put in place so that various changes in the field that occur during the rainy season can be monitored.

4. Estimation of sediment speed

4.1. Methods of estimation

The contents of the sediment material on the riverbed and the bottom of the lake and the time required for the sedimentation were investigated in the waterway from the fan to Inle Lake and in Inle Lake.

If this result reveals the difference in sedimentation rate at each point, it can be used for the plan of dredging work.

Specifically, we used a method in which a hard-transparent pipe was driven into the riverbed and the bottom of the lake and core sampling of the sediment. And C-14 dating was carried out on samples at certain depths (i.e. 20cm/60cm) by laboratory experiments.

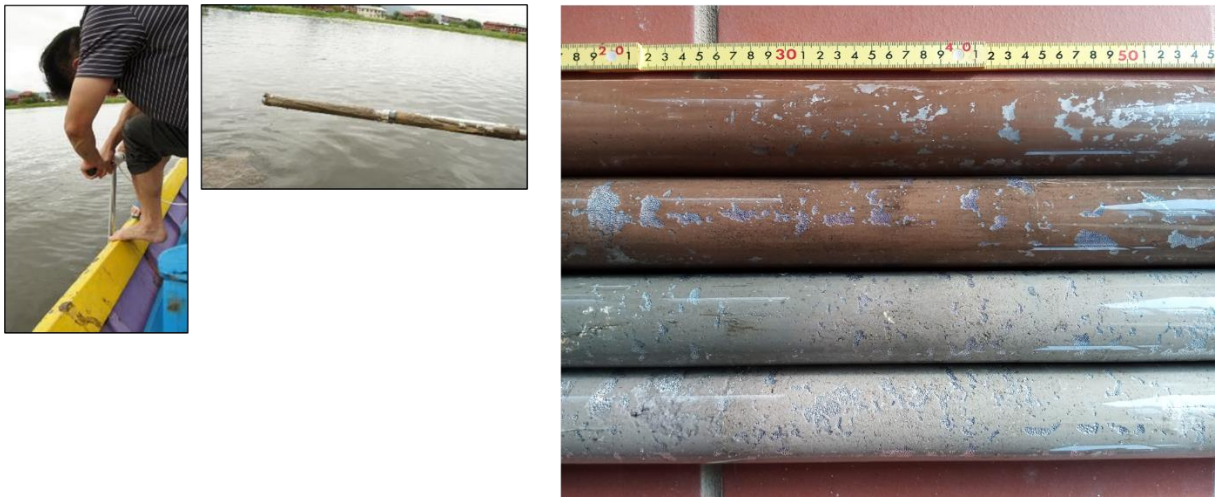


Fig-11　Situation of core sampling（Photo left）and collected core（photo right）

Photo left (placing a hard-transparent pipe from the boat to the bottom of the lake), center of the photo (pulled hard-transparent pipe and sediments stored inside), photo right (4 core samples taken at each point)

The lake bottom sediments stored in hard-transparent pipe were taken back into the office, pipe was cut and arranged into disc-shaped slices every 1 cm, and analyzed by C-14 dating.

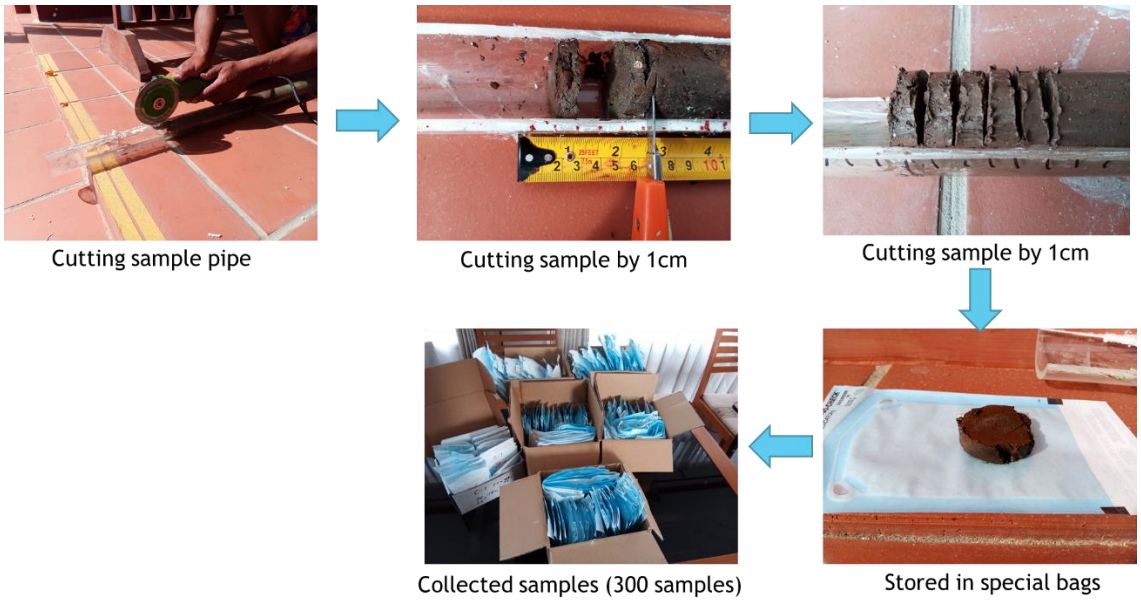


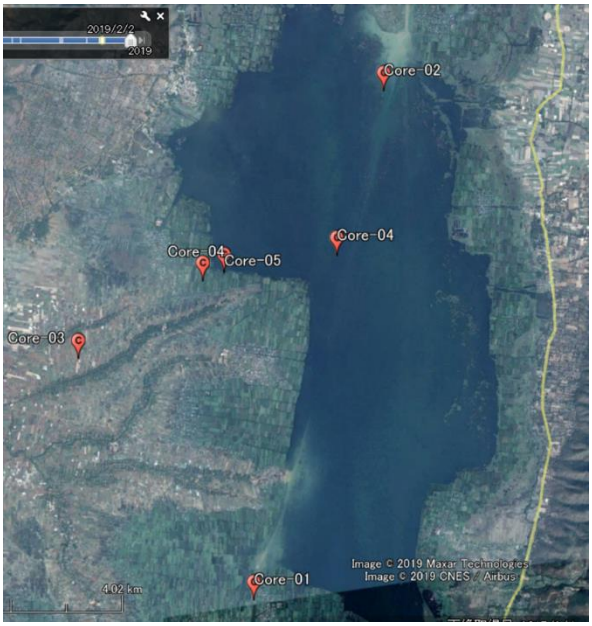
Fig-12　Arrangement of core sample for lavatory work

4.2.　Result of sediment speed estimation

Lake bottom core samples were taken from the Kalaw alluvial fan and the river mouth of the Uppre

Balu and Namlat by the method described above, and particle size analysis and C14 analysis were performed. Especially for the Kalaw river, we focused on one channel that crossed alluvial fan and flows into the Inle Lake, and set sampling points at multiple locations from the upstream to the Inle Lake connection area.

ID/Depth	20cm (year)	60cm (year)	Speed in 20cm (mm/y)
C-01	240±20	960±20	0.77
C-02	310±20	860±20	0.61
C-03	50±20	910±20	2.86
C-04	670±20	1±0.003	0.29
C-05	1,270±20	2,590±20	0.16
C-06	990±20	1,610±20	0.18



Source: JICA Project Expert Team (2020)

Table-7 Estimated sedimentation ages and acquisition location map by depth of 20 cm and 60 cm from the surface

From these results, the sedimentation rate at 60 cm depth becomes slower in the order of C-03 → C-01 → C-02 → C-04 → C-06 → C-05. The uppermost part of the Kalaw river alluvial fun has the highest sedimentation rate, followed by the Upper Balu estuary and the Namlat estuary.

On the other hand, it was confirmed that C-05 collected at the tip of the Kalaw river alluvial fun (adjacent area with Inle Lake) had the slowest sedimentation rate. This suggests that discharge sediment has stopped in the floating garden area and may not have flowed directly into Inle Lake.

In the second phase of the project, we will clarify this further and quantify how much suspended solids are flows into Inle Lake.

Attachment 10
Report on the Inventory Survey of Existing Check Dams Constructed by FD and IWUMD

Check dam inventory

1. Nyaunshwe FD

Their work of construction of check dam is almost same as a single drystone check dam except in case of a private budget source. However, in their inventory doesn't include these masonry check dams.

The summary of check dam inventory of Nyaunshwe FD is shown below. The detail data is shown in Attachment-1.

They construct 14 to 19 check dams per year, and average length of check dam is 4.1m, height is 1.6m.

Summary of Check Dam Inventory of Nyunshwe FD

Year	No. of dams	Average of dimension					
		(ft)			(m)		
		Length	Height	Volume	Length	Height	Volume
2014	14	12.3	6.1	552.9	3.7	1.9	168.5
2015	17	14.3	5.9	643.2	4.4	1.8	196.0
2016	10	16.0	5.0	720.0	4.9	1.5	219.5
2017	17	13.4	5.0	603.5	4.1	1.5	183.9
2018	19	14.0	5.0	630.0	4.3	1.5	192.0
Total	77	13.9	5.4	624.7	4.2	1.6	190.4

Source: JICA Project Expert Team prepared based on Nyaunshwe FD data (2019)

2. Kalaw FD

Their work of construction of check dam is almost same as a single drystone check dam except in case of a private budget source. However, in their inventory doesn't include these masonry check dams.

The summary of check dam inventory of Kalaw FD is shown below. The detail data is shown in Attachment-2.

They construct 10 to 13 check dams per year, and average length of check dam is 4.2m, height is 1.3m. The dimension is almost same as Nyawnshwe FD.

Summary of Check Dam Inventory of Kalaw FD

Year	No. of dams	Average of dimension					
		(ft)			(m)		
		Length	Height	Volume	Length	Height	Volume
2014	10	14.6	4.2	202.9	4.5	1.3	61.8
2015	10	16.0	4.2	218.9	4.9	1.3	66.7
2016	10	13.6	4.3	203.3	4.1	1.3	62.0
2017	11	14.5	4.2	205.1	4.4	1.3	62.5
2018	13	14.3	4.2	195.0	4.4	1.3	59.4
Total	54	14.6	4.2	204.5	4.5	1.3	62.3

Source: JICA Project Expert Team prepared based on Kalaw FD data (2019)

3. Nyaunshwe IWUMD

Their check dam constructions are almost in rivers or stream, not in gullies. Their data before

2012 don't have dimension and the data between 2012 to 2018 don't have data of volume. Also, data from 2013 to 2015 were not provided.

The summary of check dam inventory of Nyaunshwe IWUMD is shown below. The detail data is shown in Attachment-2.

They construct 18 to 25 check dams per year during 2012 to 2016, but in 2017 and 2018 the number of check dams is 3 and 2. The average dimension shows 11.2 m in length,1.3m in height. The length of check dams constructed by IWUMD is linger than FD but the height is almost same.

Summary of Check Dam Inventory of Nyaunshwe IWUMD

Year	No. of dams	Average of dimension					
		(ft)			(m)		
		Length	Height	Volume	Length	Height	Volume
2012	22	36.1	3.9	NA	11	1.2	NA
2013	18	38.6	4.0	NA	11.8	1.2	NA
2016	25	34.2	4.7	NA	10.4	1.4	NA
2017	3	50.0	5.0	NA	15.2	1.5	NA
2018	2	35.0	4.0	NA	10.7	1.2	NA
Total	70	36.6	4.2	NA	11.2	1.3	NA

Source: JICA Project Expert Team prepared based on Nyaunshwe IWUMD data (2019)

---End of Document---

Attachment-1

Check Dam Inventory (Nyaunshwe FD)

S-No.	Year	Name Place/ Stream	Purpose	Matrial	Drawing	Dimension Length (ft)	Height (ft)	Volume (ft^3)
1	2014	Near Kin Tae Viallage (1)	Erosion Control	Stone&Wood	No	18	9	810
2	2014	Near Kin Tae Viallage (2)	Erosion Control	Stone&Wood	No	18	9	810
3	2014	Near Tone Le Village (1)	Erosion Control	Stone&Wood	No	12	9	540
4	2014	Near Tone Le Village (2)	Erosion Control	Stone&Wood	No	12	9	540
5	2014	Htet Eain Stream (1)	Sediment deposit	Stone&Wood	No	9	5	405
6	2014	Htet Eain Stream (2)	Sediment deposit	Stone&Wood	No	9	5	405
7	2014	Htet Eain Stream (3)	Sediment deposit	Stone&Wood	No	9	5	405
8	2014	Htet Eain Stream (4)	Sediment deposit	Stone&Wood	No	9	5	405
9	2014	Htet Eain Stream (5)	Sediment deposit	Stone&Wood	No	9	5	405
10	2014	Taung Bo Gyi Stream (1)	Sediment deposit	Stone&Wood	No	11	5	495
11	2014	Taung Bo Gyi Stream (2)	Sediment deposit	Stone&Wood	No	11	5	495
12	2014	Ingyin Pin Stream	Sediment deposit	Stone&Wood	No	13	5	585
13	2014	Near Tone Le Village (1)	Sediment deposit	Stone&Wood	No	16	5	720
14	2014	Near Tone Le Village (2)	Sediment deposit	Stone&Wood	No	16	5	720
15	2015	Shwe Lin Ban Village (1)	Erosion Control	Stone&Wood	No	12	9	540
16	2015	Shwe Lin Ban Village (2)	Erosion Control	Stone&Wood	No	12	9	540
17	2015	Yan Dwin Stream-near Tone Le Village (1)	Erosion Control	Stone&Wood	No	18	9	810
18	2015	Yan Dwin Stream-near Tone Le Village (2)	Erosion Control	Stone&Wood	No	18	9	810
19	2015	Tha Pyay Stream	Sediment deposit	Stone&Wood	No	9	5	405
20	2015	Pa O Stream-near Sike Pyoe Village (1)	Sediment deposit	Stone&Wood	No	11	5	495
21	2015	Pa O Stream-near Sike Pyoe Village (2)	Sediment deposit	Stone&Wood	No	11	5	495
22	2015	Pa O Stream-near Sike Pyoe Village (3)	Sediment deposit	Stone&Wood	No	11	5	495
23	2015	Shwe Lin Ban Stream	Sediment deposit	Stone&Wood	No	13	5	585
24	2015	Yan Dwin Stream (1)	Sediment deposit	Stone&Wood	No	16	5	720
25	2015	Yan Dwin Stream (2)	Sediment deposit	Stone&Wood	No	16	5	720
26	2015	Yan Dwin Stream (3)	Sediment deposit	Stone&Wood	No	16	5	720
27	2015	Yan Dwin Stream (4)	Sediment deposit	Stone&Wood	No	16	5	720
28	2015	Yan Dwin Stream (5)	Sediment deposit	Stone&Wood	No	16	5	720
29	2015	Shwe Lin Ban Village	Erosion Control	Stone&Wood	No	12	5	540
30	2015	Kyauk Yae O Village	Erosion Control	Stone&Wood	No	18	5	810
31	2015	Taung Bo Gyi Village	Erosion Control	Stone&Wood	No	18	5	810
32	2016	Taung Bo Gyi (South Stream) (1)	Sediment deposit	Stone&Wood	No	16	5	720
33	2016	Taung Bo Gyi (South Stream) (2)	Sediment deposit	Stone&Wood	No	16	5	720
34	2016	Taung Bo Gyi (South Stream) (3)	Sediment deposit	Stone&Wood	No	16	5	720
35	2016	Taung Bo Gyi (South Stream) (4)	Sediment deposit	Stone&Wood	No	16	5	720
36	2016	Taung Bo Gyi (South Stream) (5)	Sediment deposit	Stone&Wood	No	16	5	720
37	2016	Taung Bo Gyi (South Stream) (6)	Sediment deposit	Stone&Wood	No	16	5	720
38	2016	Taung Bo Gyi (North Stream) (1)	Sediment deposit	Stone&Wood	No	16	5	720
39	2016	Taung Bo Gyi (North Stream) (2)	Sediment deposit	Stone&Wood	No	16	5	720
40	2016	Taung Bo Gyi (North Stream) (3)	Sediment deposit	Stone&Wood	No	16	5	720
41	2016	Shwe Taung Oo Village	Sediment deposit	Stone&Wood	No	16	5	720
42	2017	Shwe Lin Ban Village (1)	Erosion Control	Stone&Wood	No	12	5	540
43	2017	Shwe Lin Ban Village (2)	Erosion Control	Stone&Wood	No	12	5	540
44	2017	Shwe Lin Ban Village (3)	Erosion Control	Stone&Wood	No	12	5	540
45	2017	Taung Bo Gyi/Tone Le Village (1)	Erosion Control	Stone&Wood	No	15	5	675
46	2017	Taung Bo Gyi/Tone Le Village (2)	Erosion Control	Stone&Wood	No	15	5	675
47	2017	Taung Bo Gyi/Tone Le Village (3)	Erosion Control	Stone&Wood	No	15	5	675
48	2017	Tone Le Village (1)	Sediment deposit	Stone&Wood	No	16	5	720
49	2017	Tone Le Village (2)	Sediment deposit	Stone&Wood	No	16	5	720
50	2017	Tone Le Village (3)	Sediment deposit	Stone&Wood	No	16	5	720
51	2017	Lwe Nyein	Sediment deposit	Stone&Wood	No	16	5	720
52	2017	Taung Bo Gyi (1)	Sediment deposit	Stone&Wood	No	13	5	585
53	2017	Taung Bo Gyi (2)	Sediment deposit	Stone&Wood	No	13	5	585
54	2017	Lwe Tan (1)	Sediment deposit	Stone&Wood	No	13	5	585
55	2017	Lwe Tan (2)	Sediment deposit	Stone&Wood	No	11	5	495
56	2017	Lwe Tan (3)	Sediment deposit	Stone&Wood	No	11	5	495
57	2017	Lwe Tan (4)	Sediment deposit	Stone&Wood	No	11	5	495
58	2017	Lwe Tan (5)	Sediment deposit	Stone&Wood	No	11	5	495
59	2018	Thae Kyin Village (1)	Erosion Control	Stone&Wood	No	14	5	630
60	2018	Thae Kyin Village (2)	Erosion Control	Stone&Wood	No	14	5	630
61	2018	Tha Yat Pin Village (1)	Erosion Control	Stone&Wood	No	14	5	630
62	2018	That Yat Pin Village (2)	Erosion Control	Stone&Wood	No	14	5	630
63	2018	Paw Naw Village (1)	Erosion Control	Stone&Wood	No	12	5	540
64	2018	Paw Naw Village (2)	Erosion Control	Stone&Wood	No	12	5	540
65	2018	Tone Le Village (1)	Sediment deposit	Stone&Wood	No	14	5	630
66	2018	Tone Le Village (2)	Sediment deposit	Stone&Wood	No	14	5	630
67	2018	Tone Le Village (3)	Sediment deposit	Stone&Wood	No	14	5	630
68	2018	Lwe Nyein Village	Sediment deposit	Stone&Wood	No	14	5	630
69	2018	Taung Bo Gyi Village (1)	Sediment deposit	Stone&Wood	No	9	5	405
70	2018	Taung Bo Gyi Village (2)	Sediment deposit	Stone&Wood	No	9	5	405
71	2018	Kyauk Yae O Village (1)	Sediment deposit	Stone&Wood	No	16	5	720
72	2018	Kyauk Yae O Village (2)	Sediment deposit	Stone&Wood	No	16	5	720
73	2018	Kyauk Yae O Village (3)	Sediment deposit	Stone&Wood	No	16	5	720
74	2018	Kyauk Yae O Village (4)	Sediment deposit	Stone&Wood	No	16	5	720
75	2018	Kyauk Yae O Village (5)	Sediment deposit	Stone&Wood	No	16	5	720
76	2018	Hpa Yar Phyu Village (1)	Sediment deposit	Stone&Wood	No	16	5	720
77	2018	Hpa Yar Phyu Village (2)	Sediment deposit	Stone&Wood	No	16	5	720

Source: JICA Project Expert Team prepared based on Nyaunshwe FD data (2019)

Attachment-2 **Check Dam Inventory (Kalaw FD)**

S-No.	Year	Name Place/ Stream	Purpose	Matrial	Drawing	Dimension Length (ft)	Height (ft)	Volume (ft^3)
1	2014	Aung Ban Reserved Forest-Mya Nan Dar Water Resource (1)	Sediment deposit	Stone&Wood	No	14	4	168
2	2014	Aung Ban Reserved Forest-Mya Nan Dar Water Resource (2)	Sediment deposit	Stone&Wood	No	14	4	168
3	2014	Aung Ban Reserved Forest-Mya Nan Dar Water Resource (3)	Sediment deposit	Stone&Wood	No	15	4.5	236.25
4	2014	Aung Ban Reserved Forest-Mya Nan Dar Water Resource (4)	Sediment deposit	Stone&Wood	No	15	4.5	236.25
5	2014	Aung Ban Reserved Forest-Mya Nan Dar Water Resource (5)	Sediment deposit	Stone&Wood	No	14.5	4	174
6	2014	Taung Lay Lone Reserved Forest (1)	Sediment deposit	Stone&Wood	No	14	4	168
7	2014	Taung Lay Lone Reserved Forest (2)	Sediment deposit	Stone&Wood	No	15	4.5	236.25
8	2014	Taung Lay Lone Reserved Forest (3)	Sediment deposit	Stone&Wood	No	15	4.5	236.25
9	2014	Taung Lay Lone Reserved Forest (4)	Sediment deposit	Stone&Wood	No	14.5	4	203
10	2014	Taung Lay Lone Reserved Forest (5)	Sediment deposit	Stone&Wood	No	14.5	4	203
11	2015	Kalaw Reserved Forest Plot 19- (1)	Sediment deposit	Stone&Wood	No	19	4	228
12	2015	Kalaw Reserved Forest Plot 19- (2)	Sediment deposit	Stone&Wood	No	16	4	224
13	2015	Kalaw Reserved Forest Plot 19- (3)	Sediment deposit	Stone&Wood	No	15	4.5	202.5
14	2015	Kalaw Reserved Forest Plot 20- (1)	Sediment deposit	Stone&Wood	No	15	4	180
15	2015	Kalaw Reserved Forest Plot 20- (2)	Sediment deposit	Stone&Wood	No	14	4.5	220.5
16	2015	Aung Ban Reserved Forest-Lwe Hat (1)	Sediment deposit	Stone&Wood	No	19	4	228
17	2015	Aung Ban Reserved Forest-Lwe Hat (2)	Sediment deposit	Stone&Wood	No	16	4.5	252
18	2015	Taung Lay Lone Reserved Forest (1)	Sediment deposit	Stone&Wood	No	19	4	228
19	2015	Taung Lay Lone Reserved Forest (2)	Sediment deposit	Stone&Wood	No	15	4	210
20	2015	Taung Lay Lone Reserved Forest (3)	Sediment deposit	Stone&Wood	No	12	4.5	216
21	2016	Kalaw Reserved Forest Plot 19-(1)	Sediment deposit	Stone&Wood	No	14	4	168
22	2016	Kalaw Reserved Forest Plot 19-(2)	Sediment deposit	Stone&Wood	No	14	4	168
23	2016	Kalaw Reserved Forest Plot 19-(3)	Sediment deposit	Stone&Wood	No	15	4.5	236.25
24	2016	Kalaw Reserved Forest Plot 19-(4)	Sediment deposit	Stone&Wood	No	15	4.5	236.25
25	2016	Aung Ban-Baint Nae Pin Village (1)	Sediment deposit	Stone&Wood	No	14	4	168
26	2016	Aung Ban-Baint Nae Pin Village (2)	Sediment deposit	Stone&Wood	No	14	4	168
27	2016	Aung Ban-Baint Nae Pin Village (3)	Sediment deposit	Stone&Wood	No	14.5	4.5	195.75
28	2016	Aung Ban-Baint Nae Pin Village (4)	Sediment deposit	Stone&Wood	No	14.5	4.5	195.75
29	2016	Taung Lay Lone Reserved Forest (1)	Sediment deposit	Stone&Wood	No	11	4.5	297
30	2016	Taung Lay Lone Reserved Forest (2)	Sediment deposit	Stone&Wood	No	10	4	200
31	2017	Aung Ban-Kone Ni Village (1)	Sediment deposit	Stone&Wood	No	14	4	168
32	2017	Aung Ban-Kone Ni Village (2)	Sediment deposit	Stone&Wood	No	14	4	196
33	2017	Aung Ban-Kone Ni Village (3)	Sediment deposit	Stone&Wood	No	15	4.5	202.5
34	2017	Aung Ban-Kone Ni Village (4)	Sediment deposit	Stone&Wood	No	15	4	210
35	2017	Aung Ban Reserved Forest	Sediment deposit	Stone&Wood	No	15	4.5	236.25
36	2017	Thi Kaung Reserved Forest	Sediment deposit	Stone&Wood	No	14	4	168
37	2017	Baw Nin Group-Nyaung Kone (1)	Sediment deposit	Stone&Wood	No	14.5	4	203
38	2017	Baw Nin Group-Nyaung Kone (2)	Sediment deposit	Stone&Wood	No	15	4.5	236.25
39	2017	Baw Nin Group-Nyaung Kone (3)	Sediment deposit	Stone&Wood	No	14	4	168
40	2017	Baw Nin Group-Nyaung Kone (4)	Sediment deposit	Stone&Wood	No	14.5	4.5	228.38
41	2017	Baw Nin Group-Nyaung Kone (5)	Sediment deposit	Stone&Wood	No	15	4	240
42	2018	Aung Ban-Kone Ni Village (1)	Sediment deposit	Others	No	14	4	168
43	2018	Aung Ban-Kone Ni Village (2)	Sediment deposit	Others	No	14	4	168
44	2018	Aung Ban-Kone Ni Village (3)	Sediment deposit	Others	No	15	4.5	202.5
45	2018	Aung Ban-Kone Ni Village (4)	Sediment deposit	Others	No	15	4.5	202.5
46	2018	Aung Ban-Kone Ni Village (5)	Sediment deposit	Others	No	14	4	196
47	2018	Heho-Shaut Lin Tai Field (1)	Sediment deposit	Stone&Wood	No	15	4.5	236.25
48	2018	Heho-Shaut Lin Tai Field (2)	Sediment deposit	Stone&Wood	No	14	4	168
49	2018	Heho-Shaut Lin Tai Field (3)	Sediment deposit	Stone&Wood	No	14.5	4	203
50	2018	Heho-Zi Yar Village (1)	Sediment deposit	Stone&Wood	No	15	4	180
51	2018	Heho-Zi Yar Village (2)	Sediment deposit	Stone&Wood	No	14	4	196
52	2018	Heho-Zi Yar Village (3)	Sediment deposit	Stone&Wood	No	12	4	216
53	2018	Heho-Zi Yar Village (4)	Sediment deposit	Stone&Wood	No	15	4	210
54	2018	Heho-Zi Yar Village (5)	Sediment deposit	Stone&Wood	No	14	4.5	189

Source: JICA Project Expert Team prepared based on Kalaw FD data (2019)

Attachment-3

Check Dam Inventory (Nyaunshwe IWUMD)

S-No.	Year	Name Place/ Stream	Purpose	Matrial	Drawing	Dimension Length (ft)	Height (ft)	Volume (ft^3)
1	1992	Yae Bal Stream	Erosion Control					
2	1992	Tha Na Kha Stream	Erosion Control					
3	1992	Thae Kone Stream (1)	Erosion Control					
4	1992	Thae Kone Stream (2)	Erosion Control					
5	1992	Thae Kone Stream (3)	Erosion Control					
6	1992	Thae Kone Stream (4)	Erosion Control					
7	1992	Thae Kone Stream (5)	Erosion Control					
8	1992	Nam Si Stream (1)	Erosion Control					
9	1992	Nam Si Stream (2)	Erosion Control					
10	1992	Nam Si Stream (3)	Erosion Control					
11	1992	Shwe Lin Ban Stream (1)	Erosion Control					
12	1992	Shwe Lin Ban Stream (2)	Erosion Control					
13	1992	Shwe Lin Ban Stream (3)	Erosion Control					
14	1992	Chaung Saut Stream (1)	Erosion Control					
15	1992	Chaung Saut Stream (2)	Erosion Control					
16	1992	Chaung Saut Stream (3)	Erosion Control					
17	1992	Chaung Saut Stream (4)	Erosion Control					
18	1992	Tha Lae Oo Stream (1)	Erosion Control					
19	1992	Tha Lae Oo Stream (2)	Erosion Control					
20	1992	Tha Lae Oo Stream (3)	Erosion Control					
21	1993	Tha Pyay Pin Stream (1)	Erosion Control					
22	1993	Tha Pyay Pin Stream (2)	Erosion Control					
23	1993	Tha Pyay Pin Stream (3)	Erosion Control					
24	1993	Yae Bu Stream (1)	Erosion Control					
25	1993	Yae Bu Stream (2)	Erosion Control					
26	1993	Yae Bu Stream (3)	Erosion Control					
27	1993	Yae Bu Stream (4)	Erosion Control					
28	1993	Chaung Par Stream (1)	Erosion Control					
29	1993	Chaung Par Stream (2)	Erosion Control					
30	1993	Chaung Par Stream (3)	Erosion Control					
31	1993	Nam Mal Zin Stream	Erosion Control					
32	1993	Yae Oo Stream	Erosion Control					
33	1993	Ma Kyi Pin Stream (1)	Erosion Control					
34	1993	Ma Kyi Pin Stream (2)	Erosion Control					
35	1993	Ma Kyi Pin Stream (3)	Erosion Control					
36	1993	North Sein Kar Stream (1)	Erosion Control					
37	1993	North Sein Kar Stream (2)	Erosion Control					
38	1993	North Sein Kar Stream (3)	Erosion Control					
39	1993	Ma Kyi Seik Stream (1)	Erosion Control					
40	1993	Ma Kyi Seik Stream (2)	Erosion Control					
41	1993	Ma Kyi Seik Stream (3)	Erosion Control					
42	1993	Ma Kyi Seik Stream (4)	Erosion Control					
43	1993	Hti Kan Stream (1)	Erosion Control					
44	1993	Hti Kan Stream (2)	Erosion Control					
45	1993	Thar Main Kam Stream (1)	Erosion Control					
46	1993	Thar Main Kam Stream (2)	Erosion Control					
47	1994	Yam Dwin Stream (1)	Erosion Control					
48	1994	Yam Dwin Stream (2)	Erosion Control					
49	1994	La Main Sin Stream (1)	Erosion Control					
50	1994	La Main Sin Stream (2)	Erosion Control					
51	1994	Tha Phan Stream (1)	Erosion Control					
52	1994	Tha Phan Stream (2)	Erosion Control					
53	1994	Chaung Chauk Stream (1)	Erosion Control					
54	1994	Chaung Chauk Stream (2)	Erosion Control					
55	1994	War Taw Stream (1)	Erosion Control					
56	1994	War Taw Stream (2)	Erosion Control					
57	1995	Lwe Tan Stream	Erosion Control					
58	1995	Pauk Taw Stream (1)	Erosion Control					
59	1995	Pauk Taw Stream (2)	Erosion Control					
60	1996	Aye Thar Yar	Erosion Control					
61	1997	Oak Phoe Stream-Zee Phyu Kone	Erosion Control					
62	1997	Oak Phoe Stream-Tha Main Kone	Erosion Control					
63	1997	Te Kaung Mountain (1)	Erosion Control					
64	1997	Te Kaung Mountain (2)	Erosion Control					
65	1998	Lwe Paung Stream (1)	Erosion Control					
66	1998	Lwe Paung Stream (2)	Erosion Control					
67	1998	Lwe Taung Gaung Stream (1)	Erosion Control					
68	1998	Lwe Taung Gaung Stream (2)	Erosion Control					
69	1998	Li Mee Stream (1)	Erosion Control					
70	1998	Li Mee Stream (2)	Erosion Control					

S-No.	Year	Name Place/ Stream	Purpose	Matrial	Drawing	Dimension Length (ft)	Height (ft)	Volume (ft^3)
71	1998	Nal Char Stream (1)	Erosion Control					
72	1998	Nal Char Stream (2)	Erosion Control					
73	1998	Ma Kyi Pin Stream (1)	Erosion Control					
74	1998	Ma Kyi Pin Stream (2)	Erosion Control					
75	1998	Tha Phan Stream (1)	Erosion Control					
76	1998	Tha Phan Stream (2)	Erosion Control					
77	1998	Thae Kone Stream (1)	Erosion Control					
78	1998	Thae Kone Stream (2)	Erosion Control					
79	1999	Pauk Taw Stream (1)	Erosion Control					
80	1999	Pauk Taw Stream (2)	Erosion Control					
81	1999	Hti Kan Stream (1)	Erosion Control					
82	1999	Hti Kan Stream (2)	Erosion Control					
83	1999	Ma Kyi Seik (1)	Erosion Control					
84	1999	Ma Kyi Seik (2)	Erosion Control					
85	1999	North Sein Kar Stream (1)	Erosion Control					
86	1999	North Sein Kar Stream (2)	Erosion Control					
87	1999	Chaung Sauk Stream (1)	Erosion Control					
88	1999	Chaung Sauk Stream (2)	Erosion Control					
89	1999	Chaung Chauk Stream (1)	Erosion Control					
90	1999	Chaung Chauk Stream (2)	Erosion Control					
91	1999	Tha Pyay Pin Stream (1)	Erosion Control					
92	1999	Tha Pyay Pin Stream (2)	Erosion Control					
93	1999	Yam Dwin Stream (1)	Erosion Control					
94	1999	Yam Dwin Stream (2)	Erosion Control					
95	1999	La Main Sin Stream (1)	Erosion Control					
96	1999	La Main Sin Stream (2)	Erosion Control					
97	1999	War Taw Stream (1)	Erosion Control					
98	1999	War Taw Stream (2)	Erosion Control					
99	2000	Shwe Lin Ban Stream (1)	Erosion Control					
100	2000	Shwe Lin Ban Stream (2)	Erosion Control					
101	2000	Tha Pyay Stream (1)	Erosion Control					
102	2000	Tha Pyay Stream (2)	Erosion Control					
103	2001	Kan Taw Stream (1)	Erosion Control					
104	2001	Kan Taw Stream (2)	Erosion Control					
105	2001	Tha Phan Stream (1)	Erosion Control					
106	2001	Tha Phan Stream (2)	Erosion Control					
107	2001	Ma Kyi Seik Stream (1)	Erosion Control					
108	2001	Ma Kyi Seik Stream (2)	Erosion Control					
109	2001	Hti Kan Stream (1)	Erosion Control					
110	2001	Hti Kan Stream (2)	Erosion Control					
111	2001	Nal Char Stream (1)	Erosion Control					
112	2001	Nal Char Stream (2)	Erosion Control					
113	2001	Pauk Taw Stream (1)	Erosion Control					
114	2001	Pauk Taw Stream (2)	Erosion Control					
115	2002	Tha Pyay Stream	Erosion Control					
116	2002	War Taw Stream (1)	Erosion Control					
117	2002	War Taw Stream (2)	Erosion Control					
118	2002	Ma Kyi Pin Stream (1)	Erosion Control					
119	2002	Ma Kyi Pin Stream (2)	Erosion Control					
120	2002	Thae Kone Stream (1)	Erosion Control					
121	2002	Thae Kone Stream (2)	Erosion Control					
122	2002	Loi Taung Gaung Stream (1)	Erosion Control					
123	2002	Loi Taung Gaung Stream (2)	Erosion Control					
124	2002	Yae Bu Stream (1)	Erosion Control					
125	2002	Yae Bu Stream (2)	Erosion Control					
126	2002	Chaung Par Stream	Erosion Control					
127	2002	Nam Mal Zin Stream	Erosion Control					
128	2002	Yae Oo Stream	Erosion Control					
129	2002	Yam Dwin Stream	Erosion Control					
130	2003	Li Mee Stream (1)	Erosion Control					
131	2003	Li Mee Stream (2)	Erosion Control					
132	2003	East Ma Kyi Pin Stream (1)	Erosion Control					
133	2003	East Ma Kyi Pin Stream (2)	Erosion Control					
134	2003	Yam Dwin Stream	Erosion Control					
135	2003	Chaung Par Stream	Erosion Control					
136	2003	Yae Oo Stream	Erosion Control					
137	2003	Loi Taung Gaung Stream	Erosion Control					
138	2003	Shwe Lin Ban Stream	Erosion Control					
139	2004	Shwe Lin Ban Stream	Erosion Control					
140	2004	Hwe Aw Stream	Erosion Control					

S-No.	Year	Name Place/ Stream	Purpose	Matrial	Drawing	Dimension Length (ft)	Height (ft)	Volume (ft^3)
141	2004	Tha Phan Stream	Erosion Control					
142	2004	Yam Dwin Stream	Erosion Control					
143	2005	War Taw Stream	Erosion Control					
144	2005	Chaung Chauk Stream	Erosion Control					
145	2006	Tha Pyay Pin Stream	Erosion Control					
146	2006	Hwe Aw Stream	Erosion Control					
147	2007	Shwe Lin Ban Stream	Erosion Control					
148	2007	Hwe Aw Stream (1)	Erosion Control					
149	2007	Hwe Aw Stream (2)	Erosion Control					
150	2007	Tha Pyay Stream (1)	Erosion Control					
151	2007	Tha Pyay Stream (2)	Erosion Control					
152	2007	Chaung Sauk Stream	Erosion Control					
153	2007	Tha Pyay Pin Stream (1)	Erosion Control					
154	2007	Tha Pyay Pin Stream (2)	Erosion Control					
155	2007	Chaung Chauk Stream (1)	Erosion Control					
156	2007	Chaung Chauk Stream (2)	Erosion Control					
157	2007	War Taw Stream (1)	Erosion Control					
158	2007	War Taw Stream (2)	Erosion Control					
159	2007	Kone Mon Stream (1)	Erosion Control					
160	2007	Kone Mon Stream (2)	Erosion Control					
161	2007	Taung Ni Stream (1)	Erosion Control					
162	2007	Taung Ni Stream (2)	Erosion Control					
163	2007	Taung Ni Stream (3)	Erosion Control					
164	2008	War Taw Stream (1)	Erosion Control					
165	2008	War Taw Stream (2)	Erosion Control					
166	2008	Tha Pyay Stream (1)	Erosion Control					
167	2008	Tha Pyay Stream (2)	Erosion Control					
168	2008	Hti Kan Stream	Erosion Control					
169	2008	Ma Kyi Seik Stream	Erosion Control					
170	2009	Kan Taw Stream (1)	Erosion Control					
171	2009	Kan Taw Stream (2)	Erosion Control					
172	2009	Nam Si Stream	Erosion Control					
173	2010	Nam Si Stream	Erosion Control					
174	2010	Chaung Chuk Stream (1)	Erosion Control					
175	2010	Chaung Chuk Stream (2)	Erosion Control					
176	2010	West Ma Kyi Pin Stream (1)	Erosion Control					
177	2010	West Ma Kyi Pin Stream (2)	Erosion Control					
178	2010	West Ma Kyi Pin Stream (3)	Erosion Control					
179	2010	East Ma Kyi Pin Stream (1)	Erosion Control					
180	2010	East Ma Kyi Pin Stream (2)	Erosion Control					
181	2010	East Ma Kyi Pin Stream (3)	Erosion Control					
182	2010	Thae Kone Stream (1)	Erosion Control					
183	2010	Thae Kone Stream (2)	Erosion Control					
184	2010	Thae Kone Stream (3)	Erosion Control					
185	2010	Tha Phan Stream (1)	Erosion Control					
186	2010	Tha Phan Stream (2)	Erosion Control					
187	2010	Tha Lae Oo Stream (1)	Erosion Control					
188	2010	Tha Lae Oo Stream (2)	Erosion Control					
189	2010	Yam Dwin Stream (1)	Erosion Control					
190	2010	Yam Dwin Stream (2)	Erosion Control					
191	2010	Yam Dwin Stream (3)	Erosion Control					
192	2010	Shwe Lin Ban Stream (1)	Erosion Control					
193	2010	Shwe Lin Ban Stream (2)	Erosion Control					
194	2010	Yae Bal Stream	Erosion Control					
195	2011	Thae Kone Stream (1)	Erosion Control					
196	2011	Thae Kone Stream (2)	Erosion Control					
197	2011	Thae Kone Stream (3)	Erosion Control					
198	2011	Hwe Aw Stream (1)	Erosion Control					
199	2011	Hwe Aw Stream (2)	Erosion Control					
200	2011	West Ma Kyi Pin Stream (1)	Erosion Control					
201	2011	West Ma Kyi Pin Stream (2)	Erosion Control					
202	2011	Shwe Lin Ban Stream	Erosion Control					
203	2011	Tha Pyay Pin Stream (1)	Erosion Control					
204	2011	Tha Pyay Pin Stream (2)	Erosion Control					
205	2011	Tha Pyay Pin Stream (3)	Erosion Control					
206	2011	Tha Phan Stream (1)	Erosion Control					
207	2011	Tha Phan Stream (2)	Erosion Control					
208	2011	Tha Pyay Stream (1)	Erosion Control					
209	2011	Tha Pyay Stream (2)	Erosion Control					
210	2011	War Taw Stream (1)	Erosion Control					
211	2011	War Taw Stream (2)	Erosion Control					
212	2011	Chaung Chauk Stream (1)	Erosion Control					
213	2011	Chaung Chauk Stream (2)	Erosion Control					
214	2011	Inngyin Pin Stream (1)	Erosion Control					
215	2011	Inngyin Pin Stream (2)	Erosion Control					

S-No.	Year	Name Place/ Stream	Purpose	Matrial	Drawing	Dimension Length (ft)	Height (ft)	Volume (ft^3)
216	2012	Ho Nan Stream (1)	Erosion Control	Stone&Wood		55	4	
217	2012	Ho Nan Stream (2)	Erosion Control	Stone&Wood		55	4	
218	2012	East Ma Kyi Pin Stream	Erosion Control	Stone&Wood		30	4	
219	2012	Nam Si Stream (1)	Erosion Control	Stone&Wood		40	4	
220	2012	Nam Si Stream (2)	Erosion Control	Stone&Wood		40	4	
221	2012	Nam Si Stream (3)	Erosion Control	Stone&Wood		40	4	
222	2012	Kan Taw Stream	Erosion Control	Stone&Wood		40	4	
223	2012	Shwe Lin Ban Stream (1)	Erosion Control	Stone&Wood		25	3	
224	2012	Shwe Lin Ban Stream (2)	Erosion Control	Stone&Wood		25	3	
225	2012	Shwe Lin Ban Stream (3)	Erosion Control	Stone&Wood		25	3	
226	2012	Shwe Lin Ban Stream (4)	Erosion Control	Stone&Wood		25	3	
227	2012	Shwe Lin Ban Stream (5)	Erosion Control	Stone&Wood		25	3	
228	2012	Shwe Lin Ban Stream (6)	Erosion Control	Stone&Wood		30	5	
229	2012	Thae Kone Stream (1)	Erosion Control	Stone&Wood		40	4	
230	2012	Thae Kone Stream (2)	Erosion Control	Stone&Wood		40	4	
231	2012	Tha Pyay Stream (1)	Erosion Control	Stone&Wood		40	4	
232	2012	Tha Pyay Stream (2)	Erosion Control	Stone&Wood		40	4	
233	2012	North Ma Kyi Pin Stream (1)	Erosion Control	Stone&Wood		25	4	
234	2012	North Ma Kyi Pin Stream (2)	Erosion Control	Stone&Wood		25	4	
235	2012	Yae Phyu Stream (1)	Erosion Control	Stone&Wood		45	4	
236	2012	Yae Phyu Stream (2)	Erosion Control	Stone&Wood		45	4	
237	2012	Oatha Kan Stream	Erosion Control	Stone&Wood		40	5	
238	2013	North Sein Kar Stream (1)	Erosion Control	Stone&Wood		30	4	
239	2013	North Sein Kar Stream (2)	Erosion Control	Stone&Wood		30	4	
240	2013	West Ma Kyi Pin Stream (1)	Erosion Control	Stone&Wood		40	4	
241	2013	West Ma Kyi Pin Stream (2)	Erosion Control	Stone&Wood		40	4	
242	2013	Nam Si Stream (1)	Erosion Control	Stone&Wood		40	4	
243	2013	Nam Si Stream (2)	Erosion Control	Stone&Wood		40	4	
244	2013	Nam Si Stream (3)	Erosion Control	Stone&Wood		40	4	
245	2013	Thae Kone Stream (1)	Erosion Control	Stone&Wood		40	4	
246	2013	Thae Kone Stream (2)	Erosion Control	Stone&Wood		40	4	
247	2013	Shwe Lin Ban Stream (1)	Erosion Control	Stone&Wood		40	4	
248	2013	Shwe Lin Ban Stream (2)	Erosion Control	Stone&Wood		40	4	
249	2013	Shwe Lin Ban Stream (3)	Erosion Control	Stone&Wood		35	5	
250	2013	Shwe Lin Ban Stream (4)	Erosion Control	Stone&Wood		25	3	
251	2013	Tha Phan Stream (1)	Erosion Control	Stone&Wood		40	4	
252	2013	Tha Phan Stream (2)	Erosion Control	Stone&Wood		40	4	
253	2013	Yae Bal Stream	Erosion Control	Stone&Wood		55	4	
254	2013	Hwe Aw Stream (1)	Erosion Control	Stone&Wood		40	4	
255	2013	Hwe Aw Stream (2)	Erosion Control	Stone&Wood		40	4	
256	2016	Yae Bu Stream	Erosion Control	Masonry		25	4	
257	2016	Thae Kone Stream (1)	Erosion Control	Stone&Wood		35	5	
258	2016	Thae Kone Stream (2)	Erosion Control	Stone&Wood		35	5	
259	2016	Thae Kone Stream (3)	Erosion Control	Stone&Wood		40	4	
260	2016	West Ma Kyi Pin Stream (1)	Erosion Control	Stone&Wood		35	5	
261	2016	West Ma Kyi Pin Stream (2)	Erosion Control	Stone&Wood		35	5	
262	2016	West Ma Kyi Pin Stream (3)	Erosion Control	Stone&Wood		35	5	
263	2016	Yae Oo Stream (1)	Erosion Control	Stone&Wood		25	5	
264	2016	Yae Oo Stream (2)	Erosion Control	Stone&Wood		40	4	
265	2016	Chaung Chauk Stream	Erosion Control	Masonry		25	4	
266	2016	Hwe Aw Stream (1)	Erosion Control	Stone&Wood		40	5	
267	2016	Hwe Aw Stream (2)	Erosion Control	Stone&Wood		40	5	
268	2016	Hwe Aw Stream (3)	Erosion Control	Stone&Wood		40	5	
269	2016	Shwe Lin Ban Stream (1)	Erosion Control	Stone&Wood		40	5	
270	2016	Shwe Lin Ban Stream (2)	Erosion Control	Stone&Wood		40	5	
271	2016	Shwe Lin Ban Stream (3)	Erosion Control	Stone&Wood		40	5	
272	2016	Tha Pyay Pin Stream	Erosion Control	Masonry		25	4	
273	2016	Chaung Par Stream	Erosion Control	Masonry		25	4	
274	2016	Ho Nan Stream	Erosion Control	Masonry		35	4	
275	2016	North Sein Kar Stream (1)	Erosion Control	Stone&Wood		35	5	
276	2016	North Sein Kar Stream (2)	Erosion Control	Stone&Wood		25	5	
277	2016	North Sein Kar Stream (3)	Erosion Control	Stone&Wood		25	5	
278	2016	Tha Pyay Stream	Erosion Control	Stone&Wood		25	4	
279	2016	Ma Kyi Saik Stream (1)	Erosion Control	Stone&Wood		45	5	
280	2016	Ma Kyi Saik Stream (2)	Erosion Control	Stone&Wood		45	5	
281	2017	La Min Sin Stream	Erosion Control	Stone&Wood		70	5	
282	2017	War Taw Stream (1)	Erosion Control	Stone&Wood		40	5	
283	2017	War Taw Stream (2)	Erosion Control	Stone&Wood		40	5	
284	2018	Yan Dwin Stream	Erosion Control	Stone&Wood		40	5	
285	2018	War Taw Stream	Erosion Control	Masonry		30	3	

Attachment 11
Questionnaires for
Socio-economic Survey

Household Survey

Interviewer: Supervisor:

1	VT:	Village:	
2	Date:		
3	Name of Household Head: (Age: *F /M*) ; Academic background :_____ 1. None 2-. Primary school (1,2,3,4), 3. Secondary school (5,6,7,8), 4. High school (9,10) 5. Higher education than high school		
4	If CF member : Name: . Member of Village association: Name: .		

GPS	House
Altitude	m
Longitude	E
Latitude	N

Photos: Several photos when conducting survey

1. Responding family member

code	1.1	1.2	1.3	1.4	1.5
(1)	*Interviewee1:* _____	*Title*:*_____	*years old*	*M /F*	*Occupation**:*_____.
(2)	*Interviewee2:* _____	*Title*:*_____	*years old*	*M /F*	*Occupation**:*_____.

*Village leader, Manager of CF/association, etc **Famer, Fisherman, etc

1.6 Period of residence (years)

1.7 Age (Please fill in the number of the HH members)

	1.7.1	1.7.2	1.7.3
Age	M	F	Sub-total
>60 years old			

1.8 Workforce (Please fill in the number of the HH members)

		1.8.1	1.8.2	1.8.3
		M	F	Sub-total
(1)	Workforce			

(1)	45<, >=60 years old			
(2)	20<, >=45 years old			
(3)	12-20 years old			
(4)	<12 years old			
(5)	**Total**			

(2)	Non-workable			
(3)	Others			
(4)	Others			
(5)	**Total**			

Total number of the household members is same with 1.7.

1.9 Education (Please check with "✓")

		1.9.1 M			1.9.2 F		
	Education	A	G	NG	A	G	NG
(1)	STD 1 (ELS)						
(2)	STD 2 (ELS)						
(3)	STD 3 (ELS)						
(4)	STD 4 (ELS)						
(5)	STD 5 (MDS)						
(6)	STD 6 (MDS)						
(7)	STD 7 (MDS)						
(8)	STD 8 (MDS)						
(9)	STD 9 (High S.)						
(10)	STD 10 (High S.)						
(11)	University						
(12)	Master						
(13)	others						
(14)	**Total**						

Total number of the household members is same with 1.8.&1.9

A: Active, G: Graduated, NG: Non-graduated

1.10 Types of houses (Please check with "✓")

	Roof	1.10.1
	Wooden roof	
(1)	Metal roof	
(2)	Bamboo roof	
(3)	Nipa grass roof	
(4)	Other roof	
(5)	**Total**	

	Wall	1.10.2
(1)	Wooden wall	
(2)	Concrete wall	
(3)	Brick wall	
(4)	Bamboo wall	
(5)	Others	
(6)	Total	

1.11 Property (Please fill in the number)

		1.9.1
	Property	
(1)	TV	
(2)	Mobile phone	
(3)	Private car	
(4)	Private moto	
(5)	PC	
(6)	Others ( )	
(7)	Others ( )	

1.12 Access (Please check with "✓")

	Drinking Water	1.12
(1)	Tap water	
(2)	Well	
(3)	River	
(4)	Spring water	
(5)	Others	
(6)	**Total**	

1.13 Cooking source (Please check with "✓)

	Type of source	1.13
(1)	Fire wood	
(2)	Charcoal	
(3)	Gas	
(4)	Electricity (line)	
(5)	Electricity (Solar	
(6)	Other	

2. Farm Property and Inputs

2.1 Land Holding

2.1.1	2.1.2	2.1.3	2.1.4
Total Cultivating Area (Acre)	Own arable land		Tenant arable land (operating) from others
	Operating	Not operating	

2.1.5
Own land rented out to the others

2.1.6 If you have tenant land, how are you paying to the land owner and how much annually? (Please check with "✓")

☐A. By crops (Type of crop: , Volume per year: sac/kg)

☐B. By cash (Kyat/year)

☐C. By labour (Type of activities, Length of engagement period: days/year)

2.2 Use of Farm Machineries and Animals

2.2.1 Use farm machineries and/or animals in the last 2 years (Please check with "✓")

Y / N

2.2.2	2.2.3	2.2.4	2.2.5	2.2.6
			Rental	
Personally owned	Collectively owned	Borrowing from others	Renting from farmer organization e.g. cooperative, groups etc.	Renting from others
( )	( )	( )	( )	( )

A. Power trailer
B. Tractor
C. Draft cattle / buffalo
D. Cattle for transport
E. Horse for transport
F. Thresher
G. Rice mill
H. Corn mil
I: Other tools

3. Use of consumable agriculture inputs

3.1 Use consumable agriculture inputs in the last years Y / N

3.2 Which one(s) did you use in the last 2 years? [Multiple answers are possible].

A. Seed (kg/year)
B. Fertilizers (kg/year)
C. Pesticides / Fungicides (kg/year)
D. Herbicides (kg/year)

4. Shifting Cultivation

Question	Answer
Perception/understanding (Advantages of shifting cultivation, adverse effects)	
areas used (specify the size)	
how to decide size of area	
period of cultivation before shifting another place (years)	years
usage of same site after abandoning the area (none, forest/grass land, pasture, etc)	
No. of years taken to come back to the same area (fallow period)	years
Use of communal land, if any (permission from village, way of site selection)	

5. Production and Gross Income from Crops grown in the last cropping season including annual copes such as rice, maize and perennial crops such as coffee, tea, fruits, etc.

Topic				Amount	Unit
5.1 Crop 1 ( )	(1)	Planted area			acre
	(2)	Vol. harvested *(2)=(3)+(4)+(5)			sac = Kg
	(3)	Vol. consumed			sac = Kg
	(4)	Vol. stored			sac = Kg
	(5)	Marketed	Volume		sac = Kg
	(6)		Unit price		Kyat per kg
	(7)		Sales		Kyat
	(8)		Outlet*		
5.2 Crop 2 ( )	(1)	Planted area			acre
	(2)	Vol. harvested *(2)=(3)+(4)+(5)			sac = Kg
	(3)	Vol. consumed			sac = Kg
	(4)	Vol. stored			sac = Kg
	(5)	Marketed	Volume		sac = Kg
	(6)		Unit price		Kyat per kg
	(7)		Sales		Kyat
	(8)		Outlet*		
5.3 Crop 3 ( )	(1)	Planted area			acre
	(2)	Vol. harvested *(2)=(3)+(4)+(5)			sac = Kg
	(3)	Vol. consumed			sac = Kg
	(4)	Vol. stored			sac = Kg
	(5)	Marketed	Volume		sac = Kg
	(6)		Unit price		Kyat per kg
	(7)		Sales		Kyat
	(8)		Outlet*		

Topic				Amount	Unit
5.4 Crop 4 ( )	(1)	Planted area			acre
	(2)	Vol. harvested *(2)=(3)+(4)+(5)			sac = Kg
	(3)	Vol. consumed			sac = Kg
	(4)	Vol. stored			sac = Kg
	(5)	Marketed	Volume		sac = Kg
	(6)		Unit price		Kyat per kg
	(7)		Sales		Kyat
	(8)		Outlet*		
5.5 Crop 5 ( )	(1)	Planted area			acre
	(2)	Vol. harvested *(2)=(3)+(4)+(5)			sac = Kg
	(3)	Vol. consumed			sac = Kg
	(4)	Vol. kept stored			sac = Kg
	(5)	Marketed	Volume		sac = Kg
	(6)		Unit price		Kyat per kg
	(7)		Sales		Kyat
	(8)		Outlet*		
5.6 Crop 6 ( )	(1)	Planted area			acre
	(2)	Vol. harvested *(2)=(3)+(4)+(5)			sac = Kg
	(3)	Vol. consumed			sac = Kg
	(4)	Vol. kept stored			sac = Kg
	(5)	Marketed	Volume		sac = Kg
	(6)		Unit price		Kyat per kg
	(7)		Sales		Kyat
	(8)		Outlet*		

Topic				Amount	Unit	
5.7 Crop 7 ( )	(1)	Planted area			acre	
	(2)	Vol. harvested *(2)=(3)+(4)+(5)			sac	= Kg
	(3)	Vol. consumed			sac	= Kg
	(4)	Vol. stored			sac	= Kg
	(5)	Marketed	Volume		sac	= Kg
	(6)		Unit price		Kyat per kg	
	(7)		Sales		Kyat	
	(8)		Outlet*			
5.8 Crop 8 ( )	(1)	Planted area			acre	
	(2)	Vol. harvested *(2)=(3)+(4)+(5)			sac	= Kg
	(3)	Vol. consumed			sac	= Kg
	(4)	Vol. stored			sac	= Kg
	(5)	Marketed	Volume		sac	= Kg
	(6)		Unit price		Kyat per kg	
	(7)		Sales		Kyat	
	(8)		Outlet*			

Topic				Amount	Unit	
5.9 Crop 9 ( )	(1)	Planted area			acre	
	(2)	Vol. harvested *(2)=(3)+(4)+(5)			sac	= Kg
	(3)	Vol. consumed			sac	= Kg
	(4)	Vol. stored			sac	= Kg
	(5)	Marketed	Volume		sac	= Kg
	(6)		Unit price		Kyat per kg	
	(7)		Sales		Kyat	
	(8)		Outlet*			
5.10 Crop 10 ( )	(1)	Planted area			acre	
	(2)	Vol. harvested *(2)=(3)+(4)+(5)			sac	= Kg
	(3)	Vol. consumed			sac	= Kg
	(4)	Vol. kept stored			sac	= Kg
	(5)	Marketed	Volume		sac	= Kg
	(6)		Unit price		Kyat per kg	
	(7)		Sales		Kyat	
	(8)		Outlet*			

5.11 Total of market sales of Crop 1-10 （Refer to (7)）		Kyat	**(A)**

*MaMarket outlet: Nyaung Shwe (NS), Kalaw (KL), Nay Pyi Daw (NPD), Mandalay (MD), Yangon (YG) Aung Ban (AB), Pin Laung (PL), Maing Thauk (MT), Khaung Daing (KD), Nant Pan (NP) Thandaung (TD)

6. Annual Crop Production Cost (by crop) in the last cropping season

Crops *Same as Sec.5	6.1.1 (1)	6.1.1 (2)	6.1.1 (3)	6.1.2 (1)	6.1.2 (2)	6.1.2 (3)	6.1.3	6.1.4	6.1.5 (1)	6.1.5 (2)	6.1.5 (3)	6.1.6	6.1.7
	Seed			Agricultural Inputs (Fertilizer, Pectises, Herbicide)			Irrigation	Land rent	Hired labour			Hired tractors, Threshers, tools	Milling
	Vol. used	Unit price	Cost	Vol. used	Unit price	Cost			No. of person	Unit price	Cost		
Crop1( )	Sac or kg	Kyat/sac or kg	Kyat	F Sac or kg	Kyat/sac or kg	Kyat	Kyat	Kyat	Person	Kyat/person	Kyat	Kyat	Kyat
				P Sac or kg	Kyat/sac or kg	Kyat							
				H Sac or kg	Kyat/sac or kg	Kyat							
Crop2( )	Sac or kg	Kyat/sac or kg	Kyat	F Sac or kg	Kyat/sac or kg	Kyat	Kyat	Kyat	Person	Kyat/person	Kyat	Kyat	Kyat
				P Sac or kg	Kyat/sac or kg	Kyat							
				H Sac or kg	Kyat/sac or kg	Kyat							
Crop3( )	Sac or kg	Kyat/sac or kg	Kyat	F Sac or kg	Kyat/sac or kg	Kyat	Kyat	Kyat	Person	Kyat/person	Kyat	Kyat	Kyat
				P Sac or kg	Kyat/sac or kg	Kyat							
				H Sac or kg	Kyat/sac or kg	Kyat							
Crop4( )	Sac or kg	Kyat/sac or kg	Kyat	F Sac or kg	Kyat/sac or kg	Kyat	Kyat	Kyat	Person	Kyat/person	Kyat	Kyat	Kyat
				P Sac or kg	Kyat/sac or kg	Kyat							
				H Sac or kg	Kyat/sac or kg	Kyat							
Crop5( )	Sac or kg	Kyat/sac or kg	Kyat	F Sac or kg	Kyat/sac or kg	Kyat	Kyat	Kyat	Person	Kyat/person	Kyat	Kyat	Kyat
				P Sac or kg	Kyat/sac or kg	Kyat							
				H Sac or kg	Kyat/sac or kg	Kyat							

	Seed			Agricultural Inputs (Fertilizer, Pectises, Herbicide)			Irrigation	Land rent	Hired labour			Hired tractors, Threshers, tools	Milling
	Vol. used	Unit price	Cost	Vol. used	Unit price	Cost			No. of person	Unit price	Cost		
Crop6( )	Sac or kg	Kyat/sac or kg	Kyat	F Sac or kg	Kyat/sac or kg	Kyat	Kyat	Kyat	Person	Kyat/person	Kyat	Kyat	Kyat
				P Sac or kg	Kyat/sac or kg	Kyat							
				H Sac or kg	Kyat/sac or kg	Kyat							
Crop7( )	Sac or kg	Kyat/sac or kg	Kyat	F Sac or kg	Kyat/sac or kg	Kyat	Kyat	Kyat	Person	Kyat/person	Kyat	Kyat	Kyat
				P Sac or kg	Kyat/sac or kg	Kyat							
				H Sac or kg	Kyat/sac or kg	Kyat							
Crop8( )	Sac or kg	Kyat/sac or kg	Kyat	F Sac or kg	Kyat/sac or kg	Kyat	Kyat	Kyat	Person	Kyat/person	Kyat	Kyat	Kyat
				P Sac or kg	Kyat/sac or kg	Kyat							
				H Sac or kg	Kyat/sac or kg	Kyat							
Crop9( )	Sac or kg	Kyat/sac or kg	Kyat	F Sac or kg	Kyat/sac or kg	Kyat	Kyat	Kyat	Person	Kyat/person	Kyat	Kyat	Kyat
				P Sac or kg	Kyat/sac or kg	Kyat							
				H Sac or kg	Kyat/sac or kg	Kyat							
Crop10( )	Sac or kg	Kyat/sac or kg	Kyat	F Sac or kg	Kyat/sac or kg	Kyat	Kyat	Kyat	Person	Kyat/person	Kyat	Kyat	Kyat
				P Sac or kg	Kyat/sac or kg	Kyat							
				H Sac or kg	Kyat/sac or kg	Kyat							
Total			Kyat			Kyat	Kyat	Kyat			Kyat	Kyat	Kyat

Use of credit			Kyat			Kyat	Kyat	Kyat			Kyat	Kyat	Kyat

(Continued)

Crops *Same as 5	6.1.8 (1)	6.1.8 (2)	6.1.8 (3)	6.1.9 (1)	6.1.9 (2)	6.1.9 (3)	6.1.10	6.1	6.2.1 (1)	6.2.1 (2)	6.2.1 (3)	6.2.2	6.2
	Transportation for purchasing inputs			Transportation of crops to house & warehouse			Others 1 ( )	Total	Transportation for sale of products*1			Post-harvesting*2	Total
	No. of trip	Unit price	Cost	No. of trip	Unit price	Cost			No. of trip	Unit price	Cost		
Crop1( )	Trips	Kyat/Trip	Kyat	Trips	Kyat/Trip	Kyat	Kyat	Kyat	Trips	Kyat/Trip	Kyat	Kyat	Kyat
Crop2( )	Trips	Kyat/Trip	Kyat	Trips	Kyat/Trip	Kyat	Kyat	Kyat	Trips	Kyat/Trip	Kyat	Kyat	Kyat
Crop3( )	Trips	Kyat/Trip	Kyat	Trips	Kyat/Trip	Kyat	Kyat	Kyat	Trips	Kyat/Trip	Kyat	Kyat	Kyat
Crop4( )	Trips	Kyat/Trip	Kyat	Trips	Kyat/Trip	Kyat	Kyat	Kyat	Trips	Kyat/Trip	Kyat	Kyat	Kyat
Crop5( )	Trips	Kyat/Trip	Kyat	Trips	Kyat/Trip	Kyat	Kyat	Kyat	Trips	Kyat/Trip	Kyat	Kyat	Kyat

Crops *Same as 5	6.1.8 (1)	6.1.8 (2)	6.1.8 (3)	6.1.9 (1)	6.1.9 (2)	6.1.9 (3)	6.1.10	6.1	6.2.1 (1)	6.2.1 (2)	6.2.1 (3)	6.2.2	6.2
	Transportation for purchasing inputs			Transportation of crops to house & warehouse			Others 1 ( )	Total	Transportation for sale of products*1			Post-harvesting*2	Total
	No. of trip	Unit price	Cost	No. of trip	Unit price	Cost			No. of trip	Unit price	Cost		
Crop6( )	Trips	Kyat/Trip	Kyat	Trips	Kyat/Trip	Kyat	Kyat	Kyat	Trips	Kyat/Trip	Kyat	Kyat	Kyat
Crop7( )	Trips	Kyat/Trip	Kyat	Trips	Kyat/Trip	Kyat	Kyat	Kyat	Trips	Kyat/Trip	Kyat	Kyat	Kyat

Crop8( )	Trips	Kyat/Trip	Kyat	Trips	Kyat/Trip	Kyat	Kyat	Kyat	Trips	Kyat/Trip	Kyat	Kyat	Kyat
Crop9( )	Trips	Kyat/Trip	Kyat	Trips	Kyat/Trip	Kyat	Kyat	Kyat	Trips	Kyat/Trip	Kyat	Kyat	Kyat
Crop10( )	Trips	Kyat/Trip	Kyat	Trips	Kyat/Trip	Kyat	Kyat	Kyat	Trips	Kyat/Trip	Kyat	Kyat	Kyat
Total			Kyat			Kyat	Kyat	(B) Kyat			Kyat	(C) Kyat	(D) Kyat
Use of credit			Kyat			Kyat	Kyat	Kyat			Kyat	Kyat	Kyat

* 1 Transportation cost for purchase of inputs, transportation from farm to house/ warehouse, and transportation for sales to market

1*: For delivery to traders and market

2*: For processing, storage, packaging etc.

* Cost of purchasing agricultural products from elsewhere as additional raw materials should be given in Question 13.

7. Total Crop Production Cost

(Please refer to Sec. 6.2)

Total crop production cost **(B)+(D)**	
Kyat	**(E)**

8. Annual Crop Net Income

(Please refer to Sec. 5 & 6.2)

Sales	Kyat	**(A)**
Cost	Kyat	**(E)**
Net income: (A) – (E)	Kyat	**(F)**

9. Total Annual Post-harvest Operation Cost

(Please refer to Sec.6.2)

Total Annual Post-harvest Operation Cost	**(C)**
	Kyat

10. Major Problem in Crop Production and Sales

*** Crops are same as the ones selected in 5. Multiple answers are OK.**

	10.1	10.2	10.3	10.4	10.5	10.6
	Seed	Crop1 ( )	Crop2 ( )	Crop3 ( )	Crop4 ( )	Crop5 ( )
Production (1)						
10.7. Problem 1						
Sales (2)						
10.8. Problem 2						

Interviewee's comments on local and other market, traders, etc.

Code for Crop Production

a.	b.	c.	d.	e.	f.	g.	h.	i.	j.	k.	l.	m.	o
Lack of Labour	Lack of land	Lack of inputs	Lack of Water	Weed	Soil fertility	Loan payment	Low productivity	Lack of production	Pests & disaster	Lack of good seed / seedlings	Lack of processing technology	Soil erosion	Others

Code for Crop Sales

s	t	u	v	x	y	z
Lack of market channel	Transportation cost	Unstable crop price	Quality of products	Few chance send to market	Unstable international market	Others

10.9 Which activity would have good potential for you to improve the crop production in 3 years? (Multiple answers are OK.)

Code for Activity to improve Crop Production

a.	b.	c.	d.	e.	f.	g.	h.	i.
Use of tools	Use of good quality seeds	Use of inputs (fertilize, pesticides, herbicide)	Improve machines for cultivation	Use of machinery for post-harvesting & land preparation	Use of new crops	More investment	Improve technology for processing	Others

Please explain in detail:

11. Annual Livestock Production in last year

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
		Current number	Annually lost / died number	Annually marketed number	Unit price	Annually marketed amount	Annually purchased feed 1				Annually purchased feed 2				Others			
							Kinds	Bags	Unit Price	Kyat	Kinds	Bags	Unit Price	Kyat	Kinds	Bags	Unit Price	Kyat
11	Cattle				Kyat/head	Kyat			Kyat/bag	Kyat			Kyat/bag	Kyat			Kyat/bag	Kyat
11	Buffalo				Kyat/head	Kyat			Kyat/bag	Kyat			Kyat/bag	Kyat			Kyat/bag	Kyat
11	Horse				Kyat/head	Kyat			Kyat/bag	Kyat			Kyat/bag	Kyat			Kyat/bag	Kyat
11	Chicken				Kyat/head	Kyat			Kyat/bag	Kyat			Kyat/bag	Kyat			Kyat/bag	Kyat
11	Goat				Kyat/head	Kyat			Kyat/bag	Kyat			Kyat/bag	Kyat			Kyat/bag	Kyat
11	Pig				Kyat/head	Kyat			Kyat/bag	Kyat			Kyat/bag	Kyat			Kyat/bag	Kyat
11	Other ( )				Kyat/head	Kyat			Kyat/bag	Kyat			Kyat/bag	Kyat			Kyat/bag	Kyat
11	**Total**					Kyat				Kyat				Kyat				Kyat

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
	Current number	Annually lost / died number	Annually marketed number	Unit price	Annually marketed amount	Annually purchased feed 1				Annually purchased feed 2				Others			
						Kinds	Bags	Unit Price	Kyat	Kinds	Bags	Unit Price	Kyat	Kinds	Bags	Unit Price	Kyat
									(a)				**(b)**				**(c)**

(Continued)

	(14)	(15)
	Manure application to crops (1.=Yes 2.=No)	Draft power utilization (1.=Yes 2.=No)
11 Cattle	1. 2.	1. 2.
11 Buffalo	1. 2.	1. 2.
11 Horse	1. 2.	1. 2.
11 Chicken	1. 2.	
11 Goat	1. 2.	
11 Pig	1. 2.	
11 Other ( )	1. 2.	
11 **Total**		

12. Annual Livestock Net Income in last year (please refer to Sec. 11)

(G)	Sales	Kyat	**(G)**
(H)	Cost	Kyat	**(H)=(a)+(b)+(c)**
(I)	Net income	Kyat	**(I)=(G)-(H)**

13. Firewood, Timber wood and NTFPs

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Items*	**Name of Species**	**Time to collection site (minutes)**	**Frequency of collection (trips/month)**	**Amount of collection (Sac, xxx))**	**Unit price**	**Sales (kyat/year)**	**Market outlet****
				Sac/ Kg	Kyat/sac or Kg		
				Sac/ Kg	Kyat/sac or Kg		
				Sac/ Kg	Kyat/sac or Kg		
				Sac/ Kg	Kyat/sac or Kg		
				Sac/ Kg	Kyat/sac or Kg		
				Sac/ Kg	Kyat/sac or Kg		
				Sac/ Kg	Kyat/sac or Kg		
				Sac/ Kg	Kyat/sac or Kg		
				Sac/ Kg	Kyat/sac or Kg		
				Sac/ Kg	Kyat/sac or Kg		
				Sac/ Kg	Kyat/sac or Kg		
				Sac/ Kg	Kyat/sac or Kg		
				Sac/ Kg	Kyat/sac or Kg		
				Sac/ Kg	Kyat/sac or Kg		
				Sac/ Kg	Kyat/sac or Kg		

***Firewood, Charcoal, Timber, Bamboo, Bamboo shoots, Mushrooms, Honey, Nipa grass,**

****Market outlet: Nyaung Shwe (NS), Kalaw (KL), Nay Pyi Daw (NPD), Mandalay (MD), Yangon (YG) Aung Ban (AB), Pin Laung (PL), Maing Thauk (MT), Khaung Daing (KD), Nant Pan (NP) Thandaung (TD), In (Inside of the village)**

14. Annual Other Business Net Income in last year

		(1)	(2)	(3)	(4)	(5)	
	Items	Marketed Quantity	Unit price	Sales	Cost	Net income	
13.1							
13.2							
13.3							
13.4							
13.5							
13.6	**Total**					Kyat	**(J)**

*Cost of purchasing agricultural products from elsewhere as additional raw materials should be given in Question 6.

**Other business is such as fishing, motorbike taxi etc

15. Annual Labour Income in last year

		(1)	(2)	(3)	
		Days. months	Wage / day. Months	Annual income	
14.1	Farm labour			Kyat	
14.2	Other hired ( )			Kyat	
14.3	Employment1 ( )			Kyat	
14.4	Employment2 ( )			Kyat	
14.5	**Total**			Kyat	**(K)**

Labour: such as trekking guide etc

16. Total Annual Net Income

16.1	Crop	Kyat	
16.2	Livestock	Kyat	
16.3	Other business	Kyat	
16.4	Labour	Kyat	
16.5	Fires wood	Kyat	
16.6	Timber	Kyat	
16.6	NTFP	Kyat	
16.7	Remittance from family members (domestic)	Kyat	
16.8	Remittance from family members (International)	Kyat	
16.9	Total	Kyat	**(L)**

17. Monthly Cash Expense

Items			Amount	Price
Plant-derived food	Rice			Kyat/month
	Maize			Kyat/month
	Noodle			Kyat/month
	Flour			Kyat/month
	Beans			Kyat/month
	Potato			Kyat/month
	Chilli and garlic			Kyat/month
	Onions			Kyat/month
	Other vegetables			Kyat/month
	Fruits			Kyat/month
				Kyat/month
				Kyat/month
				Kyat/month
				Kyat/month
				Kyat/month
Animal-derived food	Meat			Kyat/month
	Eggs			Kyat/month
	Milk			Kyat/month
	Fish			Kyat/month
				Kyat/month
				Kyat/month
				Kyat/month
Drink	Soft drink			Kyat/month
	Beer			Kyat/month
	Hard liquor			Kyat/month
	Coffee, tea			Kyat/month

Items		Amount	Price
Seasonings and oil	Sugar		Kyat/month
	Salt		Kyat/month
	Pepper		Kyat/month
	Palm oil		Kyat/month
	Vegetable oil		Kyat/month
	Sub-total		Kyat/month
Social activities	Weddings		Kyat/month
	Ceremonies		Kyat/month
	Donations		Kyat/month
	Funeral		Kyat/month
	Sub-total		Kyat/month
Others	Soap		Kyat/month
	Cosmetics		Kyat/month
	Firewood		Kyat/month
	Gas		Kyat/month
	Fuel		Kyat/month
	Electricity		Kyat/month
	Telephone		Kyat/month
	Transportation		Kyat/month
	Tobacco		Kyat/month
	Candles		Kyat/month
			Kyat/month
			Kyat/month
Total			Kyat/month
Annual calculation (x12)		**x12**	Kyat

(M)

18. Annual Cash Expense

Items		Amount	Unit cost	Annual expense
Cloths	Cloths		Kyat	
	Shoes		Kyat	
	Accessory		Kyat	
	Sub-total			Kyat
Education	Stationary		Kyat	
	Textbooks		Kyat	
	School wear		Kyat	
	Sub-total			Kyat
House items	Kitchen pot		Kyat	
	Bucket		Kyat	
	Cooking stove		Kyat	
	Sub-total			Kyat
Others	Association or Coop. fee		Kyat	Kyat
	Support other family members		Kyat	Kyat
	Payment of interests of credit		Kyat	Kyat
	Medical treatment		Kyat	Kyat
	Medicine		Kyat	Kyat
	Maintenance of machines		Kyat	Kyat
	Sub-total			Kyat
Total			Kyat	(N)
Grand total (Annual Expense)			Kyat	(O)=(M)+(N)

19. Annual Debt

Purpose	From whom	Amount	Deadline of paying back	Interest
Total		Kyat		

Check possible contradictions among answers (Please refer to Sec.15 & 18)

When annual net income (L) is smaller than cash expense (O) and there is no (Profit) , something might be wrong in the answers.. Is it OK?

[Yes / No]

*Hunting and Gathering for Consumption (including fish)

Item	Monthly amount	Unit

20. Constraints and difficulties in making life

20.1 Which were the 3 major problems you have experienced in the last year? (Choose 3 items from the right table) ____

What did interviewee say? Please note it.

a. Lack of crops to eat
b. Lack of crops for sale
c. Lack of water
d. Insufficient crop production
e. Lack of places to sell goods
f. Road access
g. Lack of transportation
h. Lack of electricity
i. Health problem
j. Lack of cash income
k. Lack of work
l. Loan payment
m. Lack of education facility
n. Nat. disaster climate change e.g. land slide, unstable rain fall
o. Peace situation
p. Lack of market channel
q. Market is unable to absorb our products
r. Unstable price of crops
s. Others

20.2 Which activity would have higher feasibility for you to improve the livelihood? (Choose 3 items from the right table)

What did interviewee say? Please note it.

a. Improve animal production
b. Increase processing of products
c. Increase food production
d. Better access to water
e. Increase off-farm labour
f. More job opportunities
g. More education opportunity
h. Use of new production technology
i. Electrification in village
j. Better access to health service
k. Better access to latrine
l. More channels to sell goods
m. Use of new processing technology
n. Others

20.3 Which were available public services from the Government (Department of Agriculture / Department of Agricultural Research / Irrigation Department etc) in your place in the last cropping season? (Choose one or more item(s) from the right table)

What did interviewee say? Please note it.

a. Distribution of seedlings
b. Provision of credits and loans for agriculture production
c. Provision of water distribution system e.g. irrigation and dams
d. Distribution of fertilizer / pesticides
e. Agricultural training
f. Introduction of contract farming
g. Introduction of traders and / or buyers of agri. products
h. Training and education
i. Others (please specify)
j. Not sure

20.4 Which were available public services from Forest Department? (Choose one or more item(s) from the right table)

What did interviewee say? Please note it.

a. Introduction of Community Forest
b. Technical support for tree planting
c. Training for agroforestry
d. Provision of financial assistance
e. Awareness for wildlife conservation
f. Introduction of regulations for activities in Forest Reserve/Public forest
g. Introduction of marketing about forest products
h. Distribution of seedlings
i. Others (please specify)
j. Not sure

Attachment 12
Report on the Results of Household Interview Survey

Japan International Cooperation Agency (JICA)
Republic of the Union of Myanmar
Ministry of Natural Resources and Environmental Conservation

Results of Household Survey in the Target Villages in Kalaw Township; Ein Yar, Htin Yu Kone, Kan Par Ni Kone Ni, Kone Paw, Nang Ohn Ywa Ma Nang Thon, Ngoke, Nyaung Kyo Phayar Phyu, Tha Ae Tit, and Thar Hmong Kham

Design Phase of Component 2
(Integrated Watershed Management
in the Inle Lake Watershed)
of
The Project for Capacity Building for Sustainable Natural Resource Management

September 2019

Japan International Cooperation Agency (JICA)
NIPPON KOEI CO., LTD./
Japan Forest Technology Association/
Asia Air Survey Co., Ltd.

Table of Contents

1 Introduction

The new administration of Myanmar has paid attentions to environment conservation as well as rural development. Accordingly, some counter measures such as ban on illegal logging and revision of community forest instruction were introduced. Along with such policies and regulations, capacity building among related officers and actions on ground are urgent agenda on sustainable natural resource management. As one of the serious environment concerns, ecosystem degradation has been witnessed over the Inle Lake watershed in Shan State. The lake is one of the main touristic spots in Myanmar, attracting 140 thousand tourist per year. However, due to land use change, forest loss and degradation, erosion and sedimentation, discharge of sewer and increasing agriculture pesticide and fertilizer use, the environment of Inle Lake and surrounding areas have been seriously degraded. Given rapid population growth in the surrounding areas and economic development, the balance between development and environmental conservation in the area became high priority agenda for current Government.

"The Project for Capacity Building for Sustainable Natural Resource Management (hereinafter referred to as "FDSNR")," started in June 2018 in accordance with the Record of Discussion (R/D) agreed upon by the Forestry Department (FD) under the Ministry of Natural Resources and Environmental Conservation (MONREC) and JICA in December 2017. The main objective of FDSNR is to strengthen the national capacity for sustainable natural resource management by implementing three components: namely 1) improvement of management capacity of forest administration, 2) enhancement of integrated watershed management in Inle Lake watershed, and 3) development of scientific basis for biodiversity conservation.

Each component has different purposes and is aimed at different target groups. Component 2 is specifically aimed at strengthening and improvement of integrated watershed management of Inle Lake watershed to reduce the influx of suspended sediment and eventually improve the natural environment of Inle Lake. Although the progress of sedimentation in the Lake is a common concern shared by relevant government organizations and users of Inle Lake, there are less clear and scientific data which could clarify the mechanisms of soil runoff in the watershed and sedimentation in the Lake. It is, therefore, crucially essential to collect baseline quantitative data which could be used for scientific analysis/assessment of the mechanisms and determination and designing of effective measures for integrated watershed management.

To this end, JICA and FD decided to first undertake the design phase of Component 2, which mainly aims to: i) form a collaborative platform for integrated watershed management, ii) collect the baseline data on socio-economic and natural conditions of the watershed, iii) design and start the monitoring of river discharge and suspended sediment of the major rivers, iv) identify and determine effect measures for soil erosion control and sustainable land management, and v) develop a plan for gully erosion control in the selected target micro-

watershed.

As one of the activities of Component 2, socio-economic survey was conducted for understanding the current socio-economic situations, utilization and management practices of natural resources in the 12 villages of Kalaw watershed, the one of the four main watersheds of Inle lake. Agricultural statistical data of Kalaw, Pinlaung, Yuwangan, Nyaug Shwe and Pindaya townships were collected. Market data were also collected from the six main markets around Inle Lake; Aung Ban, Heho, Mine Thaunt, Nyaung Shwe, Shwe Nyaung, and Than Daung.

2 Outline of socio-economic survey

2.1 Objectives of socio-economic survey

To identify the socio-economic situations, utilization and management practices of natural resources of Kalaw watershed in Taunggyi district, Myanmar.

2.2 Target villages

540 households in 12 villages in Kalaw sub-watershed were selected for socio-economic survey.The selected villages are: Ein Yar, Htin Yu Kone, Kan Par Ni, Kone Ni, Kone Paw, Nang Ohn Ywa Ma, Nang Thon, Ngoke, Nyaung Kyo, Phayar Phyu, Tha Ae Tit, and Thar Hmong Kham.

The following points/criteria were considered for the selection of the target villages;

- ✓ Accessibility
- ✓ Allocation of Community Forest (CF) or possibility of allocation of CF in the near future
- ✓ Existence of gullies / Slope conditions
- ✓ Ethnicity
- ✓ Location of the village (distance from the stream/river of the selected target watershed and even distribution of the villages in the watershed)

2.3 Survey operation

Survey design: JICA Expert Team

Implementor: FREDA

2.4 Timeline

May–June 2019

2.5 Data collection

The following data were collected in the socio-economic survey.

Table 1: Collection of household data

Item	Contents
Basic information	Population, Number of households, Average income, Poor/Socially vulnerable, Infrastructure, Ethnic groups, History, Location (GPS)
Household	Family member, History, Academic background, House type, Access to Water /Electricity, Main source of fuel for cooking
Agriculture	Land ownership/tenure (Land holding size, Own farming area, Renting/Borrowing area), Cropped area, Type of crops grown/harvested in farms, Agri. Products and Inputs, Crop calendar, Production, Sales/Income
Financial information	Main income sources, Cash income, Monetary value, Main expenditures, Average monthly expenditure of major cost items
Natural resources	Firewood consumption, NTFPs, others

3 Results of socio-economic survey

3.1 General conditions of target area

3.1.1 Main markets

The main markets of agriculture products is Aung Bang. Majority of agriculture products in the area such as tomatoes, gingers and cabbages are brought to this market and sent to other cities such as Nay Pyi Taw, Mandalay and Yangon.

3.1.2 Demographic information

In the Kalaw watershed, only Kalaw, Pindaya and Ywangan townships are included. Here, demographic information of these three and their neighboring townships, i.e. Ping Lang and Nyang Shwe townships are also presented (**Table 2**) for the comparative understanding.

Table 2: Demographic information

Township		Pindaya	Ping Lang	Kalaw	Ywangan	Nyang Shwe
Number of houses		18,447	36,257	33,323	18,847	39,795
Households		18,566	38,947	34,791	19,381	44,602
Below 18 years old	Male	14,966	40,489	29,214	14,903	27,795
	Female	15,002	40,740	28,929	14,374	26,756
	Total	29,968	81,229	58,143	29,277	54,551
Above 18 years old	Male	25,904	49,816	49,300	27,223	60,618
	Female	27,414	52,979	51,502	27,501	63,365
	Total	53,318	102,795	100,802	54,724	123,983
Population	Male	40,870	90,305	78,514	42,126	88,413
	Female	42,416	93,719	80,431	41,875	90,121
	Pop Total	**83,286**	**184,024**	**158,945**	**84,001**	**178,534**
Area	Km^2	630	3,405	1,460	2,989	1,482
Pop density	Person/km^2	**132**	**54**	**109**	**28**	**120**

Source: GAD (2017). Kalaw, Yang Shwe, Pyndaya, Ping Lang, Ywangan.

3.1.3 Main agriculture products

Ginger, rice and tomato are main agriculture products in the target area. Some produce potatoes but because of the disease, some avoid producing it. Details of agriculture products are explained in the Section 2.

3.2 Household survey

3.2.1 Background of households

3.2.1.1 Academic background

Most villagers who were interviewed have completed primary level education from grade one to grade four. Those who completed high school were very few and there was only one person who has joined in the higher degrees after high school (**Table 3**).

Table 3: Academic background

Village	Academic background	N	Village	Academic background	N
Ein Yar	None	16	Nang Thon	None	22
	Primary 1~4	28		Primary 1~4	21
	Secondary 5~6	1		Secondary 5~6	1
Htin Yu Kone	None	14		High school	1
	Primary 1~4	27	Ngoke	None	21
	Secondary 5~6	4		Primary 1~4	24
Kan Par Ni	None	14	Nyaung Kyo	None	30
	Primary 1~4	31		Primary 1~4	15
Kone Ni	None	21	Phayar Phyu	None	13
	Primary 1~4	20		Primary 1~4	26
	Secondary 5~6	4		Secondary 5~6	5
	High school	1		High school	1
Kone Paw	None	6	Tha Ae Tit	None	32
	Primary 1~4	29		Primary 1~4	13
	Secondary 5~6	6	Thar Hmong Kham	None	8
Nang Ohn Ywa Ma	None	9		Primary 1~4	26
	Primary 1~4	20		Secondary 5~6	7
	Secondary 5~6	13		High school	3
	High school	3		Higher than high school	1
			Total		537

3.2.1.2 Work force

Work force numbers are not significantly different among the villages. The mean number of the work force per household varies from 3.98 to 5.24 (**Table 4**).

Table 4: Work force in each household

Village	Male Workforce	Female Workforce	Total
Ein Yar	1.40	1.24	2.64
Htin Yu Kone	1.38	1.40	2.78
Kan Par Ni	1.60	1.40	3.00
Kone Ni	1.46	1.37	2.83
Kone Paw	1.27	1.27	2.54
Nang Ohn Ywa Ma	1.51	1.22	2.67
Nang Thon	1.27	1.18	2.29
Ngoke	1.56	1.58	3.13
Nyaung Kyo	1.47	1.24	2.71
Phayar Phyu	1.44	1.13	2.58
Tha Ae Tit	1.38	1.38	2.76
Thar Hmong Kham	1.64	1.47	3.11
Total	1.45	1.32	2.75

3.2.1.3 Family members

The mean number of the work force per household varies from 3.9 to 5.2. The mean of those in 12 villages is 4.5 person per household (Table 5). The number

of family member is the highest at the age between 20 years to 45 years old.

Table 5:Family members

Village	M >60 year old	F >60 yeard old	>60 yeats old Sub-total	M 45<, >=60 years old	F 45<, >=60 years old	45<, >=60 years old Sub-total	M 20<, >=45 years old	F 20<, >=45 years old	20<, >=45 years old Sub-total	M 12<, >=20 years old	F 12<, >=20 years old	12<, >=20 years old Sub-total	M <12	M <12	M <12Sub-total	M Total	F Total	Total
Ein Yar	0.16	0.24	0.40	0.53	0.49	1.02	0.89	0.84	1.73	0.27	0.20	0.47	0.31	0.31	0.62	2.16	2.09	4.24
Htin Yu Kone	0.09	0.22	0.31	0.29	0.29	0.58	0.84	0.82	1.67	0.53	0.47	1.00	0.47	0.29	0.76	2.22	2.09	4.31
Kan Par Ni	0.13	0.18	0.31	0.44	0.31	0.73	0.73	0.78	1.51	0.80	0.67	1.47	0.76	0.44	1.22	2.87	2.38	5.24
Kone Ni	0.37	0.33	0.70	0.50	0.43	0.93	0.80	1.00	1.80	0.35	0.39	0.74	0.37	0.13	0.48	2.39	2.28	4.67
Kone Paw	0.07	0.17	0.24	0.37	0.32	0.68	0.83	0.88	1.71	0.32	0.39	0.68	0.59	0.39	0.98	2.20	2.15	4.34
Nang Ohn Ywa Ma	0.16	0.18	0.33	0.33	0.36	0.69	0.91	0.84	1.76	0.56	0.64	1.20	0.42	0.51	0.93	2.38	2.53	4.91
Nang Thon	0.07	0.04	0.11	0.16	0.22	0.38	0.89	0.84	1.73	0.40	0.29	0.67	0.42	0.60	0.98	1.93	1.91	3.93
Ngoke	0.18	0.13	0.31	0.24	0.31	0.56	0.80	0.87	1.67	0.60	0.56	1.09	0.38	0.71	1.04	2.16	2.58	4.73
Nyaung Kyo	0.24	0.31	0.56	0.40	0.40	0.80	0.76	0.73	1.49	0.60	0.44	1.04	0.38	0.33	0.71	2.36	2.22	4.60
Phayar Phyu	0.16	0.16	0.31	0.27	0.22	0.49	0.89	0.87	1.76	0.53	0.29	0.82	0.47	0.44	0.91	2.31	1.98	4.29
Tha Ae Tit	0.16	0.13	0.29	0.27	0.16	0.42	0.78	0.80	1.53	0.31	0.49	0.80	0.49	0.40	0.89	2.00	1.98	3.98
Thar Hmong Kham	0.18	0.18	0.36	0.51	0.53	1.04	1.07	1.04	2.11	0.44	0.53	0.98	0.22	0.44	0.64	2.42	2.69	5.13
Total	0.16	0.19	0.35	0.36	0.34	0.69	0.85	0.86	1.71	0.48	0.45	0.91	0.44	0.42	0.85	2.28	2.24	4.53

3.2.1.4 House structure

Roofs are 100% made with metal in 12 villages. House walls are different from each other. The most houses were constructed with bricks. Bamboo mats were also used for the wall. There were some houses with concrete and wood walls (**Table 6**).

Table 6: House wall

		Wall				
		Bamboo	Brick	Concrete	Wooden	Total
Village	Ein Yar	7	38	0	0	45
	Htin Yu Kone	11	32	0	2	45
	Kan Par Ni	27	17	0	1	45
	Kone Ni	8	33	5	0	46
	Kone Paw	5	30	3	3	41
	Nang Ohn Ywa Ma	7	38	0	0	45
	Nang Thon	30	15	0	0	45
	Ngoke	13	32	0	0	45
	Nyaung Kyo	22	20	1	2	45
	Phayar Phyu	16	26	0	3	45
	Tha Ae Tit	38	7	0	0	45
	Thar Hmong Kham	2	43	0	0	45
Total		186	331	9	11	537

3.2.1.5 Property

Around 50% of households interviewed owned a TV. Most villagers own a few mobile phones and also motorbikes. More than 40% of villagers interviewed own solar powers (**Table 7**–**Table 12**).

Table 7: Property, TV

		TV			
		0	1	2	Total
Village	Ein Yar	8	36	1	45
	Htin Yu Kone	25	20	0	45
	Kan Par Ni	37	8	0	45
	Kone Ni	12	32	2	46
	Kone Paw	9	30	2	41
	Nang Ohn Ywa Ma	12	33	0	45
	Nang Thon	33	11	1	45
	Ngoke	27	17	1	45
	Nyaung Kyo	32	13	0	45
	Phayar Phyu	22	22	1	45
	Tha Ae Tit	38	7	0	45
	Thar Hmong Kham	10	35	0	45
Total		265	264	8	537

Table 8: Property, Mobile phone

		Mobile phone								
		0	1	2	3	4	5	6	7	Total
Village	Ein Yar	3	19	8	7	6	2	0	0	45
	Htin Yu Kone	7	18	11	4	3	1	0	1	45
	Kan Par Ni	8	18	12	6	1	0	0	0	45
	Kone Ni	1	25	15	5	0	0	0	0	46
	Kone Paw	4	21	12	4	0	0	0	0	41
	Nang Ohn Ywa Ma	4	17	14	7	2	0	1	0	45
	Nang Thon	16	22	5	1	1	0	0	0	45
	Ngoke	8	24	12	1	0	0	0	0	45
	Nyaung Kyo	7	25	9	3	1	0	0	0	45
	Phayar Phyu	13	24	5	2	1	0	0	0	45
	Tha Ae Tit	21	16	6	2	0	0	0	0	45
	Thar Hmong Kham	4	11	12	8	5	2	2	1	45
Total		96	240	121	50	20	5	3	2	537

Table 9: Property, Motorbike

		Motorbike						
		0	1	2	3	4	7	Total
Village	Ein Yar	1	25	15	4	0	0	45
	Htin Yu Kone	8	27	7	3	0	0	45
	Kan Par Ni	7	32	6	0	0	0	45
	Kone Ni	1	35	9	1	0	0	46
	Kone Paw	1	24	16	0	0	0	41
	Nang Ohn Ywa Ma	6	21	13	4	1	0	45
	Nang Thon	15	29	1	0	0	0	45
	Ngoke	6	35	4	0	0	0	45
	Nyaung Kyo	7	27	11	0	0	0	45
	Phayar Phyu	9	32	4	0	0	0	45
	Tha Ae Tit	14	31	0	0	0	0	45
	Thar Hmong Kham	8	18	14	4	0	1	45
Total		83	336	100	16	1	1	537

Table 10: Property, PC

		PC		Total
		0	1	
Village	Ein Yar	45	0	45
	Htin Yu Kone	45	0	45
	Kan Par Ni	45	0	45
	Kone Ni	45	1	46
	Kone Paw	41	0	41
	Nang Ohn Ywa Ma	45	0	45
	Nang Thon	45	0	45
	Ngoke	45	0	45
	Nyaung Kyo	45	0	45
	Phayar Phyu	45	0	45
	Tha Ae Tit	45	0	45
	Thar Hmong Kham	44	1	45
Total		535	2	537

Table 11: Property, Solar

		Others (Solar)					Total
		0	1	2	3	4	
Village	Ein Yar	37	8	0	0	0	45
	Htin Yu Kone	26	19	0	0	0	45
	Kan Par Ni	9	36	0	0	0	45
	Kone Ni	37	8	1	0	0	46
	Kone Paw	41	0	0	0	0	41
	Nang Ohn Ywa Ma	39	6	0	0	0	45
	Nang Thon	1	44	0	0	0	45
	Ngoke	37	8	0	0	0	45
	Nyaung Kyo	22	22	1	0	0	45
	Phayar Phyu	12	27	4	1	1	45
	Tha Ae Tit	6	38	1	0	0	45
	Thar Hmong Kham	36	9	0	0	0	45
Total		303	225	7	1	1	537

Table 12: Property, Battery for solar

		Others (battery)			
		0	1	2	Total
Village	Ein Yar	42	3	0	45
	Htin Yu Kone	35	10	0	45
	Kan Par Ni	18	27	0	45
	Kone Ni	38	7	1	46
	Kone Paw	41	0	0	41
	Nang Ohn Ywa Ma	40	5	0	45
	Nang Thon	11	34	0	45
	Ngoke	39	6	0	45
	Nyaung Kyo	26	19	0	45
	Phayar Phyu	25	16	4	45
	Tha Ae Tit	23	21	1	45
	Thar Hmong Kham	38	7	0	45
Total		376	155	6	537

3.2.1.6 Cooking fuel

In the most villages, firewood was the main cooking fuel, while in Ein Yar, and Thar Hmong Kham, major source of cooking fuel was electricity (**Figure 1**).

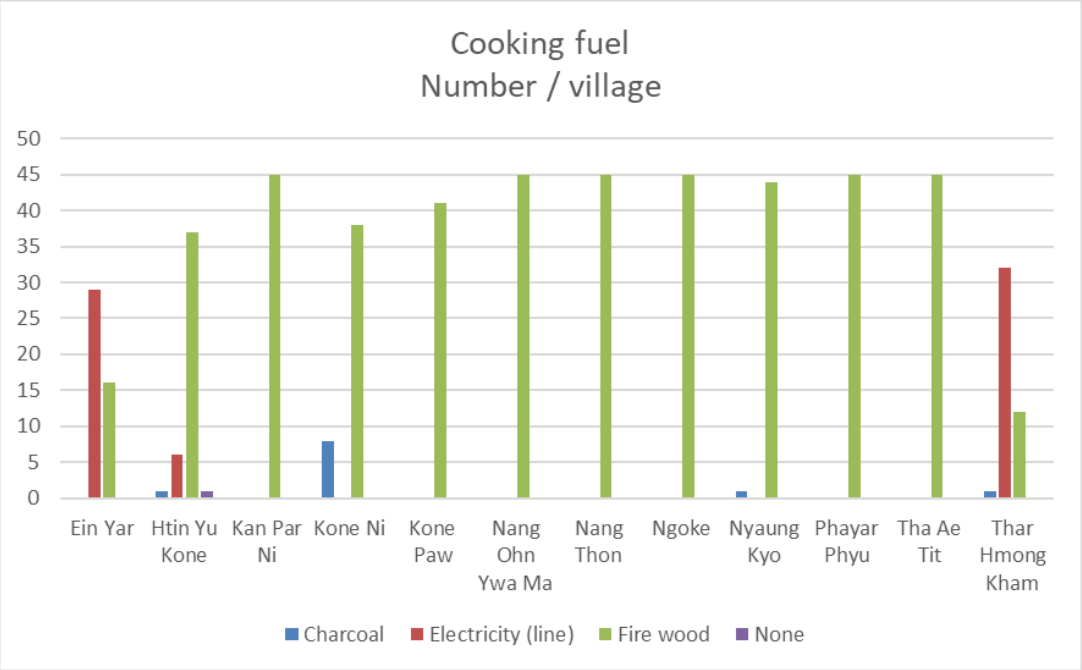


Figure 1: Cooking fuel

3.2.1.7 Land

The mean of cultivating land per household in each village varies from 0.89 to 1.98 ha (**Table 13**). In each household, there was around 20% land on average which were not used in the current year. Those areas are mainly used for ginger because it requires a few years to rest after production.

Table 13: Average area of land per household (ha)

Village	Total Cultivating Area(ha)	Own arable land (Operating) (ha)	Own arable land (Not operating) (ha)	Not operating/total area	Tenant arable land (Operating) from others	Own land rented out to the others
Ein Yar	1.98	1.37	0.59	30%	0.03	0.00
Htin Yu Kone	1.34	0.92	0.42	31%	0.01	0.00
Kan Par Ni	1.97	1.75	0.24	12%	0.15	0.00
Kone Ni	1.61	0.78	0.43	27%	0.01	0.02
Kone Paw	1.19	1.01	0.25	21%	0.07	0.03
Nang Ohn Ywa Ma	0.89	0.79	0.10	12%	0.01	0.00
Nang Thon	1.14	0.95	0.21	18%	0.20	0.00
Ngoke	1.04	0.99	0.05	5%	0.00	0.00
Nyaung Kyo	1.38	1.21	0.18	13%	0.00	0.00
Phayar Phyu	0.70	0.63	0.07	10%	0.03	0.00
Tha Ae Tit	0.58	0.59	0.00	0%	0.06	0.00
Thar Hmong Kham	1.44	0.65	0.50	35%	0.03	0.21
Total	1.27	0.97	0.25	20%	0.05	0.02

3.2.1.8 Drinking water

In some villages such as Ein Yar and Kone Ni, villagers use tap water (**Table 14**) but the source is the spring located near the villages. To protect spring, villagers practice conservation of forest around the spring.

Table 14: Drinking water

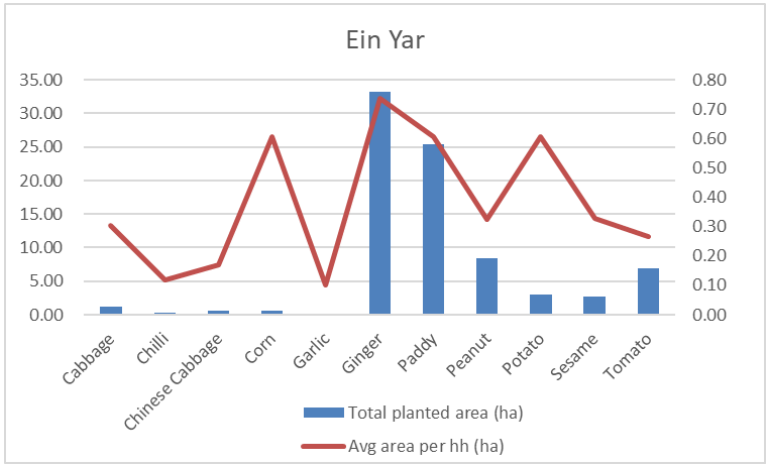
Village	Drinking Water	Number of households
Ein Yar	Others	3.00
	Pipe from Spring water	1.00
	Tap water	6.00
	Well	35.00
Htin Yu Kone	Pipe from Spring water	36.00
	Well	9.00
Kan Par Ni	Others	41.00
	Well	4.00
Kone Ni	Others	2.00
	Pipe from Spring water	27.00
	River	1.00
	Tap water	16.00
Kone Paw	Others	18.00
	Pipe from Spring water	10.00
	River	1.00
	Tap water	7.00
	Well	5.00
Nang Ohn Ywa Ma	Pipe from Spring water	30.00

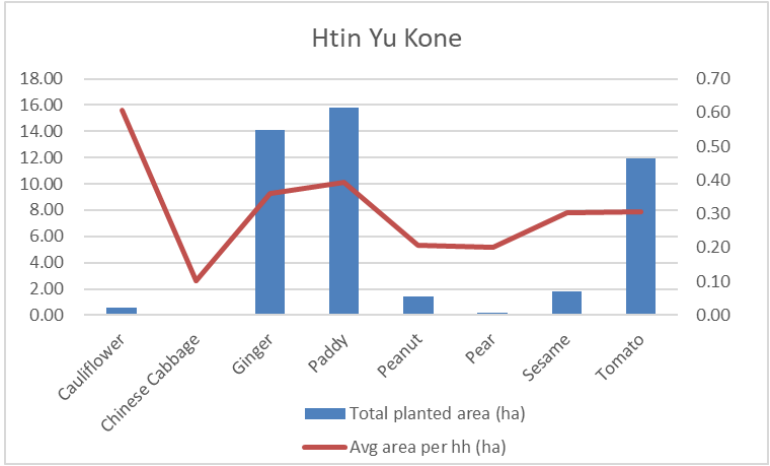
Village	Drinking Water	Number of households
	Pipe fron Spring Water	10.00
	Tap water	5.00
Nang Thon	Well	45.00
Ngoke	Others	11.00
	Pipe from Spring water	10.00
	River	9.00
	Well	15.00
Nyaung Kyo	Others	32.00
	Pipe from Spring water	3.00
	River	2.00
	Well	8.00
Phayar Phyu	Others	3.00
	Pipe from Spring water	23.00
	Tap water	17.00
	Well	2.00
Tha Ae Tit	Others	10.00
	Pipe from Spring water	3.00
	River	11.00
	Tap water	1.00
	Well	20.00
Thar Hmong Kham	Other	2.00
	Tap water	27.00
	Well	16.00

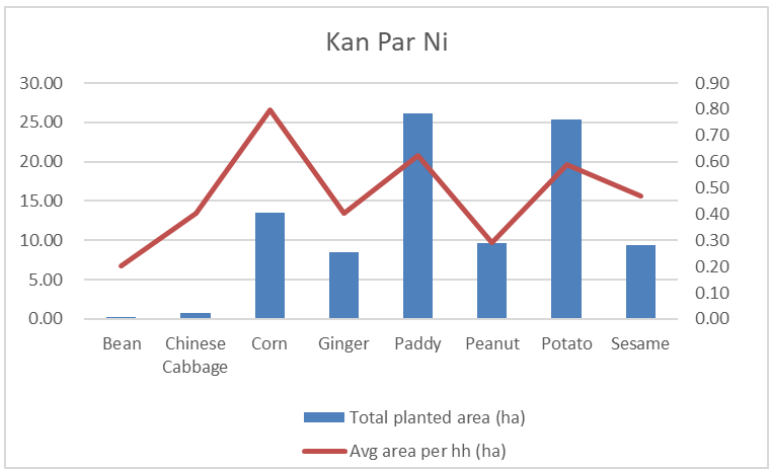
3.2.2 Agricultural practices

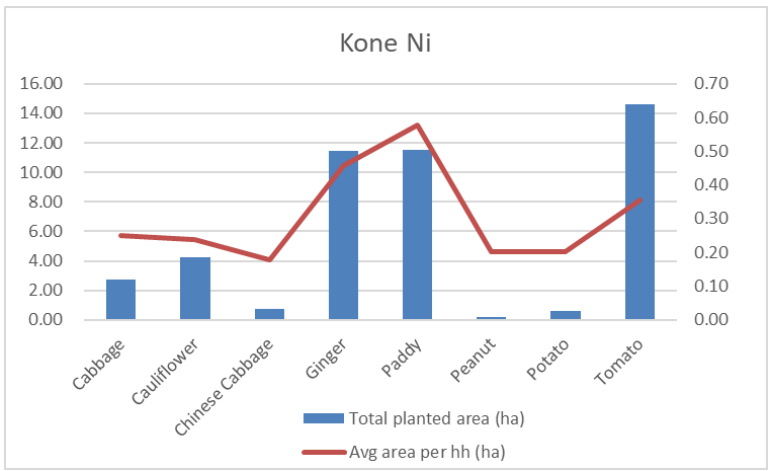
3.2.2.1 Crops with planted area

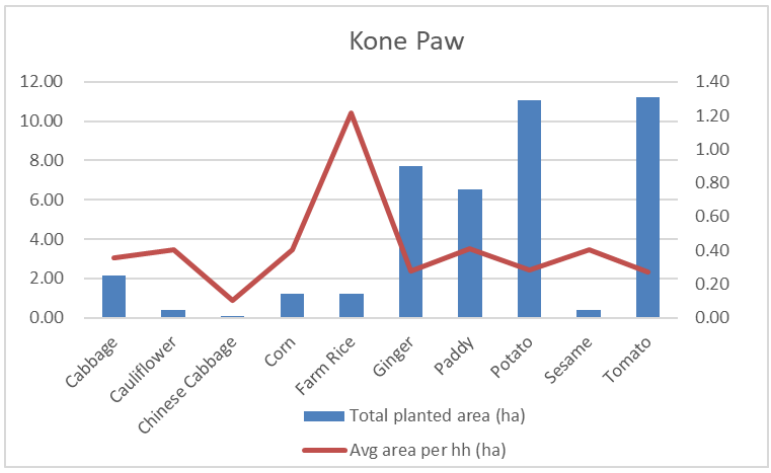
The following figures show the area of agricultural production at interviewed households. In most villages, the agriculture fields are used for ginger, paddy and tomato (**Figure 3**). In Kan Par Ni, Kone paw, Nyaung Kyo and Tha Ae Tit, potatoes are planted in the large area as one of the main products.

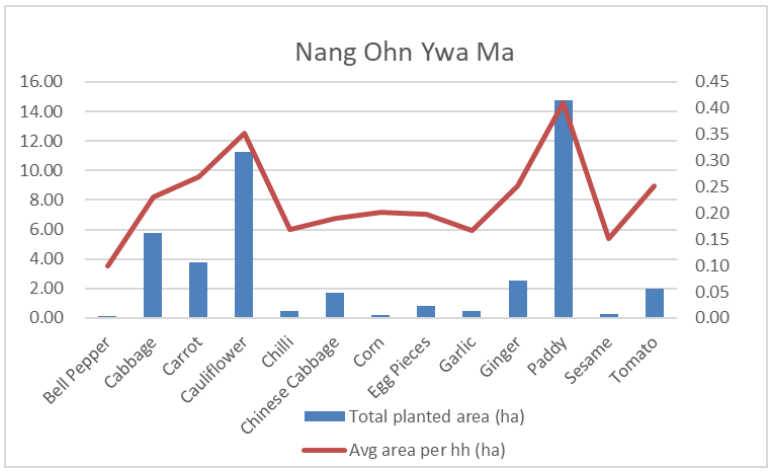

Ein Yar
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Cabbage
Chilli
Chinese Cabbage
Corn
Garlic
Ginger
Paddy
Peanut
Potato
Sesame
Tomato
Total planted area (ha)
Avg area per hh (ha)

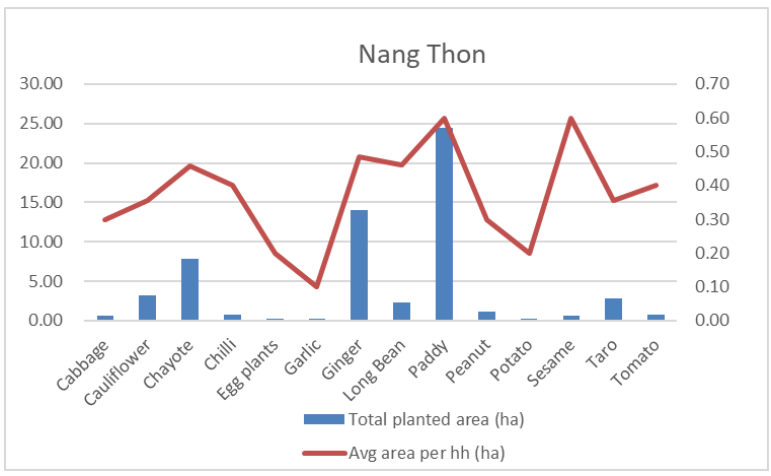

Htin Yu Kone
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Cauliflower
Chinese Cabbage
Ginger
Paddy
Peanut
Pear
Sesame
Tomato
Total planted area (ha)
Avg area per hh (ha)

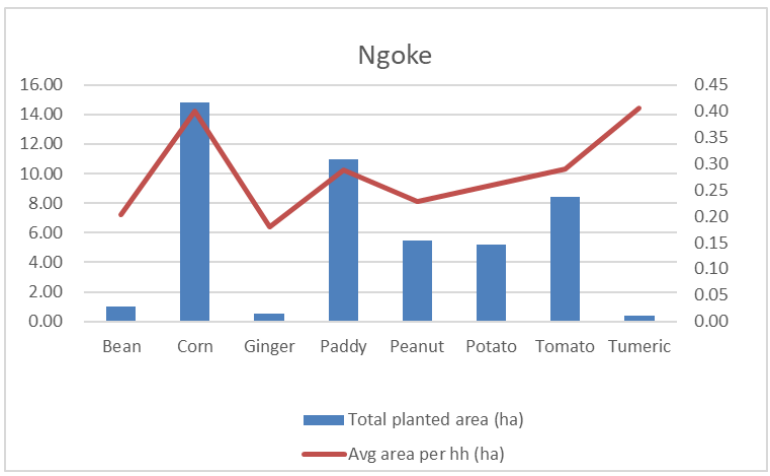

Kan Par Ni
30.00
25.00
20.00
15.00
10.00
5.00
0.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Bean
Chinese Cabbage
Corn
Ginger
Paddy
Peanut
Potato
Sesame
Total planted area (ha)
Avg area per hh (ha)

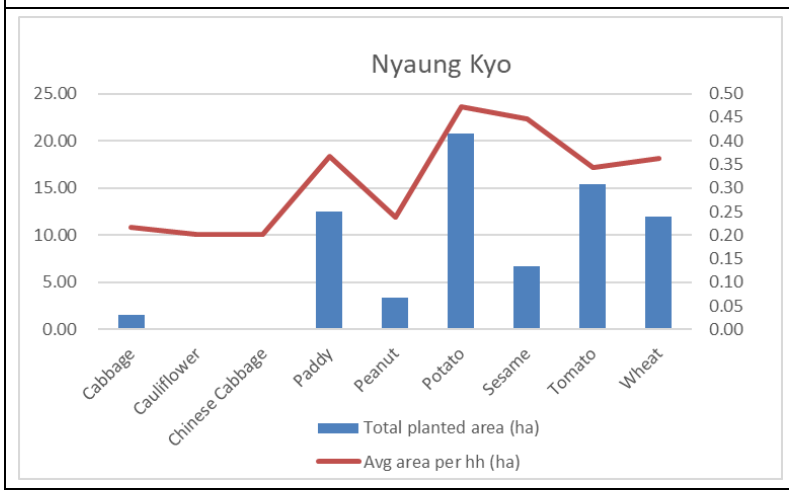

Kone Ni
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Cabbage
Cauliflower
Chinese Cabbage
Ginger
Paddy
Peanut
Potato
Tomato
Total planted area (ha)
Avg area per hh (ha)

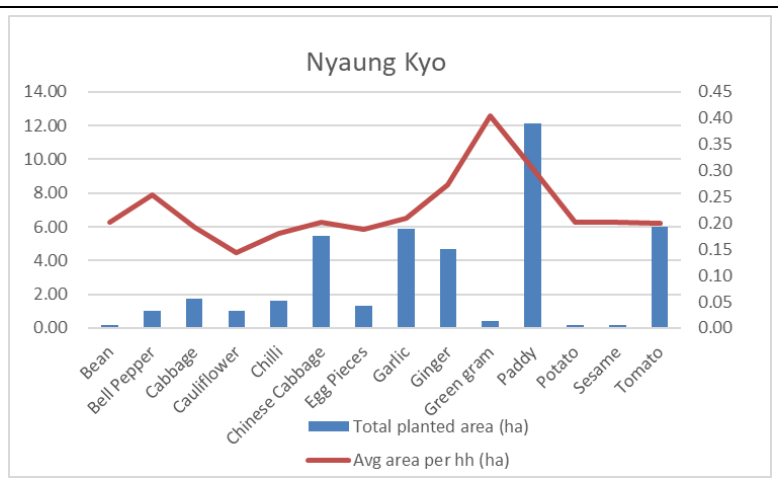

Kone Paw
12.00
10.00
8.00
6.00
4.00
2.00
0.00
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Cabbage
Cauliflower
Chinese Cabbage
Corn
Farm Rice
Ginger
Paddy
Potato
Sesame
Tomato
Total planted area (ha)
Avg area per hh (ha)


Nang Ohn Ywa Ma
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Bell Pepper
Cabbage
Carrot
Cauliflower
Chilli
Chinese Cabbage
Corn
Egg Pieces
Garlic
Ginger
Paddy
Sesame
Tomato
Total planted area (ha)
Avg area per hh (ha)


Nang Thon
30.00
25.00
20.00
15.00
10.00
5.00
0.00
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Cabbage
Cauliflower
Chayote
Chilli
Egg plants
Garlic
Ginger
Long Bean
Paddy
Peanut
Potato
Sesame
Taro
Tomato
Total planted area (ha)
Avg area per hh (ha)


Ngoke
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Bean
Corn
Ginger
Paddy
Peanut
Potato
Tomato
Tumeric
Total planted area (ha)
Avg area per hh (ha)


Nyaung Kyo
25.00
20.00
15.00
10.00
5.00
0.00
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Cabbage
Cauliflower
Chinese Cabbage
Paddy
Peanut
Potato
Sesame
Tomato
Wheat
Total planted area (ha)
Avg area per hh (ha)


Nyaung Kyo
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Bean
Bell Pepper
Cabbage
Cauliflower
Chilli
Chinese Cabbage
Egg Pieces
Garlic
Ginger
Green gram
Paddy
Potato
Sesame
Tomato
Total planted area (ha)
Avg area per hh (ha)

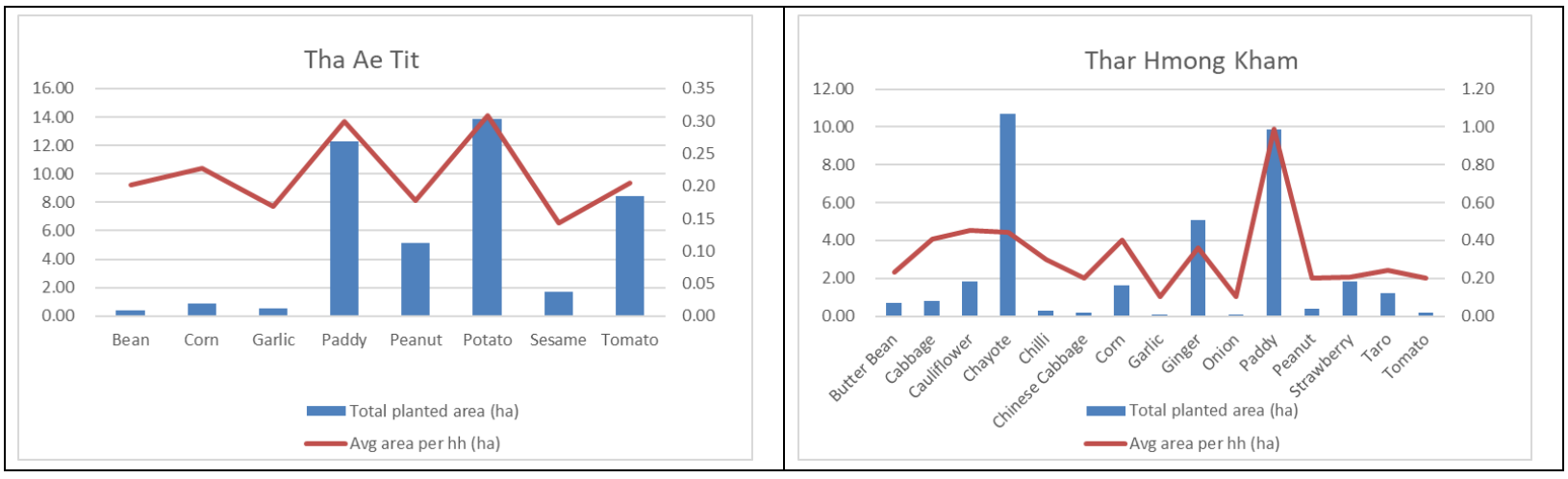


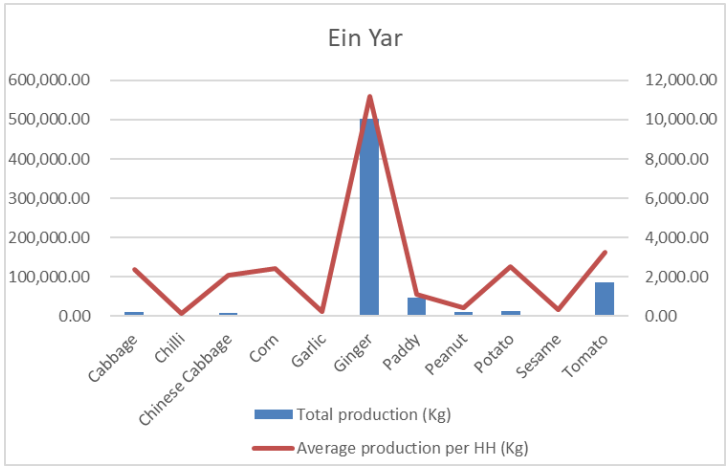
Figure 2: Area of agricultural production at interviewed households: Total in each village and average per household

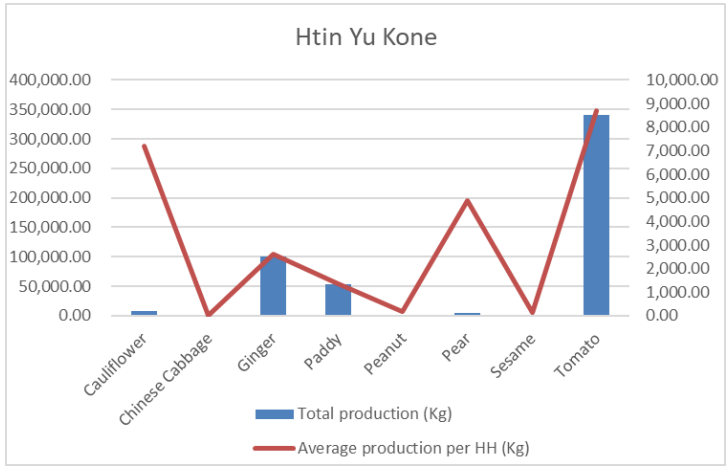
3.2.2.2 Production of each crop

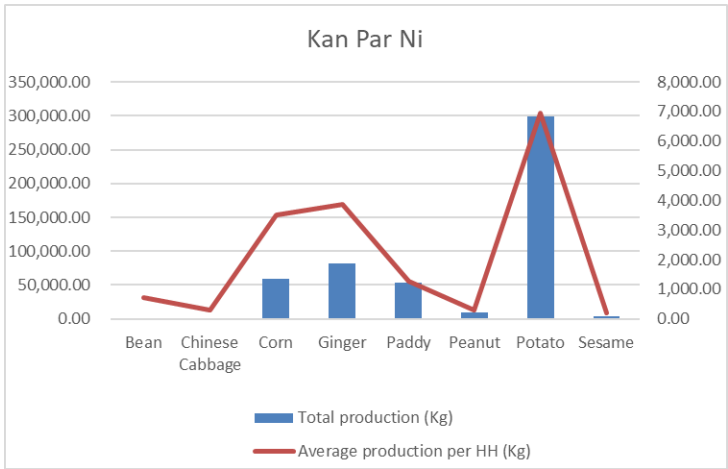
Main agriculture products are ginger, paddy and tomato (**Figure 3**, **Table 15**). In Kan Par Ni, Kone paw, Nyaung Kyo and Tha Ae Tit, potatoes are mainly produced. Chinese cabbage and cauliflower are main products in Phayar Phyu and in Nang Ohn Ywa Ma, respectively.

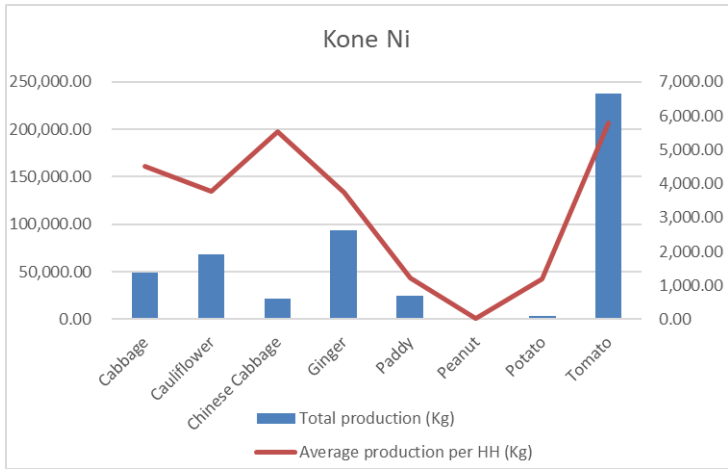
3.2.2.3 Price of each crop

The price of each crop is largely different from one village to another (**Table 15**). For example, price of tomato was 158 kyat per kg in Nang Ohn Ywa Ma while it was 533 kyat in Kone Paw and 339 kyat in Htin Yu Kone which is the main producer of tomato in Kalaw Township. They are sold at the same market, i.e. Aung Bang. Based on the interview survey, the main factor affecting the price can be the timing of selling, and quality of products. Negotiation method may be another factor. If villagers bring small amount of tomatoes, the price should be discounted.


Ein Yar
600,000.00
500,000.00
400,000.00
300,000.00
200,000.00
100,000.00
0.00
12,000.00
10,000.00
8,000.00
6,000.00
4,000.00
2,000.00
0.00
Cabbage
Chilli
Chinese Cabbage
Corn
Garlic
Ginger
Paddy
Peanut
Potato
Sesame
Tomato
Total production (Kg)
Average production per HH (Kg)


Htin Yu Kone
400,000.00
350,000.00
300,000.00
250,000.00
200,000.00
150,000.00
100,000.00
50,000.00
0.00
10,000.00
9,000.00
8,000.00
7,000.00
6,000.00
5,000.00
4,000.00
3,000.00
2,000.00
1,000.00
0.00
Cauliflower
Chinese Cabbage
Ginger
Paddy
Peanut
Pear
Sesame
Tomato
Total production (Kg)
Average production per HH (Kg)


Kan Par Ni
350,000.00
300,000.00
250,000.00
200,000.00
150,000.00
100,000.00
50,000.00
0.00
8,000.00
7,000.00
6,000.00
5,000.00
4,000.00
3,000.00
2,000.00
1,000.00
0.00
Bean
Chinese Cabbage
Corn
Ginger
Paddy
Peanut
Potato
Sesame
Total production (Kg)
Average production per HH (Kg)


Kone Ni
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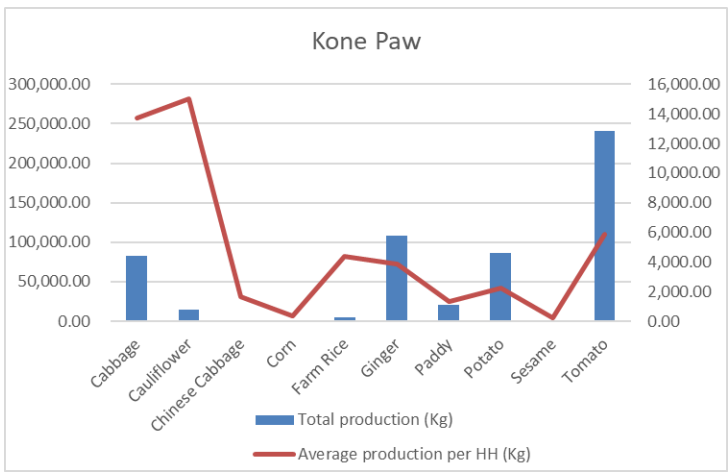
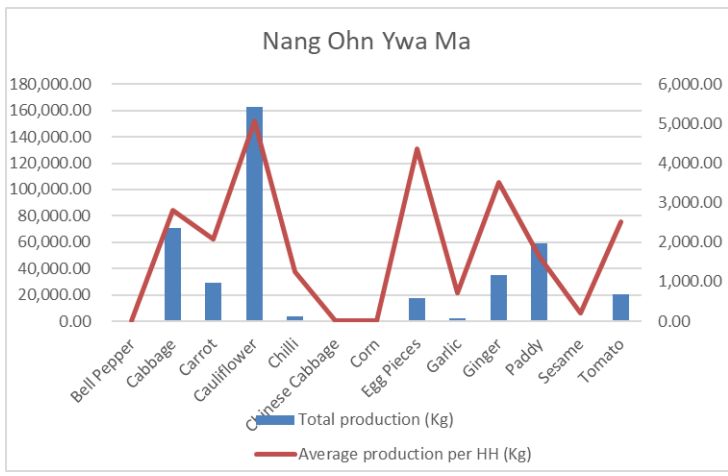
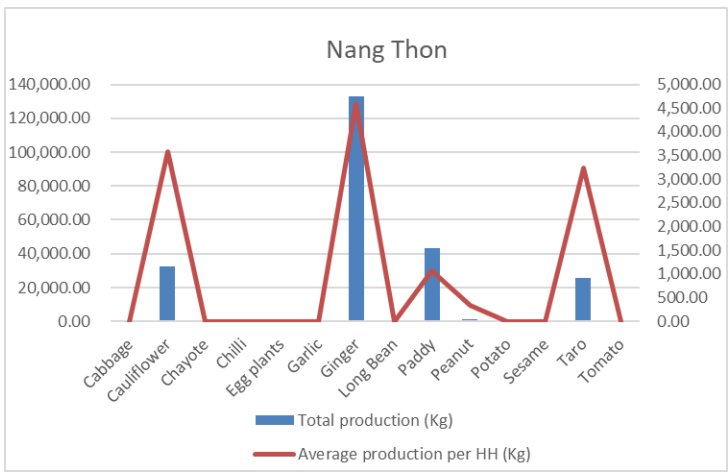
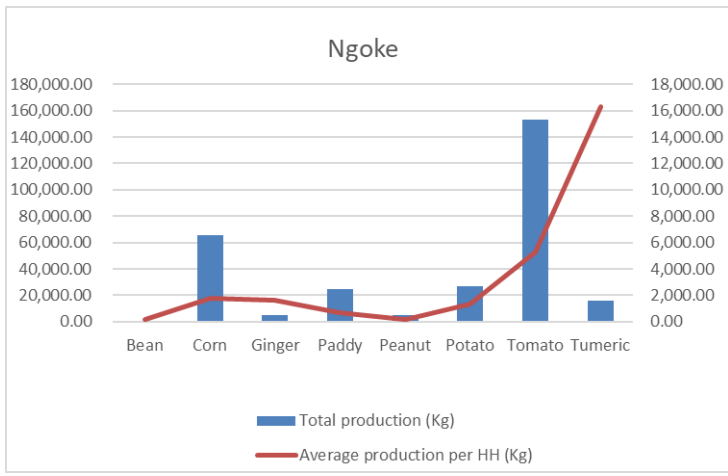
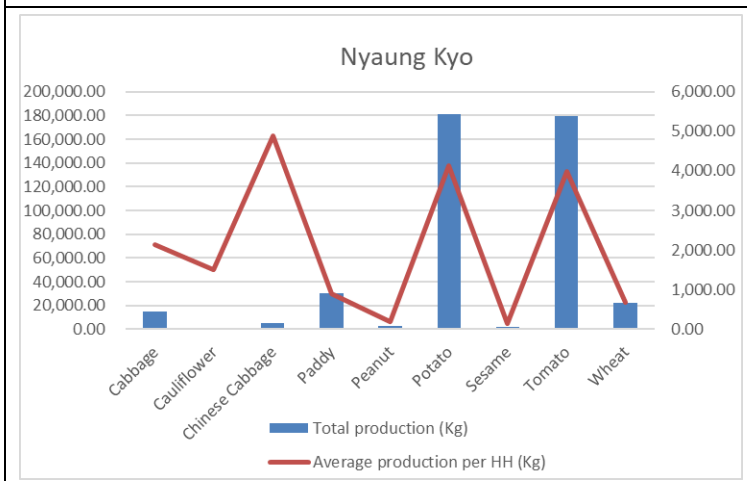
200,000.00
150,000.00
100,000.00
50,000.00
0.00
7,000.00
6,000.00
5,000.00
4,000.00
3,000.00
2,000.00
1,000.00
0.00
Cabbage
Cauliflower
Chinese Cabbage
Ginger
Paddy
Peanut
Potato
Tomato
Total production (Kg)
Average production per HH (Kg)

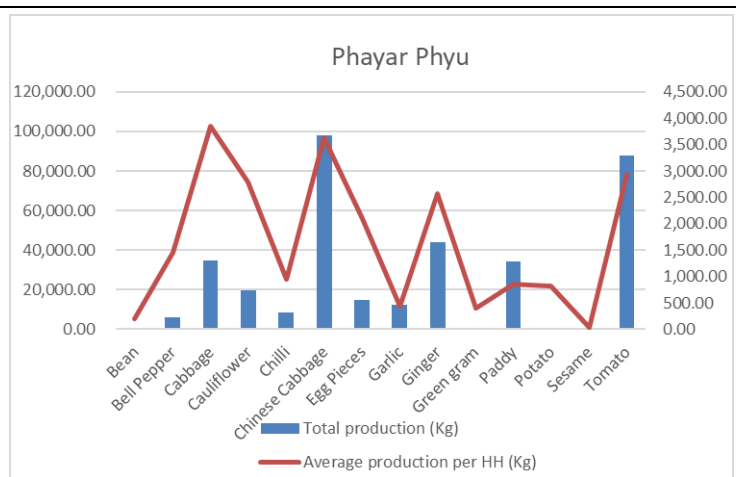

Kone Paw
300,000.00
250,000.00
200,000.00
150,000.00
100,000.00
50,000.00
0.00
16,000.00
14,000.00
12,000.00
10,000.00
8,000.00
6,000.00
4,000.00
2,000.00
0.00
Cabbage
Cauliflower
Chinese Cabbage
Corn
Farm Rice
Ginger
Paddy
Potato
Sesame
Tomato
Total production (Kg)
Average production per HH (Kg)


Nang Ohn Ywa Ma
180,000.00
160,000.00
140,000.00
120,000.00
100,000.00
80,000.00
60,000.00
40,000.00
20,000.00
0.00
6,000.00
5,000.00
4,000.00
3,000.00
2,000.00
1,000.00
0.00
Bell Pepper
Cabbage
Carrot
Cauliflower
Chilli
Chinese Cabbage
Corn
Egg Pieces
Garlic
Ginger
Paddy
Sesame
Tomato
Total production (Kg)
Average production per HH (Kg)


Nang Thon
140,000.00
120,000.00
100,000.00
80,000.00
60,000.00
40,000.00
20,000.00
0.00
5,000.00
4,500.00
4,000.00
3,500.00
3,000.00
2,500.00
2,000.00
1,500.00
1,000.00
500.00
0.00
Cabbage
Cauliflower
Chayote
Chilli
Egg plants
Garlic
Ginger
Long Bean
Paddy
Peanut
Potato
Sesame
Taro
Tomato
Total production (Kg)
Average production per HH (Kg)


Ngoke
180,000.00
160,000.00
140,000.00
120,000.00
100,000.00
80,000.00
60,000.00
40,000.00
20,000.00
0.00
18,000.00
16,000.00
14,000.00
12,000.00
10,000.00
8,000.00
6,000.00
4,000.00
2,000.00
0.00
Bean
Corn
Ginger
Paddy
Peanut
Potato
Tomato
Tumeric
Total production (Kg)
Average production per HH (Kg)


Nyaung Kyo
200,000.00
180,000.00
160,000.00
140,000.00
120,000.00
100,000.00
80,000.00
60,000.00
40,000.00
20,000.00
0.00
6,000.00
5,000.00
4,000.00
3,000.00
2,000.00
1,000.00
0.00
Cabbage
Cauliflower
Chinese Cabbage
Paddy
Peanut
Potato
Sesame
Tomato
Wheat
Total production (Kg)
Average production per HH (Kg)


Phayar Phyu
120,000.00
100,000.00
80,000.00
60,000.00
40,000.00
20,000.00
0.00
4,500.00
4,000.00
3,500.00
3,000.00
2,500.00
2,000.00
1,500.00
1,000.00
500.00
0.00
Bean
Bell Pepper
Cabbage
Cauliflower
Chilli
Chinese Cabbage
Egg Pieces
Garlic
Ginger
Green gram
Paddy
Potato
Sesame
Tomato
Total production (Kg)
Average production per HH (Kg)

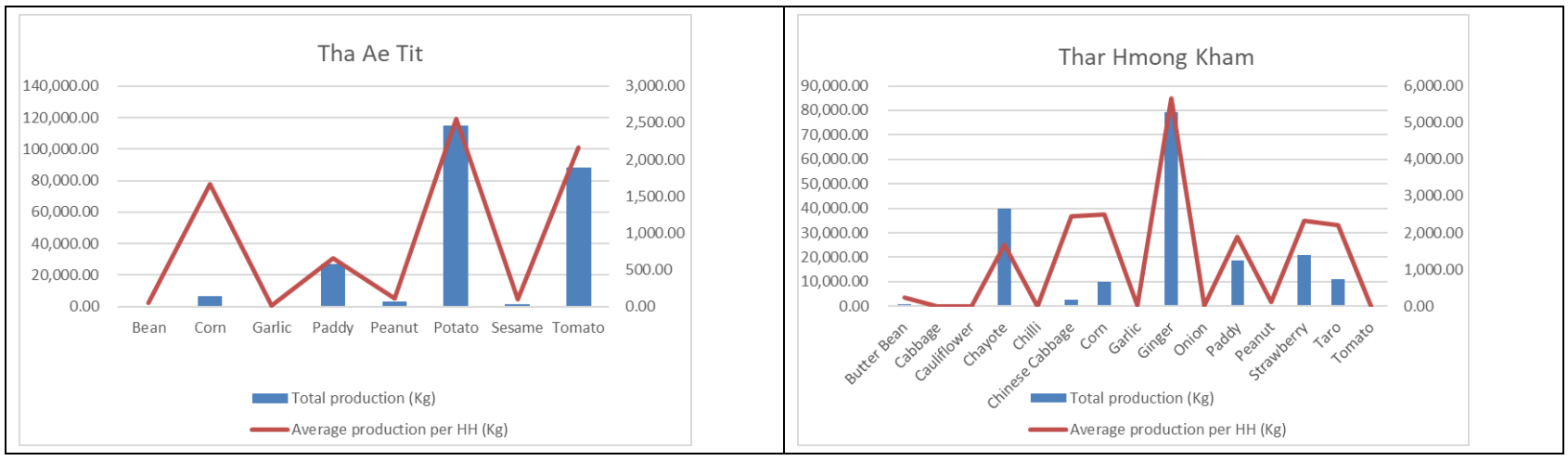


Figure 3: Volume of agricultural production at interviewed households

Table 15: Table for agricultural products and sales at each village by product

Village	Crop		Production Area_ha	Production Kg	Market_sales_kyat	Market_sales_Kg	Uni Price_Kyat in Market
Ein Yar	Cabbage	Avg	0.30	2,375.00	565,000.00	2,375.00	371.11
		Total	1.22	9,500.00	2,260,000.00	9,500.00	
		Qty	4.00	4.00	4.00	4.00	3.00
	Chilli	Avg	0.12	138.55	84,000.00	138.55	613.50
		Total	0.24	277.10	168,000.00	277.10	
		Qty	2.00	2.00	2.00	2.00	2.00
	Chinese Cabbage	Avg	0.17	2,078.25	332,500.00	2,078.25	81.80
		Total	0.68	8,313.00	1,330,000.00	8,313.00	
		Qty	4.00	4.00	4.00	4.00	3.00
	Corn	Avg	0.61	2,445.00	585,000.00	2,445.00	239.26
		Total	0.61	2,445.00	585,000.00	2,445.00	
		Qty	1.00	1.00	1.00	1.00	1.00
	Garlic	Avg	0.10	244.50	120,000.00	244.50	490.80
		Total	0.10	244.50	120,000.00	244.50	
		Qty	1.00	1.00	1.00	1.00	1.00
	Ginger	Avg	0.74	11,178.18	6,369,633.33	8,221.79	759.78
		Total	33.21	503,018.00	286,633,500.00	369,980.66	
		Qty	45.00	45.00	45.00	45.00	45.00
	Paddy	Avg	0.61	1,119.64	0.00	0.00	
		Total	25.42	47,025.00	0.00	0.00	
		Qty	42.00	42.00	42.00	42.00	
	Peanut	Avg	0.32	447.05	60,192.31	42.00	1,226.99
		Total	8.40	11,623.25	1,565,000.00	1,092.10	
		Qty	26.00	26.00	26.00	26.00	3.00
	Potato	Avg	0.61	2,510.20	1,018,160.00	2,479.23	396.32
		Total	3.04	12,551.00	5,090,800.00	12,396.15	
		Qty	5.00	5.00	5.00	5.00	5.00
	Sesame	Avg	0.33	325.80	169,887.50	127.55	695.30
		Total	2.63	2,606.37	1,359,100.00	1,020.38	
		Qty	8.00	8.00	8.00	8.00	3.00
	Tomato	Avg	0.27	3,266.90	1,104,817.31	3,247.09	343.32
		Total	6.92	84,939.30	28,725,250.00	84,424.22	
		Qty	26.00	26.00	26.00	26.00	26.00
	Total	Avg	0.18	1,516.76	728,525.89	1,088.21	588.92
		Total	82.45	682,542.52	327,836,650.00	489,693.11	
		Qty	450.00	450.00	450.00	450.00	92.00
Htin Yu Kone	Cauliflower	Avg	0.61	7,200.00	2,304,000.00	0.00	
		Total	0.61	7,200.00	2,304,000.00	0.00	
		Qty	1.00	1.00	1.00	1.00	
	Chinese Cabbage	Avg	0.10	0.00	100,000.00	0.00	
		Total	0.10	0.00	100,000.00	0.00	
		Qty	1.00	1.00	1.00	1.00	
	Ginger	Avg	0.36	2,596.15	1,525,512.82	1,903.89	829.53
		Total	14.07	101,250.00	59,495,000.00	74,251.74	
		Qty	39.00	39.00	39.00	39.00	39.00
	Paddy	Avg	0.39	1,345.96	0.00	0.00	
		Total	15.80	53,838.40	0.00	0.00	
		Qty	40.00	40.00	40.00	40.00	
	Peanut	Avg	0.21	166.38	0.00	0.00	
		Total	1.45	1,164.65	0.00	0.00	
		Qty	7.00	7.00	7.00	7.00	
	Pear	Avg	0.20	4,890.00	2,400,000.00	4,890.00	490.80
		Total	0.20	4,890.00	2,400,000.00	4,890.00	
		Qty	1.00	1.00	1.00	1.00	1.00
	Sesame	Avg	0.30	149.92	0.00	0.00	
		Total	1.82	899.54	0.00	0.00	
		Qty	6.00	6.00	6.00	6.00	
	Tomato	Avg	0.31	8,714.23	3,075,384.62	8,702.82	339.00
		Total	11.95	339,855.00	119,940,000.00	339,410.01	
		Qty	39.00	39.00	39.00	39.00	39.00
	Total	Avg	0.10	1,131.33	409,420.00	930.12	583.08
		Total	46.00	509,097.59	184,239,000.00	418,551.75	
		Qty	450.00	450.00	450.00	450.00	79.00
Kan Par Ni	Bean	Avg	0.20	733.50	0.00	0.00	
		Total	0.20	733.50	0.00	0.00	
		Qty	1.00	1.00	1.00	1.00	
	Chinese Cabbage	Avg	0.41	309.70	187,500.00	0.00	
		Total	0.81	619.40	375,000.00	0.00	
		Qty	2.00	2.00	2.00	2.00	
	Corn	Avg	0.80	3,514.09	769,970.59	3,082.62	255.50
		Total	13.57	59,739.50	13,089,500.00	52,404.50	
		Qty	17.00	17.00	17.00	17.00	17.00
	Ginger	Avg	0.41	3,873.19	1,989,523.81	2,945.64	597.43
		Total	8.51	81,337.00	41,780,000.00	61,858.50	
		Qty	21.00	21.00	21.00	21.00	21.00
	Paddy	Avg	0.62	1,265.45	0.00	0.00	
		Total	26.12	53,148.70	0.00	0.00	
		Qty	42.00	42.00	42.00	42.00	
	Peanut	Avg	0.29	303.19	10,909.09	8.89	1,226.99
		Total	9.65	10,005.41	360,000.00	293.40	
		Qty	33.00	33.00	33.00	33.00	1.00
	Potato	Avg	0.59	6,944.56	2,084,372.09	6,863.44	311.03
		Total	25.31	298,616.00	89,628,000.00	295,127.80	
		Qty	43.00	43.00	43.00	43.00	43.00
	Sesame	Avg	0.47	200.72	114,135.00	69.45	792.22
		Total	9.42	4,014.30	2,282,700.00	1,388.95	
		Qty	20.00	20.00	20.00	20.00	6.00
	Total	Avg	0.21	1,129.36	327,811.56	913.50	411.86
		Total	93.59	508,213.81	147,515,200.00	411,073.15	
		Qty	450.00	450.00	450.00	450.00	88.00
Kone Ni	Cabbage	Avg	0.25	4,511.36	907,181.82	4,509.55	225.89
		Total	2.77	49,625.00	9,979,000.00	49,605.00	
		Qty	11.00	11.00	11.00	11.00	9.00
	Cauliflower	Avg	0.24	3,772.22	1,249,897.78	0.00	
		Total	4.27	67,900.00	22,498,160.00	0.00	
		Qty	18.00	18.00	18.00	18.00	
	Chinese Cabbage	Avg	0.18	5,521.63	1,537,900.00	5,518.37	286.30
		Total	0.71	22,086.50	6,151,600.00	22,073.46	
		Qty	4.00	4.00	4.00	4.00	3.00
	Ginger	Avg	0.46	3,747.70	1,536,320.00	2,928.72	529.83
		Total	11.45	93,692.40	38,408,000.00	73,217.97	
		Qty	25.00	25.00	25.00	25.00	24.00
	Paddy	Avg	0.58	1,233.10	51,000.00	173.47	311.00
		Total	11.53	24,662.00	1,020,000.00	3,469.40	
		Qty	20.00	20.00	20.00	20.00	3.00
	Peanut	Avg	0.20	32.60	0.00	0.00	
		Total	0.20	32.60	0.00	0.00	
		Qty	1.00	1.00	1.00	1.00	
	Tomato	Avg	0.36	5,795.45	1,548,476.83	5,746.66	300.01
		Total	14.63	237,613.25	63,487,550.00	235,613.24	
		Qty	41.00	41.00	41.00	41.00	41.00
	Total	Avg	0.10	1,085.21	310,732.74	849.63	349.28
		Total	46.16	499,197.75	142,937,060.00	390,830.72	
		Qty	460.00	460.00	460.00	460.00	86.00
Kone Paw	Cabbage	Avg	0.35	13,733.33	533,200.00	11,181.67	251.63
		Total	2.12	82,400.00	3,199,200.00	67,090.00	
		Qty	6.00	6.00	6.00	6.00	6.00
	Cauliflower	Avg	0.41	15,000.00	4,478,400.00	0.00	
		Total	0.41	15,000.00	4,478,400.00	0.00	
		Qty	1.00	1.00	1.00	1.00	
	Chinese Cabbage	Avg	0.10	1,630.00	200,000.00	1,630.00	122.70
		Total	0.10	1,630.00	200,000.00	1,630.00	
		Qty	1.00	1.00	1.00	1.00	1.00
	Corn	Avg	0.41	380.33	166,666.67	380.33	260.74
		Total	1.22	1,141.00	500,000.00	1,141.00	
		Qty	3.00	3.00	3.00	3.00	2.00
	Farm Rice	Avg	1.22	4,389.00	1,050,000.00	3,135.00	334.93
		Total	1.22	4,389.00	1,050,000.00	3,135.00	
		Qty	1.00	1.00	1.00	1.00	1.00
	Ginger	Avg	0.28	3,853.79	1,413,107.14	2,417.93	529.14
		Total	7.72	107,906.00	39,567,000.00	67,702.05	
		Qty	28.00	28.00	28.00	28.00	28.00
	Paddy	Avg	0.41	1,316.84	65,312.50	248.19	303.03
		Total	6.52	21,069.50	1,045,000.00	3,971.00	
		Qty	16.00	16.00	16.00	16.00	3.00
	Sesame	Avg	0.41	250.80	204,000.00	250.80	813.40
		Total	0.41	250.80	204,000.00	250.80	
		Qty	1.00	1.00	1.00	1.00	1.00
	Tomato	Avg	0.27	5,883.90	2,500,695.12	5,697.33	533.85
		Total	11.23	241,240.00	102,528,500.00	233,590.41	
		Qty	41.00	41.00	41.00	41.00	41.00
	Total	Avg	0.10	1,369.11	449,230.73	1,132.98	429.65
		Total	41.98	561,334.80	184,184,600.00	464,522.42	
		Qty	410.00	410.00	410.00	410.00	126.00
Nang Ohn Ywa Ma	Bell Pepper	Avg	0.10	0.00	120,000.00	0.00	
		Total	0.10	0.00	120,000.00	0.00	
		Qty	1.00	1.00	1.00	1.00	
	Cabbage	Avg	0.23	2,816.00	2,042,600.00	1,816.00	250.93
		Total	5.75	70,400.00	51,065,000.00	45,400.00	
		Qty	25.00	25.00	25.00	25.00	7.00
	Carrot	Avg	0.27	2,072.43	532,508.93	2,071.67	236.64
		Total	3.77	29,014.00	7,455,125.00	29,003.31	
		Qty	14.00	14.00	14.00	14.00	14.00
	Cauliflower	Avg	0.35	5,075.00	2,662,187.50	765.63	197.93
		Total	11.28	162,400.00	85,190,000.00	24,500.00	
		Qty	32.00	32.00	32.00	32.00	2.00
	Chilli	Avg	0.17	1,249.67	800,000.00	1,249.67	552.15
		Total	0.51	3,749.00	2,400,000.00	3,749.00	
		Qty	3.00	3.00	3.00	3.00	2.00
	Chinese Cabbage	Avg	0.19	0.00	1,546,666.67	0.00	
		Total	1.71	0.00	13,920,000.00	0.00	
		Qty	9.00	9.00	9.00	9.00	
	Corn	Avg	0.20	0.00	250,000.00	0.00	
		Total	0.20	0.00	250,000.00	0.00	
		Qty	1.00	1.00	1.00	1.00	
	Garlic	Avg	0.17	706.33	474,666.67	624.77	756.73
		Total	0.50	2,119.00	1,424,000.00	1,874.30	
		Qty	3.00	3.00	3.00	3.00	3.00
	Ginger	Avg	0.25	3,518.25	1,308,000.00	2,492.27	513.50
		Total	2.52	35,182.50	13,080,000.00	24,922.70	
		Qty	10.00	10.00	10.00	10.00	10.00
	Paddy	Avg	0.41	1,638.82	0.00	0.00	
		Total	14.74	58,997.40	0.00	0.00	
		Qty	36.00	36.00	36.00	36.00	
	Sesame	Avg	0.15	195.60	164,550.00	95.36	797.55
		Total	0.30	391.20	329,100.00	190.71	
		Qty	2.00	2.00	2.00	2.00	1.00
	Tomato	Avg	0.25	2,526.50	574,250.00	2,526.50	158.49
		Total	2.02	20,212.00	4,594,000.00	20,212.00	
		Qty	8.00	8.00	8.00	8.00	6.00
	Total	Avg	0.10	888.83	405,440.50	371.91	337.16
		Total	44.20	399,971.30	182,448,225.00	167,358.22	
		Qty	450.00	450.00	450.00	450.00	49.00
Nang Thon	Cabbage	Avg	0.30	0.00	1,148,000.00	0.00	
		Total	0.60	0.00	2,296,000.00	0.00	
		Qty	2.00	2.00	2.00	2.00	
	Cauliflower	Avg	0.36	3,577.78	902,222.22	3,572.78	231.25
		Total	3.20	32,200.00	8,120,000.00	32,155.00	
		Qty	9.00	9.00	9.00	9.00	8.00
	Chayote	Avg	0.46	0.00	1,747,691.18	0.00	
		Total	7.80	0.00	29,710,750.00	0.00	
		Qty	17.00	17.00	17.00	6.00	
	Chilli	Avg	0.40	0.00	71,937.50	0.00	
		Total	0.80	0.00	143,875.00	0.00	
		Qty	2.00	2.00	2.00	2.00	
	Egg plants	Avg	0.20	0.00	1,489,000.00	0.00	
		Total	0.20	0.00	1,489,000.00	0.00	
		Qty	1.00	1.00	1.00	1.00	
	Garlic	Avg	0.10	0.00	0.00	0.00	
		Total	0.20	0.00	0.00	0.00	
		Qty	2.00	2.00	2.00	2.00	
	Long Bean	Avg	0.46	0.00	246,780.00	0.00	
		Total	2.30	0.00	1,233,900.00	0.00	
		Qty	5.00	5.00	5.00	5.00	
	Paddy	Avg	0.60	1,059.39	0.00	0.00	
		Total	24.50	43,435.00	0.00	0.00	
		Qty	41.00	41.00	41.00	41.00	
	Peanut	Avg	0.30	332.11	0.00	0.00	
		Total	1.20	1,328.45	0.00	0.00	
		Qty	4.00	4.00	4.00	4.00	
	Potato	Avg	0.20	0.00	525,000.00	0.00	
		Total	0.20	0.00	525,000.00	0.00	
		Qty	1.00	1.00	1.00	1.00	
	Sesame	Avg	0.60	0.00	52,800.00	0.00	
		Total	0.60	0.00	52,800.00	0.00	
		Qty	1.00	1.00	1.00	1.00	
	Taro	Avg	0.35	3,239.63	470,250.00	0.00	
		Total	2.84	25,917.00	3,762,000.00	0.00	
		Qty	8.00	8.00	8.00	8.00	
	Tomato	Avg	0.40	0.00	2,348,750.00	0.00	
		Total	0.80	0.00	4,697,500.00	0.00	
		Qty	2.00	2.00	2.00	2.00	
	Total	Avg	0.13	524.61	250,982.72	284.44	509.69
		Total	59.29	236,072.55	112,942,225.00	124,869.20	
		Qty	450.00	450.00	450.00	439.00	37.00
Ngoke	Bean	Avg	0.20	136.92	73,860.00	0.00	
		Total	1.01	684.60	369,300.00	0.00	
		Qty	5.00	5.00	5.00	5.00	
	Ginger	Avg	0.18	1,630.00	700,666.67	1,249.67	568.51
		Total	0.54	4,890.00	2,102,000.00	3,749.00	
		Qty	3.00	3.00	3.00	3.00	3.00
	Paddy	Avg	0.29	655.60	0.00	0.00	
		Total	10.94	24,912.80	0.00	0.00	
		Qty	38.00	38.00	38.00	38.00	
	Peanut	Avg	0.23	197.71	156,160.42	87.55	1,814.59
		Total	5.47	4,745.02	3,747,850.00	2,101.10	
		Qty	24.00	24.00	24.00	24.00	11.00
	Potato	Avg	0.26	1,335.79	420,745.00	1,257.22	321.28
		Total	5.20	26,715.70	8,414,900.00	25,144.38	
		Qty	20.00	20.00	20.00	20.00	19.00
	Tomato	Avg	0.29	5,283.45	845,200.00	4,482.72	185.53
		Total	8.44	153,220.00	24,510,800.00	129,999.02	
		Qty	29.00	29.00	29.00	29.00	29.00
	Tumeric	Avg	0.41	16,300.00	9,750,000.00	15,892.50	613.50
		Total	0.41	16,300.00	9,750,000.00	15,892.50	
		Qty	1.00	1.00	1.00	1.00	1.00
	Total	Avg	0.10	659.61	144,689.06	538.31	429.76
		Total	46.78	296,822.97	65,110,075.00	242,240.85	
		Qty	450.00	450.00	450.00	450.00	100.00
Nyaung Kyo	Cabbage	Avg	0.22	2,142.86	513,600.00	1,710.86	150.00
		Total	1.52	15,000.00	3,595,200.00	11,976.00	
		Qty	7.00	7.00	7.00	7.00	3.00
	Cauliflower	Avg	0.20	1,500.00	148,000.00	1,480.00	100.00
		Total	0.20	1,500.00	148,000.00	1,480.00	
		Qty	1.00	1.00	1.00	1.00	1.00
	Chinese Cabbage	Avg	0.20	4,890.00	585,600.00	4,772.64	122.70
		Total	0.20	4,890.00	585,600.00	4,772.64	
		Qty	1.00	1.00	1.00	1.00	1.00
	Paddy	Avg	0.37	902.39	0.00	0.00	
		Total	12.45	30,681.20	0.00	0.00	
		Qty	34.00	34.00	34.00	34.00	
	Peanut	Avg	0.24	184.71	0.00	0.00	
		Total	3.34	2,585.90	0.00	0.00	
		Qty	14.00	14.00	14.00	14.00	
	Potato	Avg	0.47	4,123.16	1,273,565.91	4,086.93	313.72
		Total	20.75	181,419.00	56,036,900.00	179,824.86	
		Qty	44.00	44.00	44.00	44.00	44.00
	Sesame	Avg	0.45	142.57	6,000.00	9.78	613.50
		Total	6.68	2,138.56	90,000.00	146.70	
		Qty	15.00	15.00	15.00	15.00	1.00
	Tomato	Avg	0.34	3,997.12	814,095.56	3,959.49	205.86
		Total	15.42	179,870.50	36,634,300.00	178,176.93	
		Qty	45.00	45.00	45.00	45.00	45.00
	Wheat	Avg	0.36	675.72	458,818.18	629.80	937.08
		Total	11.94	22,298.70	15,141,000.00	20,783.55	
		Qty	33.00	33.00	33.00	33.00	32.00
	Total	Avg	0.16	978.63	249,402.22	882.58	427.88
		Total	72.50	440,383.86	112,231,000.00	397,160.68	
		Qty	450.00	450.00	450.00	450.00	127.00
Phayar Phyu	Bean	Avg	0.20	195.60	180,000.00	195.60	920.25
		Total	0.20	195.60	180,000.00	195.60	
		Qty	1.00	1.00	1.00	1.00	1.00
	Bell Pepper	Avg	0.25	1,467.00	741,500.00	1,464.96	444.79
		Total	1.01	5,868.00	2,966,000.00	5,859.85	
		Qty	4.00	4.00	4.00	4.00	4.00
	Cabbage	Avg	0.19	3,855.56	766,333.33	3,810.00	150.00
		Total	1.72	34,700.00	6,897,000.00	34,290.00	
		Qty	9.00	9.00	9.00	9.00	7.00
	Cauliflower	Avg	0.14	2,785.71	475,000.00	0.00	
		Total	1.01	19,500.00	3,325,000.00	0.00	
		Qty	7.00	7.00	7.00	7.00	
	Chilli	Avg	0.18	939.97	377,288.89	396.09	490.80
		Total	1.62	8,459.70	3,395,600.00	3,564.81	
		Qty	9.00	9.00	9.00	9.00	6.00
	Chinese Cabbage	Avg	0.20	3,622.22	503,077.78	3,608.54	139.85
		Total	5.44	97,800.00	13,583,100.00	97,430.57	
		Qty	27.00	27.00	27.00	27.00	23.00
	Garlic	Avg	0.21	444.76	114,128.57	324.43	307.88
		Total	5.87	12,453.20	3,195,600.00	9,083.99	
		Qty	28.00	28.00	28.00	28.00	27.00
	Ginger	Avg	0.27	2,579.24	1,651,141.18	2,347.01	552.15
		Total	4.66	43,847.00	28,069,400.00	39,899.14	
		Qty	17.00	17.00	17.00	17.00	16.00
	Green gram	Avg	0.41	407.50	294,000.00	399.35	736.20
		Total	0.41	407.50	294,000.00	399.35	
		Qty	1.00	1.00	1.00	1.00	1.00
	Paddy	Avg	0.30	855.86	0.00	0.00	
		Total	12.15	34,234.20	0.00	0.00	
		Qty	40.00	40.00	40.00	40.00	
	Potato	Avg	0.20	815.00	247,500.00	806.85	306.75
		Total	0.20	815.00	247,500.00	806.85	
		Qty	1.00	1.00	1.00	1.00	1.00
	Sesame	Avg	0.20	32.60	0.00	0.00	
		Total	0.20	32.60	0.00	0.00	
		Qty	1.00	1.00	1.00	1.00	
	Tomato	Avg	0.20	2,928.57	598,341.67	2,887.27	230.06
		Total	6.01	87,857.00	17,950,250.00	86,618.20	
		Qty	30.00	30.00	30.00	30.00	30.00
	Total	Avg	0.09	801.87	184,575.44	652.09	295.30
		Total	41.82	360,839.80	83,058,950.00	292,790.65	
		Qty	450.00	450.00	450.00	449.00	123.00
Tha Ae Tit	Bean	Avg	0.20	48.90	0.00	0.00	
		Total	0.41	97.80	0.00	0.00	
		Qty	2.00	2.00	2.00	2.00	
	Garlic	Avg	0.17	16.30	0.00	0.00	
		Total	0.51	48.90	0.00	0.00	
		Qty	3.00	3.00	3.00	3.00	
	Paddy	Avg	0.30	661.66	0.00	0.00	
		Total	12.25	27,128.20	0.00	0.00	
		Qty	41.00	41.00	41.00	41.00	
	Peanut	Avg	0.18	111.37	6,275.86	2.74	2,358.94
		Total	5.16	3,229.85	182,000.00	79.51	
		Qty	29.00	29.00	29.00	29.00	3.00
	Potato	Avg	0.31	2,555.48	772,972.22	2,528.49	296.80
		Total	13.87	114,996.50	34,783,750.00	113,782.15	
		Qty	45.00	45.00	45.00	45.00	45.00
	Sesame	Avg	0.14	96.83	96,100.00	75.39	958.59
		Total	1.72	1,161.99	1,153,200.00	904.65	
		Qty	12.00	12.00	12.00	12.00	8.00
	Tomato	Avg	0.20	2,158.76	422,304.88	2,063.34	191.08
		Total	8.40	88,509.00	17,314,500.00	84,597.00	
		Qty	41.00	41.00	41.00	41.00	41.00
	Total	Avg	0.10	537.46	121,796.56	457.88	364.42
		Total	43.23	241,855.24	54,808,450.00	206,046.31	
		Qty	450.00	450.00	450.00	450.00	101.00
Thar Hmong Kham	Butter Bean	Avg	0.23	244.63	54,500.00	239.20	286.09
		Total	0.70	733.90	163,500.00	717.60	
		Qty	3.00	3.00	3.00	3.00	3.00
	Cabbage	Avg	0.41	0.00	550,000.00	0.00	
		Total	0.81	0.00	1,100,000.00	0.00	
		Qty	2.00	2.00	2.00	2.00	
	Cauliflower	Avg	0.46	0.00	5,387,500.00	0.00	
		Total	1.82	0.00	21,550,000.00	0.00	
		Qty	4.00	4.00	4.00	4.00	
	Chilli	Avg	0.30	0.00	135,000.00	0.00	
		Total	0.30	0.00	135,000.00	0.00	
		Qty	1.00	1.00	1.00	1.00	
	Chinese Cabbage	Avg	0.20	2,445.00	445,500.00	2,420.55	184.05
		Total	0.20	2,445.00	445,500.00	2,420.55	
		Qty	1.00	1.00	1.00	1.00	1.00
	Corn	Avg	0.40	2,485.75	804,000.00	2,485.75	257.67
		Total	1.62	9,943.00	3,216,000.00	9,943.00	
		Qty	4.00	4.00	4.00	4.00	3.00
	Garlic	Avg	0.10	16.30	0.00	0.00	
		Total	0.10	16.30	0.00	0.00	
		Qty	1.00	1.00	1.00	1.00	
	Ginger	Avg	0.36	5,658.43	2,270,714.29	3,877.07	598.16
		Total	5.06	79,218.00	31,790,000.00	54,279.00	
		Qty	14.00	14.00	14.00	14.00	14.00
	Onion	Avg	0.10	9.78	0.00	0.00	
		Total	0.10	9.78	0.00	0.00	
		Qty	1.00	1.00	1.00	1.00	
	Paddy	Avg	0.99	1,881.00	0.00	0.00	
		Total	9.89	18,810.00	0.00	0.00	
		Qty	10.00	10.00	10.00	10.00	
	Peanut	Avg	0.20	104.50	0.00	0.00	
		Total	0.41	209.00	0.00	0.00	
		Qty	2.00	2.00	2.00	2.00	
	Strawberry	Avg	0.21	2,320.12	4,079,118.75	0.00	
		Total	1.85	20,881.04	36,712,068.75	0.00	
		Qty	9.00	9.00	9.00	9.00	
	Tomato	Avg	0.20	0.00	0.00	0.00	
		Total	0.20	0.00	0.00	0.00	
		Qty	1.00	1.00	1.00	1.00	
	Total	Avg	0.08	407.34	460,385.15	166.94	446.62
		Total	34.95	183,304.02	207,173,318.75	75,124.15	
		Qty	450.00	450.00	450.00	450.00	25.00
Total	Bean	Avg	0.20	190.17	61,033.33	21.73	920.25
		Total	1.82	1,711.50	549,300.00	195.60	
		Qty	9.00	9.00	9.00	9.00	1.00
	Bell Pepper	Avg	0.22	1,173.60	617,200.00	1,171.97	444.79
		Total	1.11	5,868.00	3,086,000.00	5,859.85	
		Qty	5.00	5.00	5.00	5.00	4.00
	Butter Bean	Avg	0.23	244.63	54,500.00	239.20	286.09
		Total	0.70	733.90	163,500.00	717.60	
		Qty	3.00	3.00	3.00	3.00	3.00
	Cabbage	Avg	0.25	3,964.02	1,218,051.52	3,300.92	226.07
		Total	16.50	261,625.00	80,391,400.00	217,861.00	
		Qty	66.00	66.00	66.00	66.00	35.00
	Carrot	Avg	0.27	2,072.43	532,508.93	2,071.67	236.64
		Total	3.77	29,014.00	7,455,125.00	29,003.31	
		Qty	14.00	14.00	14.00	14.00	14.00
	Cauliflower	Avg	0.31	4,187.67	2,022,103.56	796.37	213.26
		Total	22.80	305,700.00	147,613,560.00	58,135.00	
		Qty	73.00	73.00	73.00	73.00	11.00
	Chilli	Avg	0.20	734.46	367,204.41	446.52	527.61
		Total	3.46	12,485.80	6,242,475.00	7,590.91	
		Qty	17.00	17.00	17.00	17.00	10.00
	Chinese Cabbage	Avg	0.20	2,755.68	733,816.00	2,732.80	148.45
		Total	9.95	137,783.90	36,690,800.00	136,640.22	
		Qty	50.00	50.00	50.00	50.00	32.00
	Corn	Avg	0.49	2,168.75	525,831.72	2,059.27	249.38
		Total	32.90	145,306.35	35,230,725.00	137,971.35	
		Qty	67.00	67.00	67.00	67.00	64.00
	Egg Pieces	Avg	0.19	2,925.11	506,954.55	2,922.59	192.41
		Total	2.11	32,176.20	5,576,500.00	32,148.49	
		Qty	11.00	11.00	11.00	11.00	11.00
	Egg plants	Avg	0.20	0.00	1,489,000.00	0.00	
		Total	0.20	0.00	1,489,000.00	0.00	
		Qty	1.00	1.00	1.00	1.00	
	Farm Rice	Avg	1.22	4,389.00	1,050,000.00	3,135.00	334.93
		Total	1.22	4,389.00	1,050,000.00	3,135.00	
		Qty	1.00	1.00	1.00	1.00	1.00
	Garlic	Avg	0.19	391.63	124,726.32	294.81	357.22
		Total	7.28	14,881.90	4,739,600.00	11,202.79	
		Qty	38.00	38.00	38.00	38.00	31.00
	Ginger	Avg	0.44	5,123.52	2,605,351.95	3,734.09	644.88
		Total	101.79	1,183,533.00	601,836,300.00	862,574.96	
		Qty	231.00	231.00	231.00	231.00	229.00
	Green gram	Avg	0.41	407.50	294,000.00	399.35	736.20
		Total	0.41	407.50	294,000.00	399.35	
		Qty	1.00	1.00	1.00	1.00	1.00
	Onion	Avg	0.10	9.78	0.00	0.00	
		Total	0.10	9.78	0.00	0.00	
		Qty	1.00	1.00	1.00	1.00	
	Paddy	Avg	0.46	1,094.86	5,162.50	18.60	307.02
		Total	182.31	437,942.40	2,065,000.00	7,440.40	
		Qty	400.00	400.00	400.00	400.00	6.00
	Peanut	Avg	0.25	249.46	41,820.36	25.47	1,774.74
		Total	35.29	34,924.13	5,854,850.00	3,566.11	
		Qty	140.00	140.00	140.00	140.00	18.00
	Pear	Avg	0.20	4,890.00	2,400,000.00	4,890.00	490.80
		Total	0.20	4,890.00	2,400,000.00	4,890.00	
		Qty	1.00	1.00	1.00	1.00	1.00
	Potato	Avg	0.40	3,607.00	1,132,000.50	3,542.37	318.31
		Total	80.23	725,007.70	227,532,100.00	712,016.60	
		Qty	201.00	201.00	201.00	201.00	199.00
	Sesame	Avg	0.36	174.17	82,892.42	59.12	836.62
		Total	23.79	11,495.36	5,470,900.00	3,902.19	
		Qty	66.00	66.00	66.00	66.00	20.00
	Strawberry	Avg	0.21	2,320.12	4,079,118.75	0.00	
		Total	1.85	20,881.04	36,712,068.75	0.00	
		Qty	9.00	9.00	9.00	9.00	
	Taro	Avg	0.31	2,842.69	463,346.15	597.23	243.99
		Total	4.04	36,955.00	6,023,500.00	7,764.00	
		Qty	13.00	13.00	13.00	13.00	4.00
	Tomato	Avg	0.28	4,730.42	1,387,401.49	4,596.18	290.83
		Total	86.01	1,433,316.05	420,382,650.00	1,392,641.03	
		Qty	303.00	303.00	303.00	303.00	298.00
	Tumeric	Avg	0.41	16,300.00	9,750,000.00	15,892.50	613.50
		Total	0.41	16,300.00	9,750,000.00	15,892.50	
		Qty	1.00	1.00	1.00	1.00	1.00
	Total	Avg	0.12	916.13	336,030.68	686.87	423.67
		Total	652.95	4,919,636.20	1,804,484,753.75	3,680,261.21	
		Qty	5,370.00	5,370.00	5,370.00	5,358.00	1,033.00

3.2.2.4 Annual market sales

The total sales in the village and average sales of each household are high in Ein Yar, Kone Pa and Nang Ohn Ywa Ma (**Figure 4**). In the villages located far from the main market, Aung Bang, such as Ngoke and Tha Ae Tit, the total sales in the village and average sales of each household are much lower than other villages.

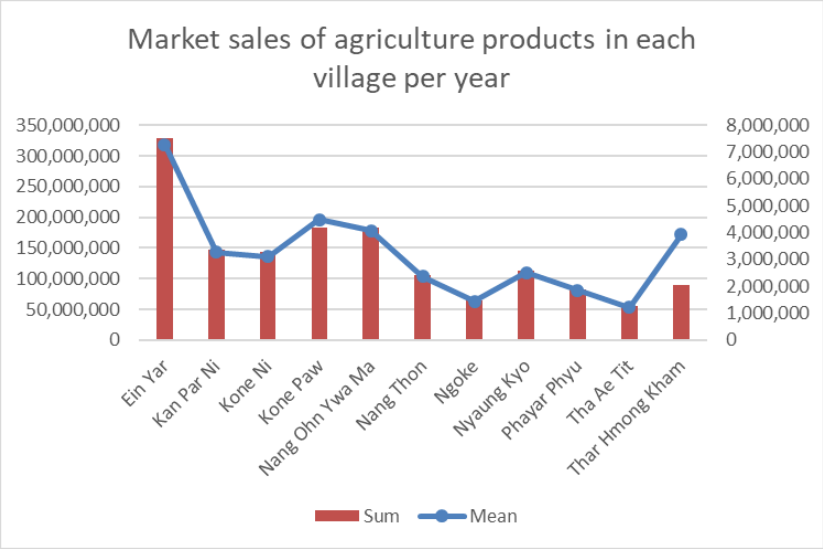


Figure 4: Annual market sales of agriculture products in each village and average per household

3.2.2.5 Annual crop production cost

Average annual crop production cost by village varies from 563,652 Kyat/year (in Ngoke) to 1,553,323 Kyat/year (in Ein Yar) (**Figure 5:**, **Table 16**). A large portion, 31% to 48%, of the total crop production cost was used for fertilizers in the target villages.

Table 16: Average annual crop production cost in the last cropping season (2018) by village

Village	Seed Cost	Fertilizer Total Cost	Irrigation Cost	Land rent	Hired labour Cost	Hired tractors Threshers, tools	Milling	Pesticides	Herbicides	Trans for purchaing inputs	Transportation of crops to house &warehouse	Transportation for sale of products	Total
Ein Yar	170,889	508,606	16,222	6,000	360,000	260,676	11,874	59,468	65,189	6,593	27,044	60,762	1,553,323
Htin Yu Kone	75,833	424,951	48,122	0	126,578	106,751	13,327	67,671	27,156	2,083	28,891	74,384	995,748
Kan Par Ni	510,744	470,000	6,667	23,333	99,067	140,878	9,853	55,189	16,700	9,660	3,833	61,965	1,407,889
Kone Ni	171,489	438,174	106,076	8,696	98,978	108,674	1,826	78,690	27,130	5,399	19,148	88,655	1,152,935
Kone Paw	353,268	433,043	45,915	8,537	112,122	173,388	4,468	101,334	37,939	7,032	41,800	86,793	1,405,638
Nang Ohn Ywa Ma	77,758	599,556	256,267	0	98,778	75,911	133	83,800	12,844	2,656	5,389	29,367	1,242,458
Nang Thon	42,853	388,011	20,389	18,889	91,733	289,644	5,711	18,587	18,883	2,807	10,833	51,160	959,501
Ngoke	113,206	197,139	1,111	0	21,178	65,422	10,018	31,467	9,367	5,948	15,544	93,253	563,652
Nyaung Kyo	450,933	514,089	4,444	0	30,556	65,206	18,376	96,511	32,944	23,556	1,711	110,327	1,348,652
Phayar Phyu	96,450	325,534	84,998	2,444	56,133	34,747	5,039	75,938	9,767	3,361	4,889	73,691	772,990
Tha Ae Tit	161,058	307,022	0	8,889	42,544	57,493	12,266	77,489	25,767	8,049	5,278	74,781	780,635
Thar Hmong Kham	38,825	245,757	51,778	5,556	101,467	236,211	3,856	8,820	8,931	2,198	1,738	54,422	759,557
Total	187,350	404,172	53,653	6,853	103,187	134,246	8,077	62,657	24,289	6,606	13,643	71,549	1,076,284

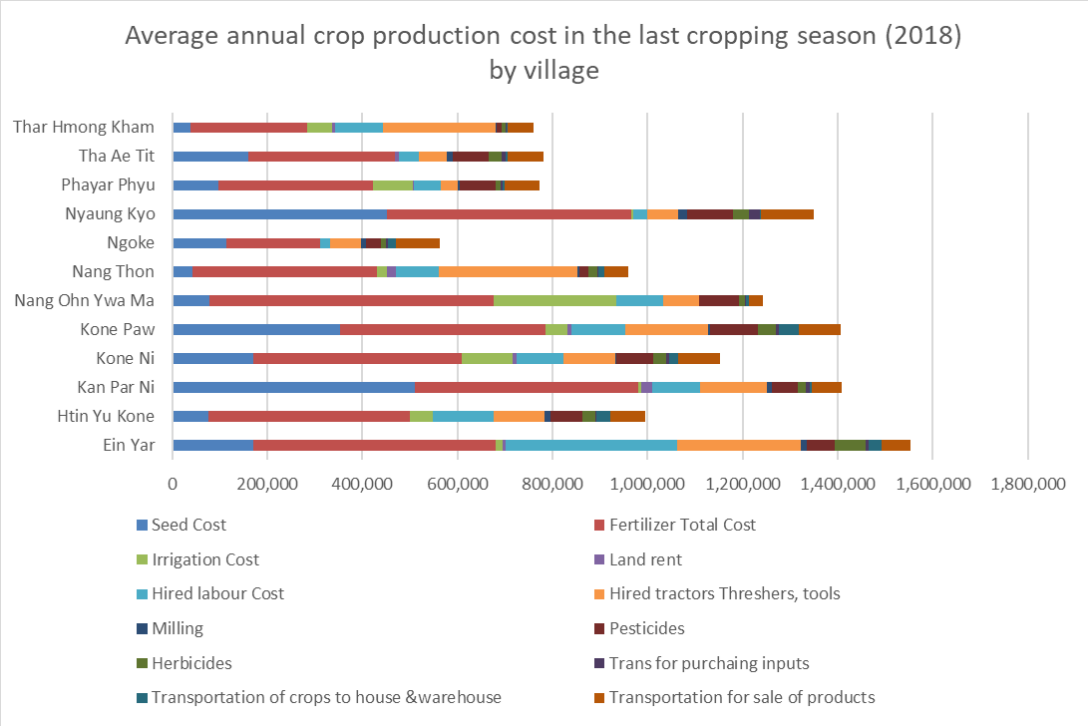


Figure 5:: Average annual crop production cost in the last cropping season (2018) by village

3.2.2.6 Fertilizers

Chemical fertilizers were used for most crops such as tomatoes, gingers and rice. In Nyaung Kyo where tomatoes, potatoes and cabbages are being mainly produced, villagers use the highest volume of chemical fertilizers per household among the 12 villages (**Figure 6**).

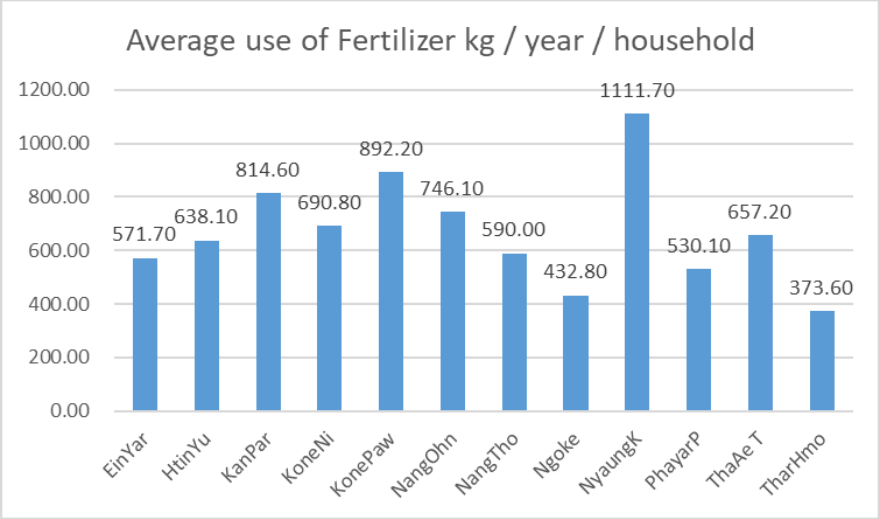


Figure 6: Average use of fertilizers

Average cost for fertilizers per household was high in Ein Ya, Nang Ohn Ywa Ma and Nyaung Kyo (**Table 17**).

Table 17: Average cost for fertilizers per household

Village	Fertilizer Grand Total Cost
Ein Yar	508,606
Htin Yu Kone	424,951
Kan Par Ni	470,000
Kone Ni	433,000
Kone Paw	382,689
Nang Ohn Ywa Ma	597,511
Nang Thon	388,011
Ngoke	197,139
Nyaung Kyo	490,378
Phayar Phyu	325,534
Tha Ae Tit	307,022
Thar Hmong Kham	245,757
Total	397,726

3.2.2.7 Pesticides

Pesticides are used for most vegetables such as tomatoes and cabbages (**Figure 7**). Highest volume of pesticides is used in Kone Paw among the 12 villages.

Their main agriculture products are tomatoes, potatoes and gingers.

According to villagers interviewed, they were instructed how to use it by the vendor briefly. It is highly needed to provide instructions to villagers how to use pesticides for improving health conditions of farm workers.

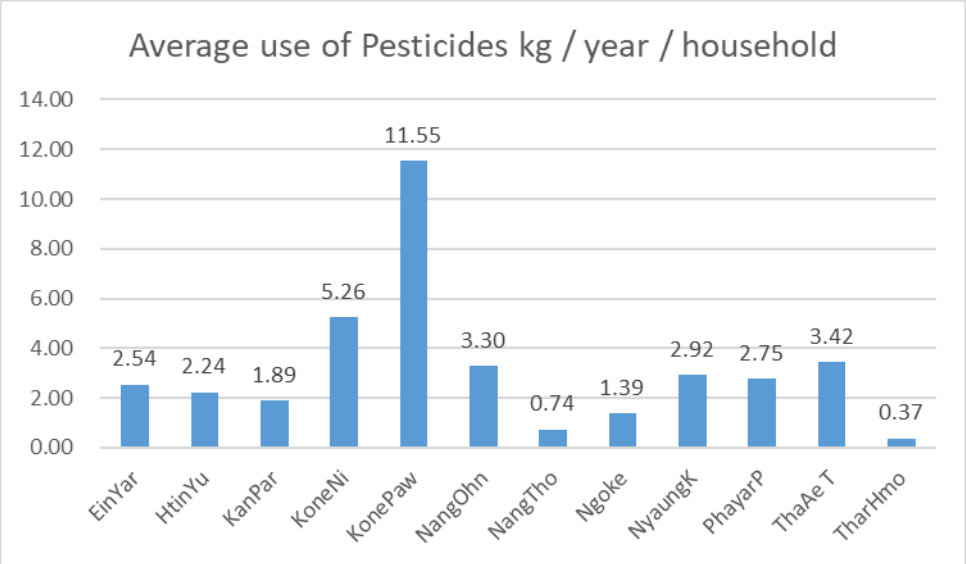


Figure 7: Average use of pesticides

3.2.2.8 Herbicides

Much herbicides are used in Ein Yar and Nang Tho (**Figure 8**). In Ein Yar, they were used for ginger, potato, tomato and rice. In Nang Tho, herbicides are also be used for chayote production.

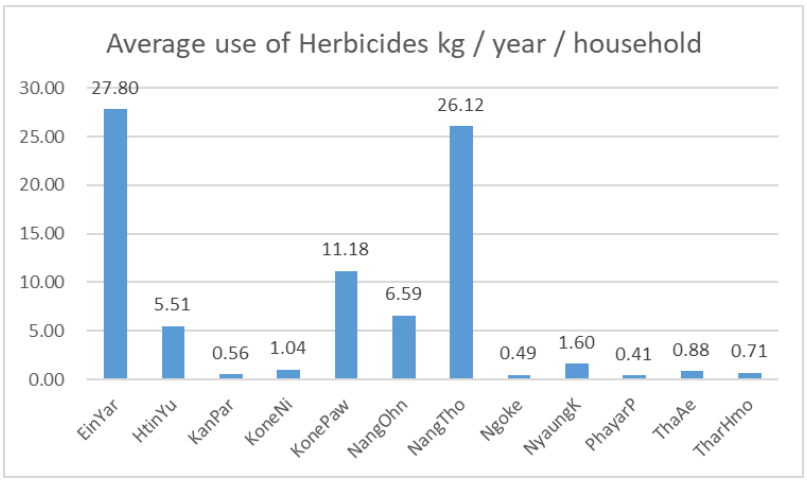


Figure 8: Average use of herbicides

3.2.2.9 Fungicides

According to the interview results of the villagers, fungicides are used for

tomatoes. The much volume was used in Nayng Kyo (**Figure 9**).

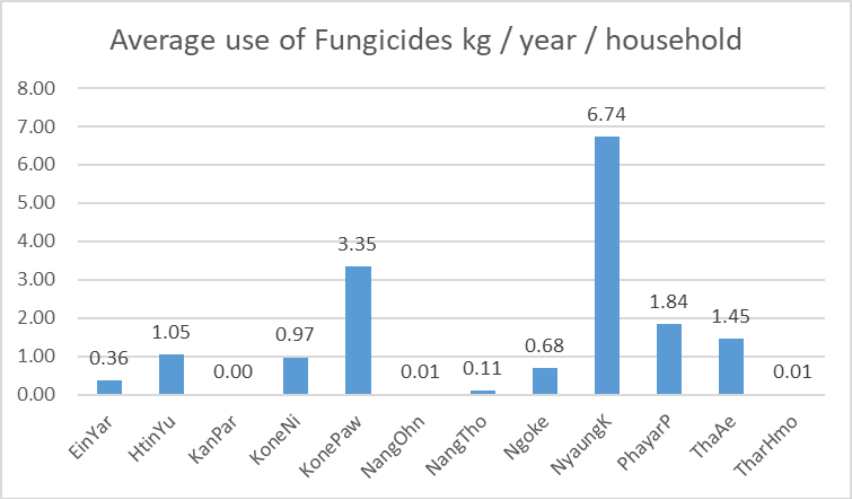


Figure 9: Average use of fungicides

3.2.2.10 Transportation

Figure 10 shows transportation cost for agricultural products. The transportation cost does not relate to the volume of products and the distance from the market, i.e. Aung Bang, because some vegetables such as cabbages are sold at their farmlands to traders. Villagers sometimes mentioned it is more beneficial for them rather than bringing their products to the markets and paying the cost for the transports.

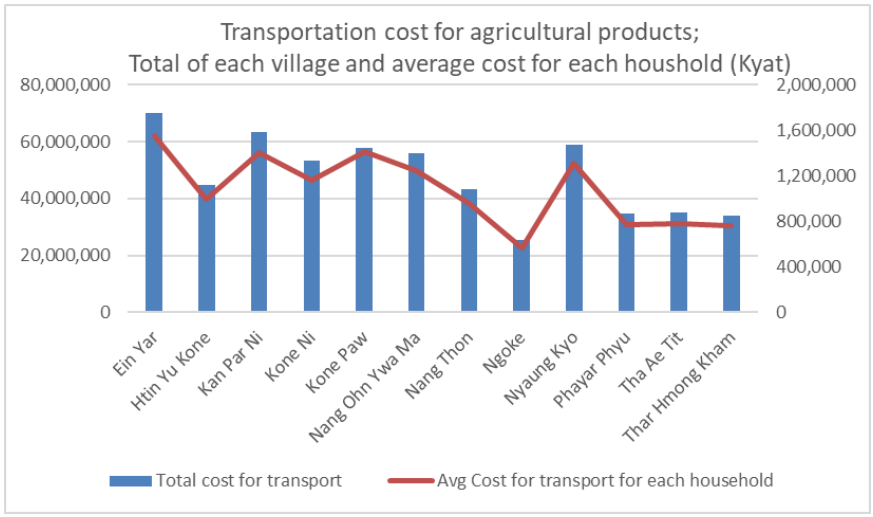


Figure 10: Transportation cost for agricultural products

3.2.2.11 Net income from agricultural practices

Figure 11 shows the average sales and cost ratio of agricultural practices in the villages. The average net income from agricultural practices per household per year is the highest in Ein Yar village, followed by Htin Yu Kone (**Table 18**). In Ein Yar, ginger is the main agricultural product that has contributed to the high income. In Htin Yu Kone, tomato is the main agricultural product. Accessibility from both villages to the main market, Aung Bang, is good.

Table 18: Average net income from agricultural practices

Village	Sales (Kyat) (A)	Cost (Kyat) (E)	Net income: (A) - (E) = (F)(Kyat)
Ein Yar	7,292,014	1,553,323	5,738,691
Htin Yu Kone	4,094,200	995,748	3,098,452
Kan Par Ni	3,278,116	1,407,889	1,870,226
Kone Ni	3,107,327	1,157,272	1,947,023
Kone Paw	4,488,137	1,413,370	3,074,767
Nang Ohn Ywa Ma	4,067,929	1,242,458	2,825,472
Nang Thon	2,363,354	959,501	1,403,853
Ngoke	1,446,891	563,652	883,238
Nyaung Kyo	2,505,378	1,313,388	1,147,892
Phayar Phyu	1,845,754	772,990	1,072,764
Tha Ae Tit	1,222,232	780,635	441,597
Thar Hmong Kham	4,737,185	759,557	3,977,628
Average	3,361,896	1,074,291	2,283,650

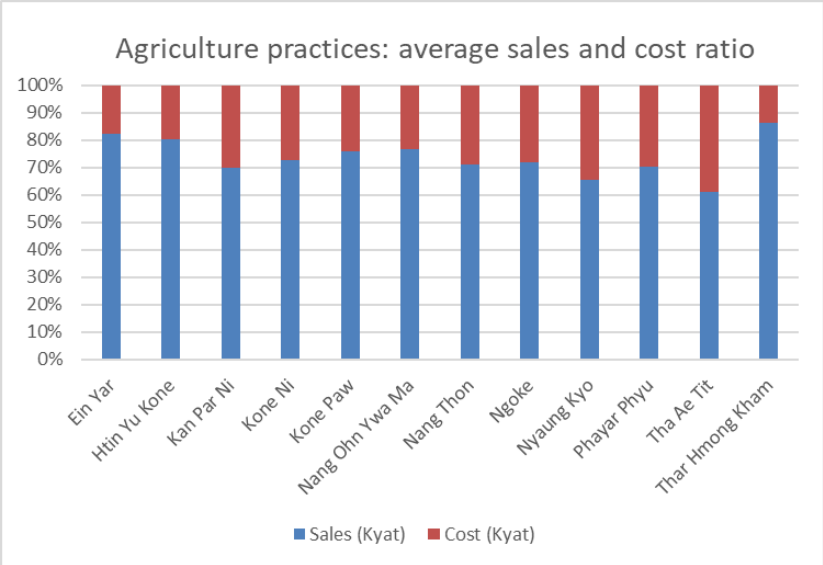


Figure 11: Average sales and cost ratio of agricultural practices

3.2.3 Major problems for crop production

Low productivity and pest/disasters are frequently answered by the villagers as the major problems for crop production (**Table 19**). Other challenges such as lack of water and lack of production maybe because of lack of water/other kinds of inputs are also frequently said.

Table 19: Major problems for crop production

Crop	Lack of Labour	Lack of land	Lack of inputs	Lack of Water	Weed	Soil fertility	Loan payment	Low productivity	Lack of production	Pests & disaster	Lack of good seed / seedlings	Lack of processing technology	Soil erosion	Others
Bean										2.0				
Butter Bean										1.0				
Cabbage		2.0		4.0	3.0	8.0		21.0	10.0	55.0	2.0		1.0	2.0
Carrot								5.0	4.0	7.0				
Cauliflower		1.0		5.0	2.0	3.0		18.0	7.0	46.0				2.0
Chayote	2.0	1.0		8.0	3.0	1.0		5.0	1.0	13.0				1.0
Chilli				5.0	2.0			9.0	4.0	12.0		1.0		
Chinese Cabbage						1.0		2.0		3.0				
Con								1.0		1.0				
Corn	1.0			9.0	7.0	7.0		12.0	1.0	33.0				
Egg Plant		1.0		3.0		1.0		4.0	2.0	11.0				
Garlic				6.0	1.0	2.0		14.0	3.0	22.0		1.0		
Ginger	4.0	4.0		15.0	22.0	19.0		63.0	22.0	128.0	1.0	2.0		9.0
Gladiolus										1.0				
Green gram				1.0						1.0				
Haricot										1.0				
Long Bean			1.0			1.0		1.0						
Mustard		1.0						1.0	1.0	7.0				
None								1.0						
Orange										1.0				
Paddy	12.0	9.0	2.0	66.0	76.0	21.0		77.0	29.0	149.0	1.0	6.0		2.0
Peanut				8.0	7.0	6.0	1.0	29.0	7.0	59.0		1.0		
Potato	3.0	5.0		23.0	5.0	12.0		52.0	16.0	165.0	4.0			3.0
Sesame				8.0	3.0	3.0		16.0	4.0	25.0		2.0		
Strawberry				1.0				2.0	1.0	2.0				2.0
Taro					2.0	1.0		1.0		1.0				
Tomato	3.0	5.0	1.0	36.0	5.0	18.0	1.0	90.0	38.0	239.0	5.0	2.0	2.0	6.0
Tumeric										1.0				
Wheat		2.0		7.0				12.0	4.0	15.0		3.0		
Total	25.0	31.0	4.0	205.0	138.0	104.0	2.0	436.0	154.0	1001.0	13.0	18.0	3.0	27.0

3.2.4 Other income

3.2.4.1 Livestock

Sometimes, net income from livestock becomes minus (loss) because their raising cost is higher than the income from them. Even so, villagers keep livestock such as caws to sell and to survive when their agricultural production is low.

Table 20: Income from livestock

Village		Net income (Kyat)	Income	Cost
Ein Yar	Mean	184,544	325,556	141,011
	N	45	45	45
	Minimum	-343,500	0	0
	Maximum	2,725,000	5,600,000	4,080,000
Htin Yu Kone	Mean	354,956	565,556	210,600
	N	45	45	45
	Minimum	-140,000	0	0
	Maximum	5,486,000	5,500,000	2,500,000
Kan Par Ni	Mean	-15,100	79,333	94,433
	N	45	45	45
	Minimum	-480,000	0	0
	Maximum	1,795,500	1,800,000	1,500,000
Kone Ni	Mean	471,509	611,087	139,578
	N	46	46	46
	Minimum	-219,500	0	0
	Maximum	6,500,000	6,500,000	2,700,000
Kone Paw	Mean	341,244	506,878	165,634
	N	41	41	41
	Minimum	-605,000	0	0
	Maximum	7,500,000	7,500,000	2,896,000
Nang Ohn Ywa Ma	Mean	397,989	435,556	37,567
	N	45	45	45
	Minimum	-120,000	0	0
	Maximum	3,500,000	3,500,000	1,100,000
Nang Thon	Mean	-1,556	0	1,556
	N	45	45	45
	Minimum	-50,000	0	0
	Maximum	0	0	50,000
Ngoke	Mean	3,378	150,444	147,067
	N	45	45	45
	Minimum	-468,000	0	0
	Maximum	1,300,000	1,300,000	915,000
Nyaung Kyo	Mean	126,978	212,222	85,244
	N	45	45	45
	Minimum	-560,000	0	0
	Maximum	4,050,000	4,050,000	2,300,000
Phayar Phyu	Mean	411	62,222	61,811
	N	45	45	45
	Minimum	-150,000	0	0
	Maximum	335,000	2,400,000	2,065,000
Tha Ae Tit	Mean	-52,033	198,000	250,033
	N	45	45	45
	Minimum	-425,000	0	0
	Maximum	490,000	2,000,000	2,100,000
Thar Hmong Kham	Mean	380,067	463,222	83,156
	N	45	45	45
	Minimum	-260,000	0	0
	Maximum	4,000,000	4,000,000	1,445,000
Total	Mean	182,056	299,883	117,827
	N	537	537	537
	Minimum	-605,000	0	0
	Maximum	7,500,000	7,500,000	4,080,000

3.2.4.2 Labour income

Income from labour was very small in the target 12 villages (**Table 21**).

Table 21: Income from labour (working for others)

Village	Mean	N	Minimum	Maximum
Ein Yar	0	45	0	0
Htin Yu Kone	0	45	0	0
Kan Par Ni	0	45	0	0
Kone Ni	405	45	0	13,000
Kone Paw	2	41	0	72
Nang Ohn Ywa Ma	7,511	45	0	90,000
Nang Thon	0	45	0	0
Ngoke	0	45	0	0
Nyaung Kyo	0	45	0	0
Phayar Phyu	4,407	45	0	182,000
Tha Ae Tit	1,456	45	0	50,000
Thar Hmong Kham	20	45	0	288
Total	1,159	536	0	182,000

3.2.4.3 Others (timber, NTFP)

Quite few villagers obtained income from timber and NTFPs (**Table 22**). Income from timber and NTFPs was high at Htin Yu Kone. However, in Kone Paw and Nang Thon, there is no income from timber and NTFPs.

Table 22: Income from others (timber, NTFP)

Village	Mean	Minimum	Maximum
Ein Yar	5,678	0	1,277,500
Htin Yu Kone	120,818	0	14,400,000
Kan Par Ni	66,820	0	7,200,000
Kone Ni	14,348	0	1,800,000
Kone Paw	0	0	0
Nang Ohn Ywa Ma	52,143	0	1,983,000
Nang Thon	0	0	0
Ngoke	83,631	0	1,642,500
Nyaung Kyo	889	0	200,000
Phayar Phyu	3,111	0	300,000
Tha Ae Tit	933	0	210,000
Thar Hmong Kham	26,378	0	1,825,000
Total	31,430	0	14,400,000

3.2.5 Cash expenses

Questions about cash expenses for the main items for their livelihood such as rice, maze meat, etc. were asked to villagers. They were grouped into five categories i.e. Plant-derived food, Animal-derived food, Drink seasonings and oil, Social activities, and Others. Of them, expenses on plant-derived food was the highest followed by animal-derived food and others (**Figure 12**, **Table 23**). In the cost for other categories, the telephone cost was the highest at 34% for the total of the other cost. It should also be noted that 15% of the expenses was spent for the social activities such as donations.

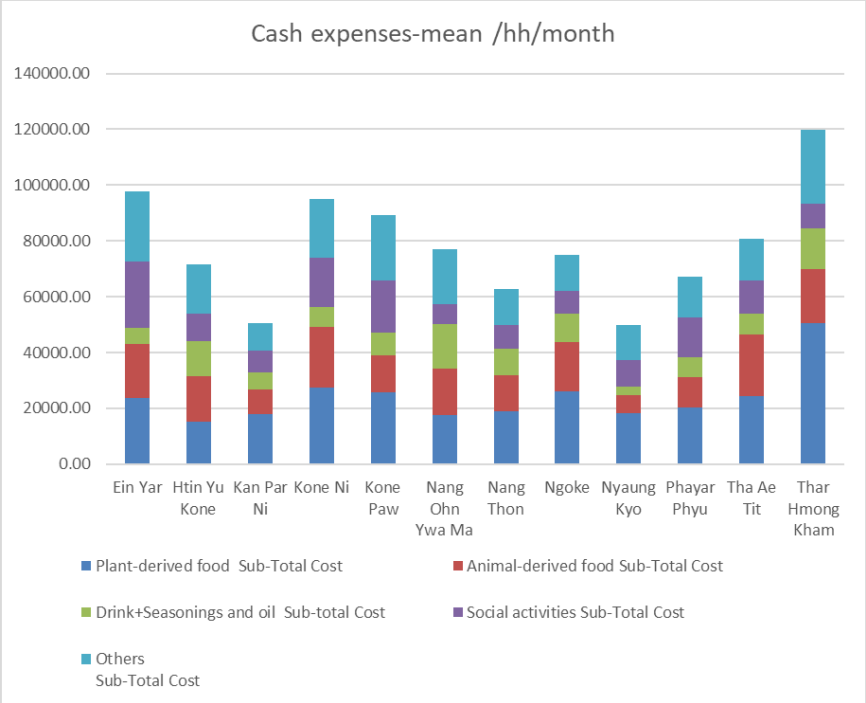


Figure 12: Monthly cash expenses per household

Table 23: Average expenditure for food, drink etc. per household

Village	Plant-derived food Sub-Total Cost	Animal-derived food Sub-Total Cost	Drink+Seasonings and oil Sub-total Cost	Social activities Sub-Total Cost	Others Sub-Total Cost	Total Cost
Ein Yar	23,582	19,302	6,032	23,740	25,164	97,821
Htin Yu Kone	15,131	16,484	12,500	9,756	17,609	71,480
Kan Par Ni	18,021	8,584	6,409	7,642	9,783	50,440
Kone Ni	27,375	21,680	7,143	17,617	21,326	95,142
Kone Paw	25,842	12,971	8,192	18,934	23,288	89,227
Nang Ohn Ywa Ma	17,618	16,578	16,142	6,956	19,661	76,954
Nang Thon	19,056	12,707	9,662	8,331	12,942	62,698
Ngoke	26,029	17,627	10,418	7,924	12,940	74,938
Nyaung Kyo	18,387	6,202	3,011	9,753	12,532	49,886
Phayar Phyu	20,330	10,758	7,104	14,253	14,556	67,001
Tha Ae Tit	24,475	21,904	7,674	11,597	14,928	80,578
Thar Hmong Kham	50,387	19,577	14,628	8,789	26,344	119,724
Total	23,844	15,394	9,079	12,067	17,554	77,939
Ein Yar	24%	20%	6%	24%	26%	100%
Htin Yu Kone	21%	23%	17%	14%	25%	100%
Kan Par Ni	36%	17%	13%	15%	19%	100%
Kone Ni	29%	23%	8%	19%	22%	100%
Kone Paw	29%	15%	9%	21%	26%	100%
Nang Ohn Ywa Ma	23%	22%	21%	9%	26%	100%
Nang Thon	30%	20%	15%	13%	21%	100%
Ngoke	35%	24%	14%	11%	17%	100%
Nyaung Kyo	37%	12%	6%	20%	25%	100%
Phayar Phyu	30%	16%	11%	21%	22%	100%
Tha Ae Tit	30%	27%	10%	14%	19%	100%
Thar Hmong Kham	42%	16%	12%	7%	22%	100%
Total	**31%**	**20%**	**12%**	**15%**	**23%**	**100%**

Average of annual cash expense per household for others is categorized into four groups, i.e. Clothes, Education, House items, and Others (**Figure 13**, **Table 24**). Clothes were the highest expenses followed by others. In others, payment of interests of credit was the highest.

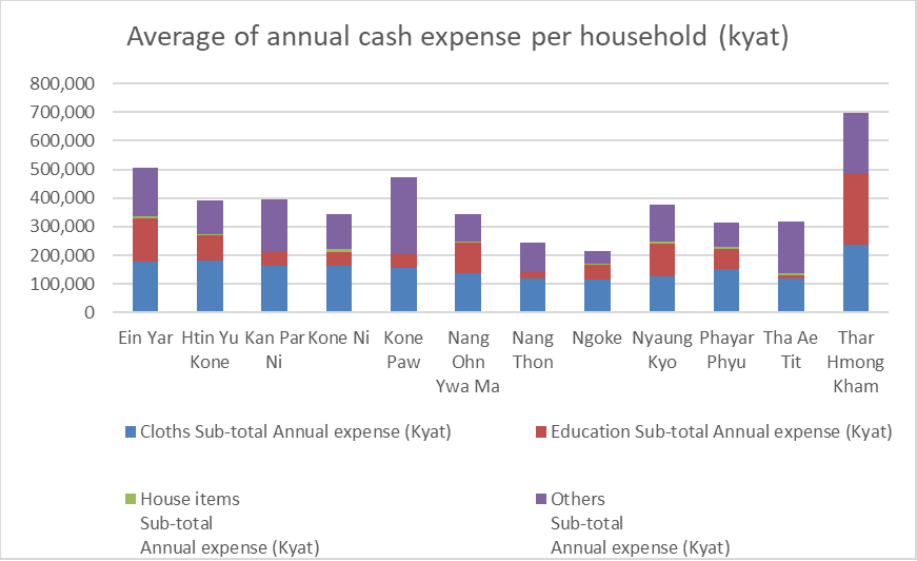


Figure 13: Average annual cash expenses per household for others (Clothes, Education, House items, and Others)

Table 24: Average expenditure for others

Village	Cloths Sub-total Annual expense (Kyat)	Education Sub-total Annual expense (Kyat)	House items Sub-total Annual expense (Kyat)	Others Sub-total Annual expense (Kyat)	Total
Ein Yar	177,113	150,978	9,433	169,311	506835.556
Htin Yu Kone	182,024	89,153	1,800	120,000	392,978
Kan Par Ni	162,856	46,260	1,300	184,958	395,373
Kone Ni	162,450	48,220	12,496	119,459	342,624
Kone Paw	156,307	46,680	1,354	268,346	472,688
Nang Ohn Ywa Ma	137,413	106,831	2,556	96,800	343,600
Nang Thon	119,456	19,833	2,333	104,151	245,773
Ngoke	116,793	51,000	1,178	44,929	213,900
Nyaung Kyo	127,789	111,611	10,000	125,756	375,156
Phayar Phyu	152,589	70,327	5,267	85,857	314,039
Tha Ae Tit	118,956	11,729	6,256	182,296	319,236
Thar Hmong Kham	236,096	250,747	444	209,176	696,462
Total	154,153	83,823	4,573	141,607	384,156
Ein Yar	35%	30%	2%	33%	100%
Htin Yu Kone	46%	23%	0%	31%	100%
Kan Par Ni	41%	12%	0%	47%	100%
Kone Ni	47%	14%	4%	35%	100%
Kone Paw	33%	10%	0%	57%	100%
Nang Ohn Ywa Ma	40%	31%	1%	28%	100%
Nang Thon	49%	8%	1%	42%	100%
Ngoke	55%	24%	1%	21%	100%
Nyaung Kyo	34%	30%	3%	34%	100%
Phayar Phyu	49%	22%	2%	27%	100%
Tha Ae Tit	37%	4%	2%	57%	100%
Thar Hmong Kham	34%	36%	0%	30%	100%
Total	40%	22%	1%	37%	100%

Average annual cash expenses are summarized below. The following basic livelihood expenditure such as food and cloth cost, education, telephone and credit payment are high expenses (**Figure 14**).

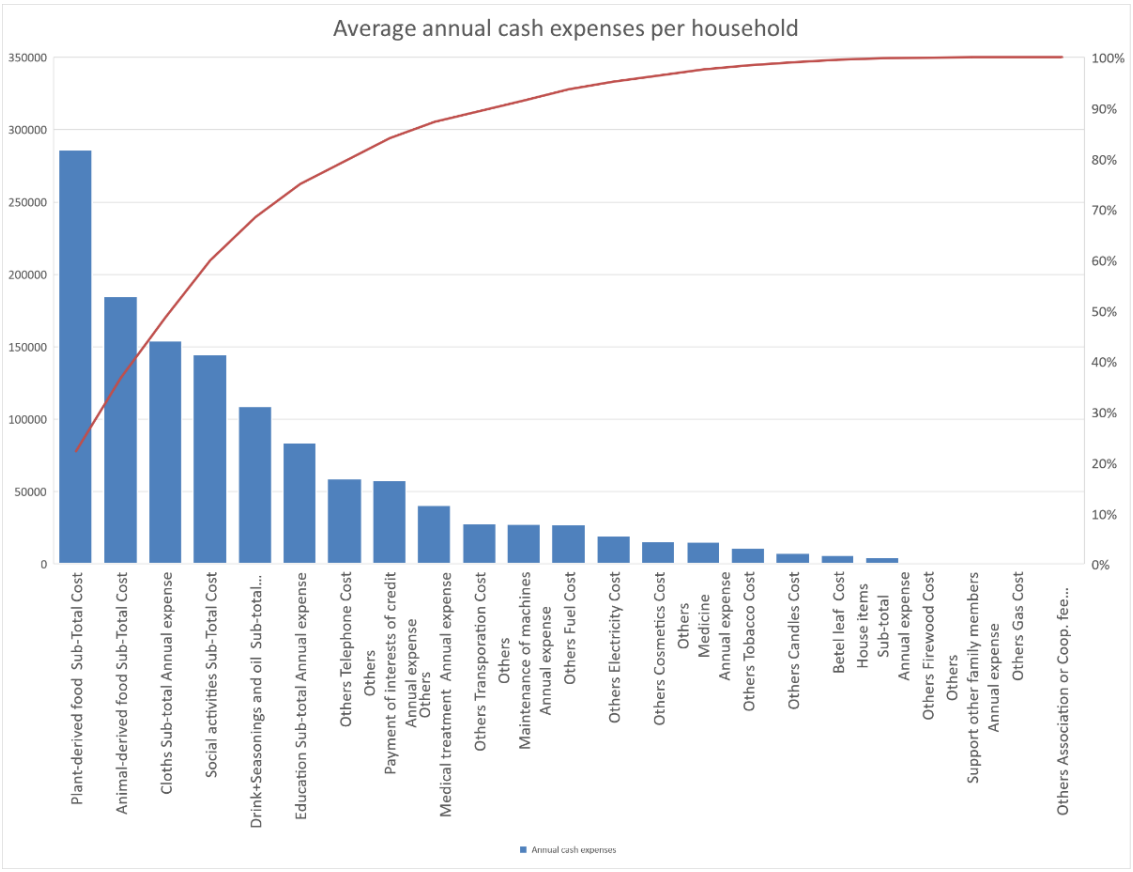


Figure 14: Summary of average annual cash expenses

3.2.6 Total net income

Average total net income per household is varied from -786, 859 kyat to 5,692,997 kyat / household / year (**Table 25**, **Figure 15**). This net income is calculated from all income sources and expenses but not including debt. The net income of Thar Hmon Kham is the highest in the 12 villages. At Thar Hmon Kham, the main agricultural products are chayote and rice. They are spending less for the production for chayote which has contributed to the higher net income. On the other hand, the net income of Tha Ae Tit is the lowest due to the harsh environment such as limited water sources and limited suitable areas for agricultural production.

Table 25: Average total net income per household

Village	Net income (crop, livestock, etc)	Annual expenses	Income minus expense
Ein Yar	6,461,158	1,570,764	4,890,394
Htin Yu Kone	4,506,071	1,242,258	3,263,813
Kan Par Ni	2,516,895	1,046,653	1,470,242
Kone Ni	3,077,216	1,517,254	1,559,962
Kone Paw	3,426,089	1,568,098	1,857,991
Nang Ohn Ywa Ma	4,141,063	1,224,173	2,916,889
Nang Thon	2,077,186	1,136,307	940,879
Ngoke	1,470,105	1,280,689	189,416
Nyaung Kyo	1,367,061	1,102,764	264,298
Phayar Phyu	1,241,931	1,026,879	215,052
Tha Ae Tit	444,230	1,231,089	-786,859
Thar Hmong Kham	7,661,539	1,968,542	5,692,997
Average	3,197,295	1,324,844	1,872,451

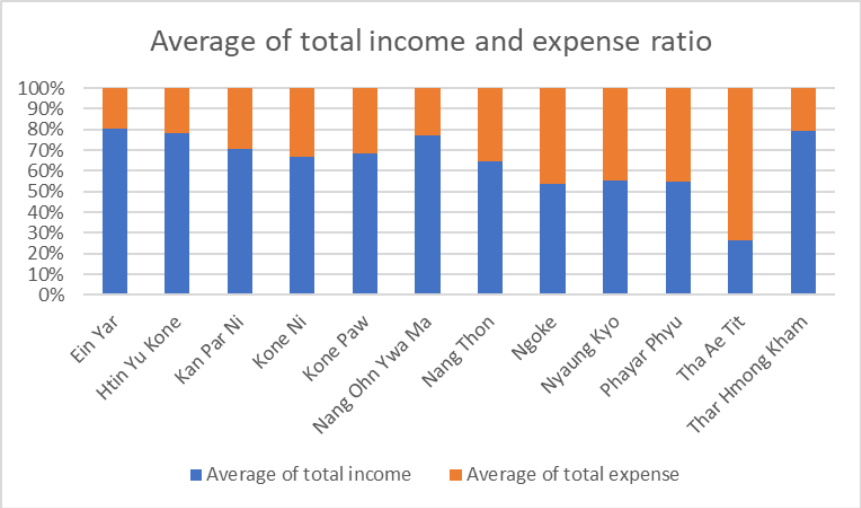


Figure 15: Average of total net income not including debt

3.2.7 Debt

The debt amount is varied in the 12 villages (**Figure 16**, **Table 26**). In Thar Hmong Kham village most villagers borrow money from Korean Project "Saemual Undong Project". Total annual debt including interest payment per household is 603,211 kyat. In Ein Yar, Koni, Ngoke and Phayar Phyu, the debt amount is low. The lenders for villagers are varied such as banks, traders, government, NGOs etc.

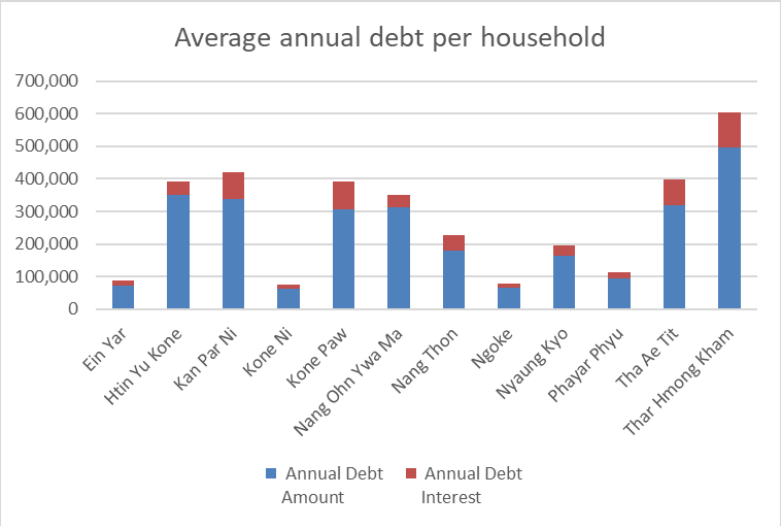


Figure 16: Average annual debt per household

Table 26: Average annual debt per household

Village	Annual Debt Amount	Annual Debt Interest	Annual Debt Total Amount
Ein Yar	71,111	16,067	87,178
Htin Yu Kone	351,111	42,133	393,244
Kan Par Ni	338,222	82,613	555,480
Kone Ni	60,870	14,935	75,804
Kone Paw	305,244	86,605	416,678
Nang Ohn Ywa Ma	312,222	38,133	350,356
Nang Thon	178,889	48,644	227,533
Ngoke	64,889	13,440	78,329
Nyaung Kyo	163,111	33,367	196,478
Phayar Phyu	93,556	19,512	113,068
Tha Ae Tit	318,889	80,178	399,067
Thar Hmong Kham	495,556	107,656	603,211
Total	228,594	48,261	290,034

3.2.8 Difficulties in making life

Major difficulties for villagers to make their life are low cash income, unstable prices, lack of electricity, inadequate crops for sales, and natural disasters (**Figure 17**). Also, loan payment, insufficient crops to eat and water were expressed as difficulties.

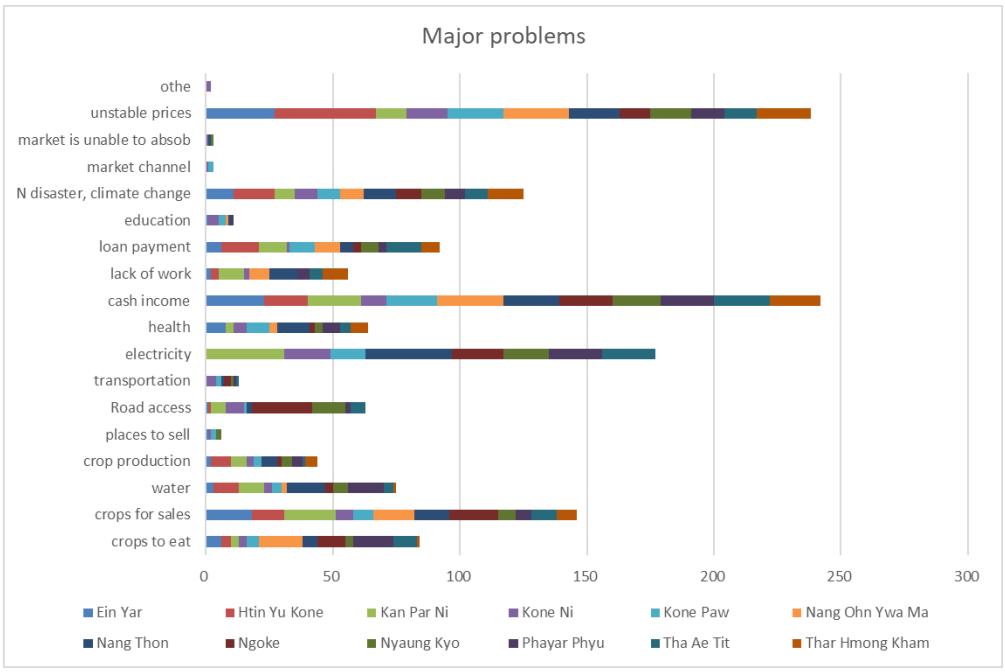


Figure 17: Difficulties in making life

According to the survey results, as aspired by the villagers, better animal production is the most important item to improve their livelihood, followed by electrification, processing of agricultural products and education (**Figure 18**). Access to water is answered but not by many villagers. This may be attributed to the fact that most of them have good access to water in this area.

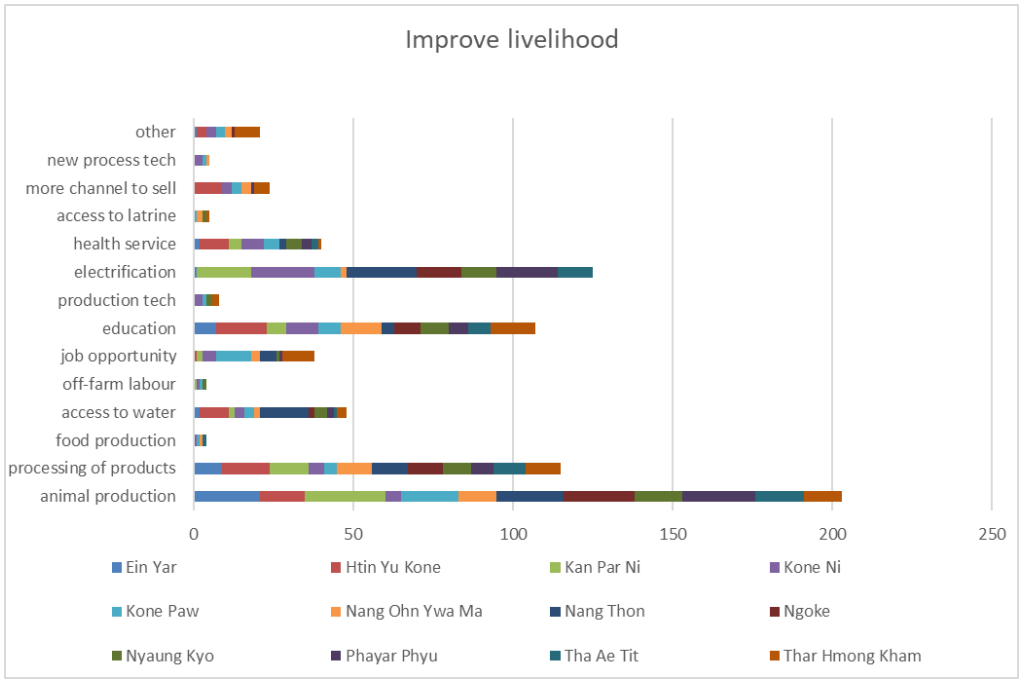


Figure 18: Items to improve villagers' lives

3.2.9 Services from the government

Services from the Government are recognized by not many villagers. As one of the few services, agriculture training and seedling distribution are recognized (**Figure 19**).

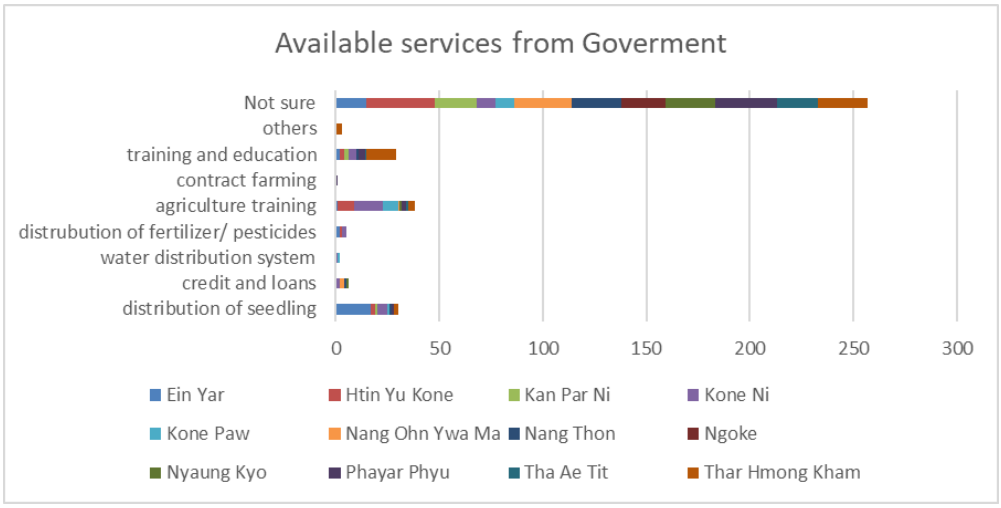


Figure 19: Available services from the Government

As services from Forest Department, seedling distribution, tree planting training and community forest are recognized by villagers (**Figure 20**).

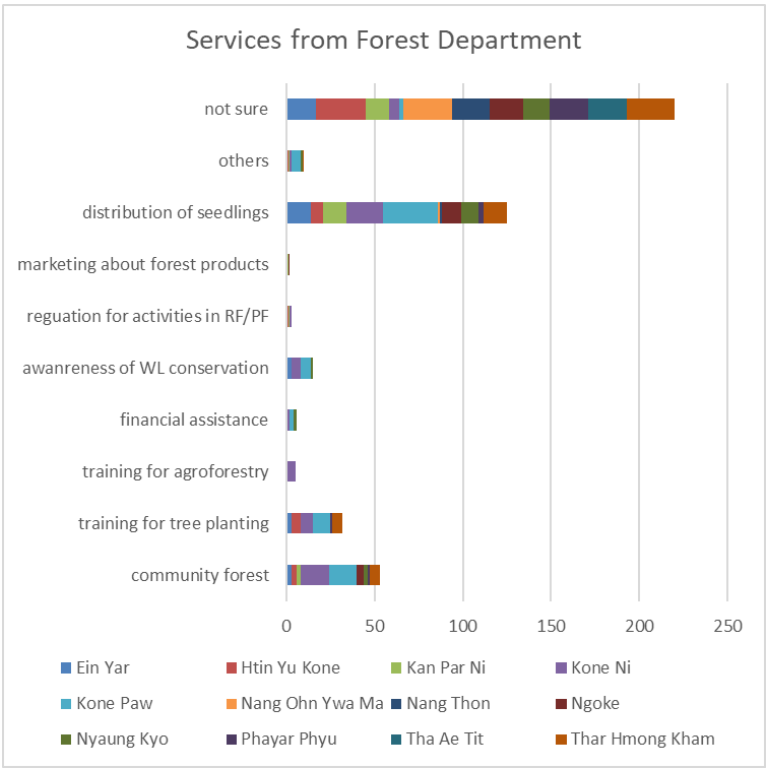


Figure 20: Services from Forest Department

3.2.10 Amount of timbers/bamboos for house construction

Figure 21, **Figure 22**, **Table 27** and **Table 28** show data related to amount of timbers/bamboos for house construction in the target villages. About 100 pieces of timbers were used for a house construction. One piece of timber is approximately 0.15 m^3 of volume based on 2 inch x 4 inch x 10 feet (120 inch) dimension. On average in the twelve villages, the constructed houses last around 18 years before re-built.

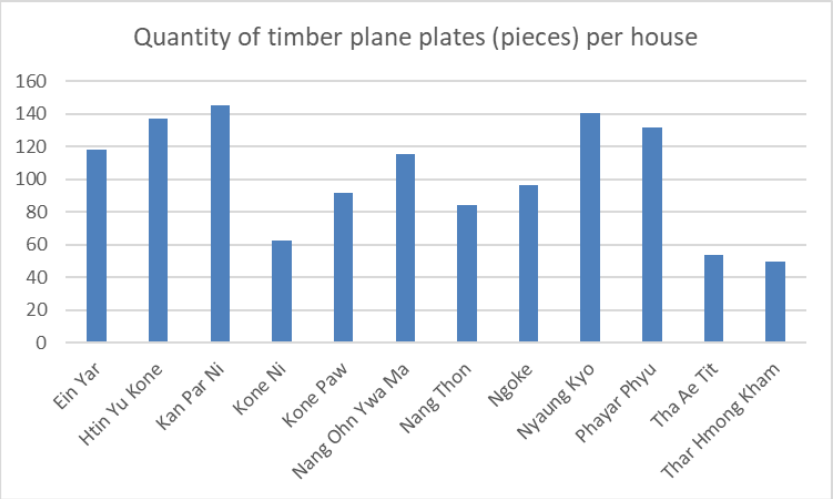


Figure 21: Quantity of timber plane plates (piece)

Table 27: Years before re-built houses

Village	Quantity of timber plane plates (pieces) (one piece = m3)	Years before re-built
Ein Yar	118	16
Htin Yu Kone	137	18
Kan Par Ni	145	20
Kone Ni	62	19
Kone Paw	92	12
Nang Ohn Ywa Ma	115	18
Nang Thon	84	18
Ngoke	97	18
Nyaung Kyo	141	23
Phayar Phyu	132	17
Tha Ae Tit	54	17
Thar Hmong Kham	49	21
Total	108	18

Also, about 150 poles of bamboo are used for roofs, ceilings and rails for staircases when constructing houses.

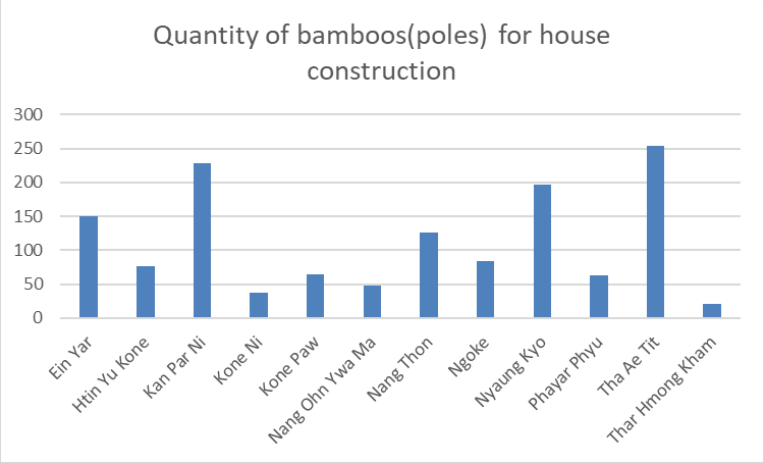


Figure 22: Quantity of bamboo poles used for a house construction

Table 28: Bamboo poles used for a house construction

Village	Mean	Minimum	Maximum	N
Ein Yar	150	100	250	6
Htin Yu Kone	76	15	200	17
Kan Par Ni	228	11	700	28
Kone Ni	38	20	100	7
Kone Paw	64	10	200	10
Nang Ohn Ywa Ma	48	2	150	11
Nang Thon	126	2	400	34
Ngoke	83	7	220	28
Nyaung Kyo	196	15	1,200	29
Phayar Phyu	63	11	200	17
Tha Ae Tit	253	15	1,000	44
Thar Hmong Kham	21	11	30	2
Total	148	2	1,200	233

3.2.11 Problems related with Inle Lake

3.2.11.1 Perception about problems in Inle Lake

Quality of water was the most frequently answered as the problems happening in Inle Lake, followed by the soil flowing into the lake (**Figure 23**, **Table 29**). Quality of water and quantity of fish were not so much concerned by the villagers who live in the upper stream of the watershed.

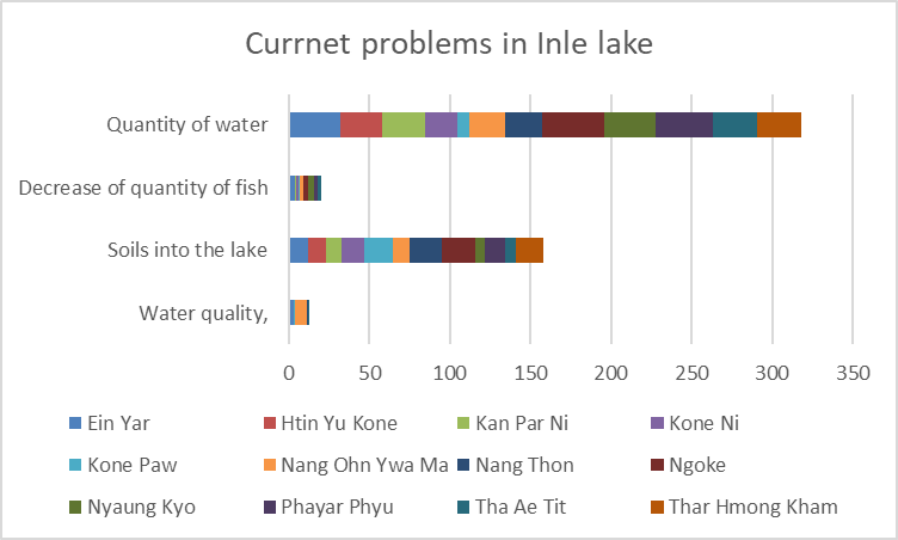


Figure 23: Current problems in Inle Lake

Table 29: Current problems in Inle Lake

Village	Water quality,	Soils into the lake	Decrease of quantity of fish	Quantity of water
Ein Yar	3	12	4	32
Htin Yu Kone		11		26
Kan Par Ni		10	1	27
Kone Ni		14	1	20
Kone Paw	1	18	1	7
Nang Ohn Ywa Ma	7	10	2	22
Nang Thon	1	20		23
Ngoke		21	3	39
Nyaung Kyo		6	4	32
Phayar Phyu		12	2	35
Tha Ae Tit	1	7	2	28
Thar Hmong Kham		17		27
Total	13	158	20	318

3.2.11.2 Causes of the problems

Most villagers considered deforestation was the cause of the problems; i.e. reduced quantity of water and increased amount of soil flowing into the lake as shown above (**Figure 24**, **Table 30**). Climate change was also frequently answered, which mainly mean the unstable rainfall pattern compared with the past years and lack of rain in the dry season.

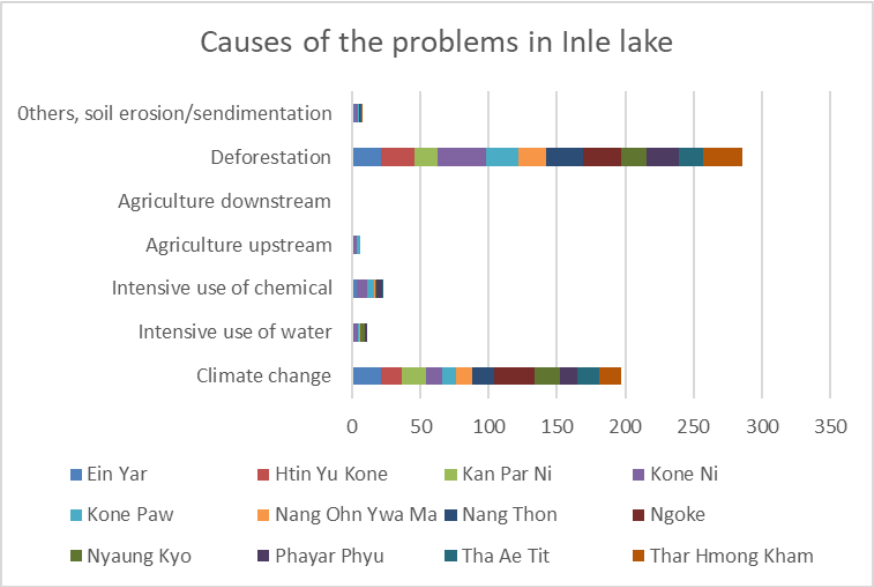


Figure 24: Causes of problems in Inle Lake

Table 30: Causes of problems in Inle Lake

Village	Climate change	Intensive use of water	Intensive use of chemical	Agriculture upstream	Agriculture downstream	Deforestation	0thers, soil erosion/sendimentation
Ein Yar	21	1	3			21	2
Htin Yu Kone	15					25	
Kan Par Ni	18			1		17	
Kone Ni	12	3	8	2		35	2
Kone Paw	10	1	5	3	1	24	1
Nang Ohn Ywa Ma	12	1	1			20	
Nang Thon	16					27	
Ngoke	30					28	
Nyaung Kyo	18	3	1			19	
Phayar Phyu	13	2	4			23	1
Tha Ae Tit	16		1			18	1
Thar Hmong Kham	16					29	1
Total	197	11	23	6	1	286	8

3.2.11.3 Soil erosion

About 28% of villagers interviewed recognized there was soil erosion around their farmland and 72% responded it was not (**Figure 25**, **Table 31**). Higher percentage of villagers who live in the south of the Kalaw watershed, such as Ngoke, Kone Ni and Nyaung Kyo, considered there was problems of soil erosion.

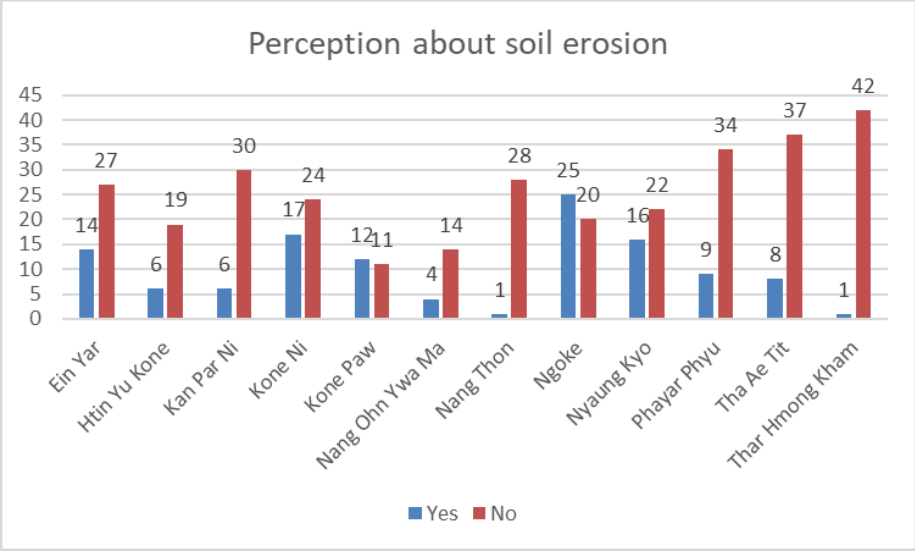


Figure 25: Perception about existence of soil erosion

Table 31: Perception about existence of soil erosion

Village	Yes	No
Ein Yar	14	27
Htin Yu Kone	6	19
Kan Par Ni	6	30
Kone Ni	17	24
Kone Paw	12	11
Nang Ohn Ywa Ma	4	14
Nang Thon	1	28
Ngoke	25	20
Nyaung Kyo	16	22
Phayar Phyu	9	34
Tha Ae Tit	8	37
Thar Hmong Kham	1	42
Total	119	308

3.2.11.4 Practices for soil erosion control

People practice soil erosion control by themselves by utilizing vegetation covers (**Figure 26**, **Table 32**). Some have experiences of making check dams with concrete or the wood and stones which were most probably done with the initiative of FD.

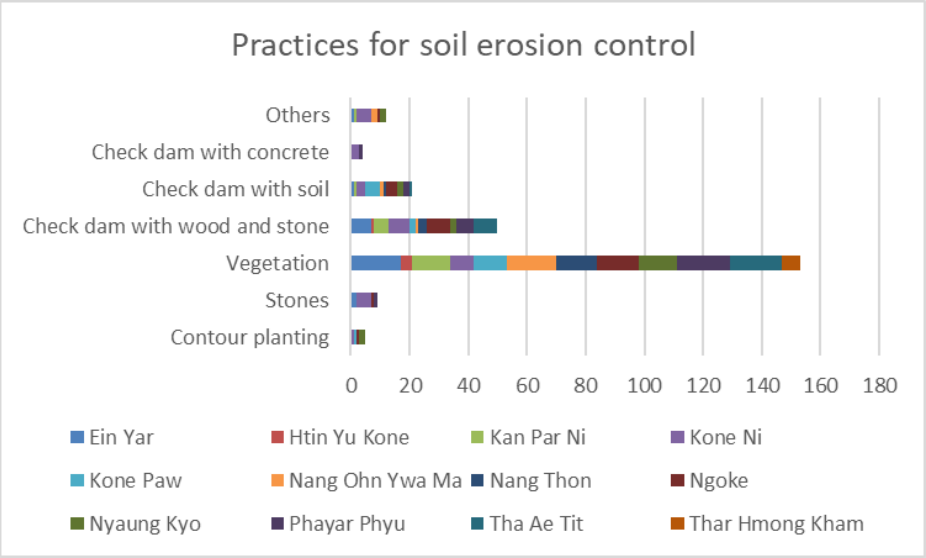


Figure 26: Practices for soil erosion control

Table 32: Practices for soil erosion control

	Contour planting	Stones	Vegetation	Check dam with wood and stone	Check dam with soil	Check dam with concrete	Others
Ein Yar		2	17	7	1		1
Htin Yu Kone			4	1			
Kan Par Ni			13	5	1		1
Kone Ni	1	5	8	7	3	3	5
Kone Paw	1		11	2	5		
Nang Ohn Ywa Ma			17	1	1		2
Nang Thon			14	3	1		
Ngoke	1	1	14	8	4		1
Nyaung Kyo	2		13	2	2		2
Phayar Phyu		1	18	6	2	1	
Tha Ae Tit			18	8	1		
Thar Hmong Kham			6				
Total	5	9	153	50	21	4	12

3.2.12 Organic farming

There are quite a few numbers of households using organic fertilizers, 226 out of 537 (**Figure 27**, **Table 33**). They purchased it from other people sometimes from the market and spent 356, 442 kyat per year.

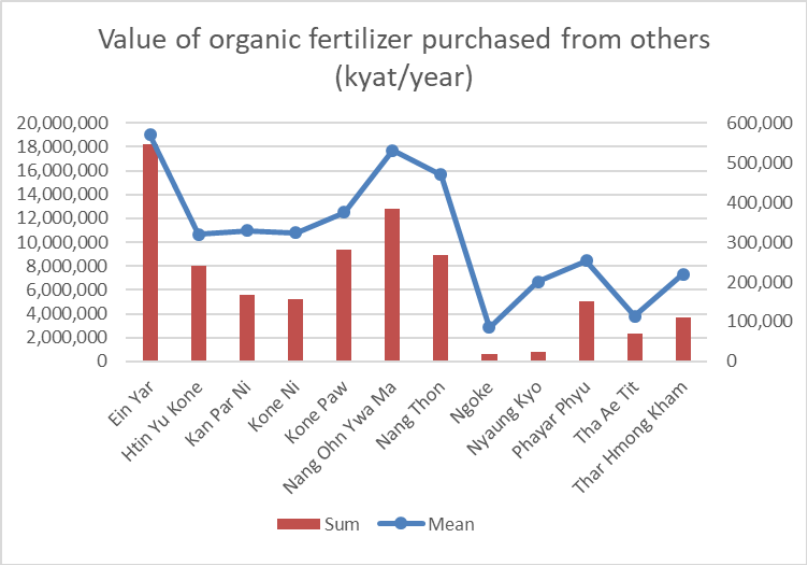


Figure 27: Value of organic fertilizer purchased from others

Table 33: Organic fertilizer purchase (kyat/year)

Village	Mean	Sum	N
Ein Yar	569,813	18,234,000	32
Htin Yu Kone	319,200	7,980,000	25
Kan Par Ni	328,824	5,590,000	17
Kone Ni	323,750	5,180,000	16
Kone Paw	375,600	9,390,000	25
Nang Ohn Ywa Ma	531,667	12,760,000	24
Nang Thon	470,000	8,930,000	19
Ngoke	86,000	602,000	7
Nyaung Kyo	200,000	800,000	4
Phayar Phyu	253,500	5,070,000	20
Tha Ae Tit	114,500	2,290,000	20
Thar Hmong Kham	219,412	3,730,000	17
Total	356,442	80,556,000	226

3.3 Summary of the socio-economic survey results

Ginger, rice and tomato are the main agriculture products in the target 12 villages. They are mainly sold at Aung Bang market, from which these products are sold to other cities such as Nay Pyi Taw, Mandalay and Yangon.

The average net income from agricultural practices per household per year is the highest in Ein Yar village, followed by Htin Yu Kone. In Ein Yar, Ginger is the main marketing agricultural product, while it is tomato and ginger in Htin yu Kone which are contributing to their higher income.

Average annual crop production cost by village varies from 563,652 Kyat/year in Ngoke to 1,553,323 Kyat/year in Ein Yar. Much amount, 31% to 48%, of the total crop

production cost was used for fertilizers in the target villages.

A large amount of chemicals for agriculture production such as herbicides and fungicides have been used. Villagers were instructed how to use those herbicides and fungicides and the quantity by the shops where they bought them.

Chemical fertilizers were used for most crops which is the major cost for agricultural production. In Nyaung Kyo, the sales were not so high and the input such as chemical fertilizers were high which in turn reduced their total income from agricultural practices.

As the current problems Inle Lake, the high percentage of villagers answered the water quantity was the problem, followed by soils flowing into the lake. They were not much concerned about the quality of water and quantity of fish, probably because they live upper stream of the Lake watershed. As the cause of the problems occurring in Inle Lake, deforestation and climate change were told by villagers most frequently.

Major difficulties for villagers to make their lives are inadequate cash income and unstable prices. This is caused probably because they are contacting with traders individually and are not organized, for instance, they have no cooperatives.

4 Market survey of agricultural products

4.1 Methods

4.1.1 Survey operation

Government data and market data were collected. The government data were collected from Kalaw, Pinlaung, Yuwangan, Nyaug Shwe and Pindaya Market data were collected from the six main markets around Inle Lake; Aung Ban, Heho, Mine Thaunt, Nyaung Shwe, Shwe Nyaung, Than Daung.

Implementor: FREDA

4.1.2 Timeline

May–August, 2019

4.1.3 Data collection

The following data were collected as in Table 34.

Table 34: Collected data from the Government departments and six markets

Item	Contents
Government agriculture	Area of cultivated Rainfed Crops (Cultivated Acre)
Market survey	Unit price and original production location of Staple food, Meat, Fruit, Vegetables, Wood, Flower NTFP, Trend of products

4.2 Results of market survey

4.2.1 Government statistics by township

The data produced by the government are Completing Condition of cultivated Rainfed Crops (Cultivated Acre) in Kalaw, Pinlaung and Yuwangan in 2017–2018 season and at Nyaug Shwe and Pindaya in 2018–2019 season (**Figure 28**, **Figure 29**).

The largest areas are used for upland (non-irrigated) and farmland (irrigated) rice, followed by corns (maize), other beans, potatoes, fruits etc. Recently, it looks production of tomatoes and cabbages have been increased but the results have not been added to the obtained data.

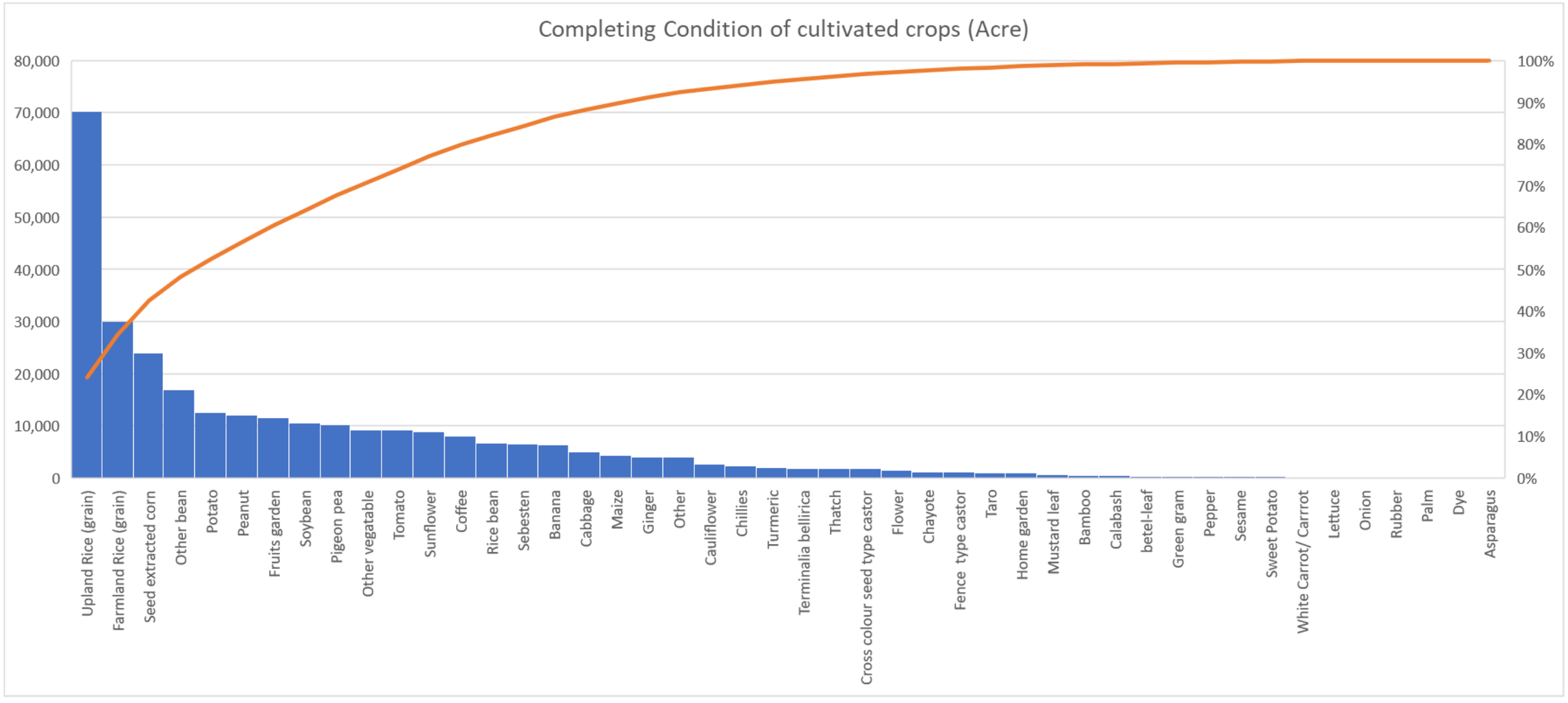
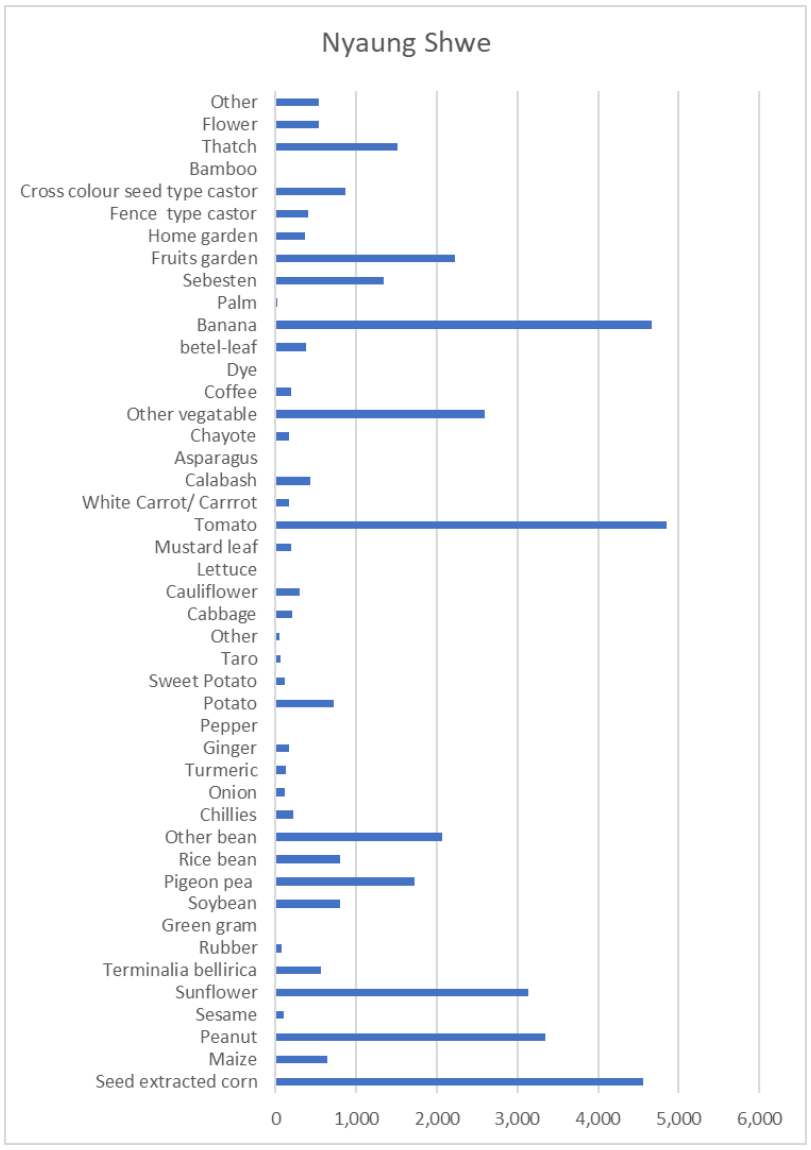


Figure 28: Area of cultivated Rainfed Crops (Cultivated Acre) by Government statistics

Sum of the data at Kalaw, Pinlaung and Yuwangan in 2017–2018 season and at Nyaug Shwe and Pindaya in 2018–2019 season


Nyaung Shwe
Other
Flower
Thatch
Bamboo
Cross colour seed type castor
Fence type castor
Home garden
Fruits garden
Sebesten
Palm
Banana
betel-leaf
Dye
Coffee
Other vegatable
Chayote
Asparagus
Calabash
White Carrot/ Carrrot
Tomato
Mustard leaf
Lettuce
Cauliflower
Cabbage
Other
Taro
Sweet Potato
Potato
Pepper
Ginger
Turmeric
Onion
Chillies
Other bean
Rice bean
Pigeon pea
Soybean
Green gram
Rubber
Terminalia bellirica
Sunflower
Sesame
Peanut
Maize
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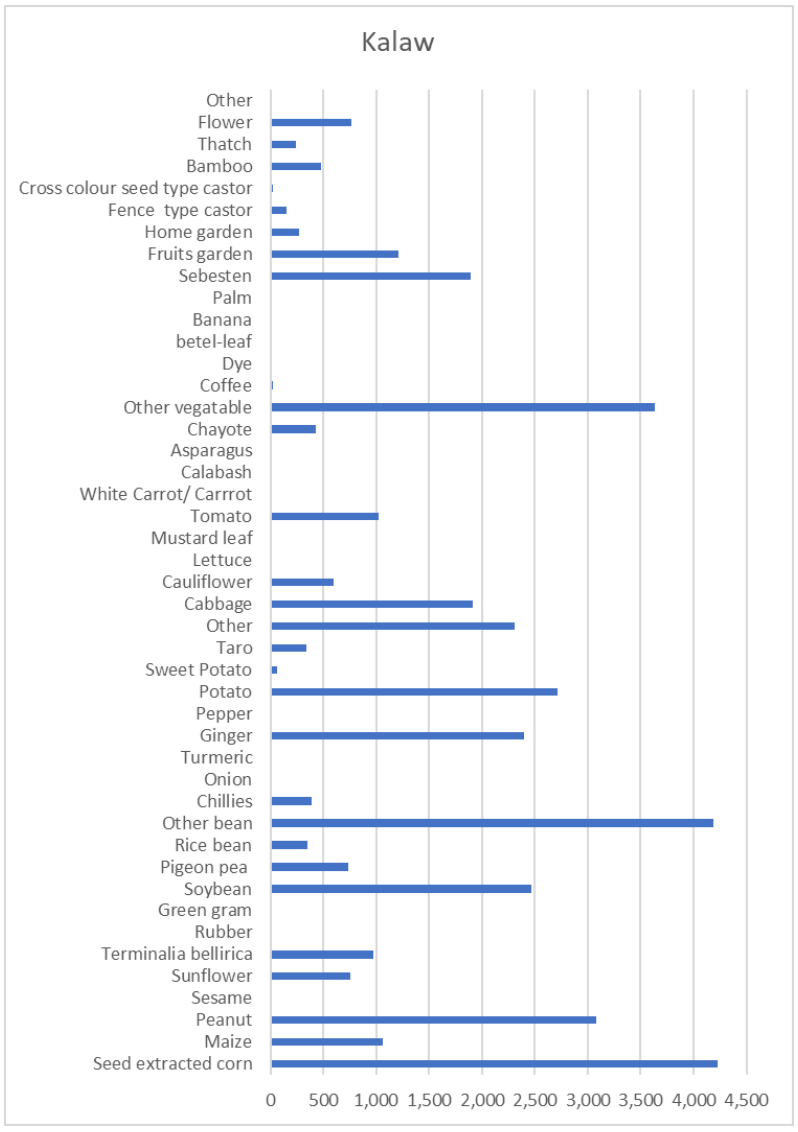
6,000


Kalaw
Other
Flower
Thatch
Bamboo
Cross colour seed type castor
Fence type castor
Home garden
Fruits garden
Sebesten
Palm
Banana
betel-leaf
Dye
Coffee
Other vegatable
Chayote
Asparagus
Calabash
White Carrot/ Carrrot
Tomato
Mustard leaf
Lettuce
Cauliflower
Cabbage
Other
Taro
Sweet Potato
Potato
Pepper
Ginger
Turmeric
Onion
Chillies
Other bean
Rice bean
Pigeon pea
Soybean
Green gram
Rubber
Terminalia bellirica
Sunflower
Sesame
Peanut
Maize
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2,500
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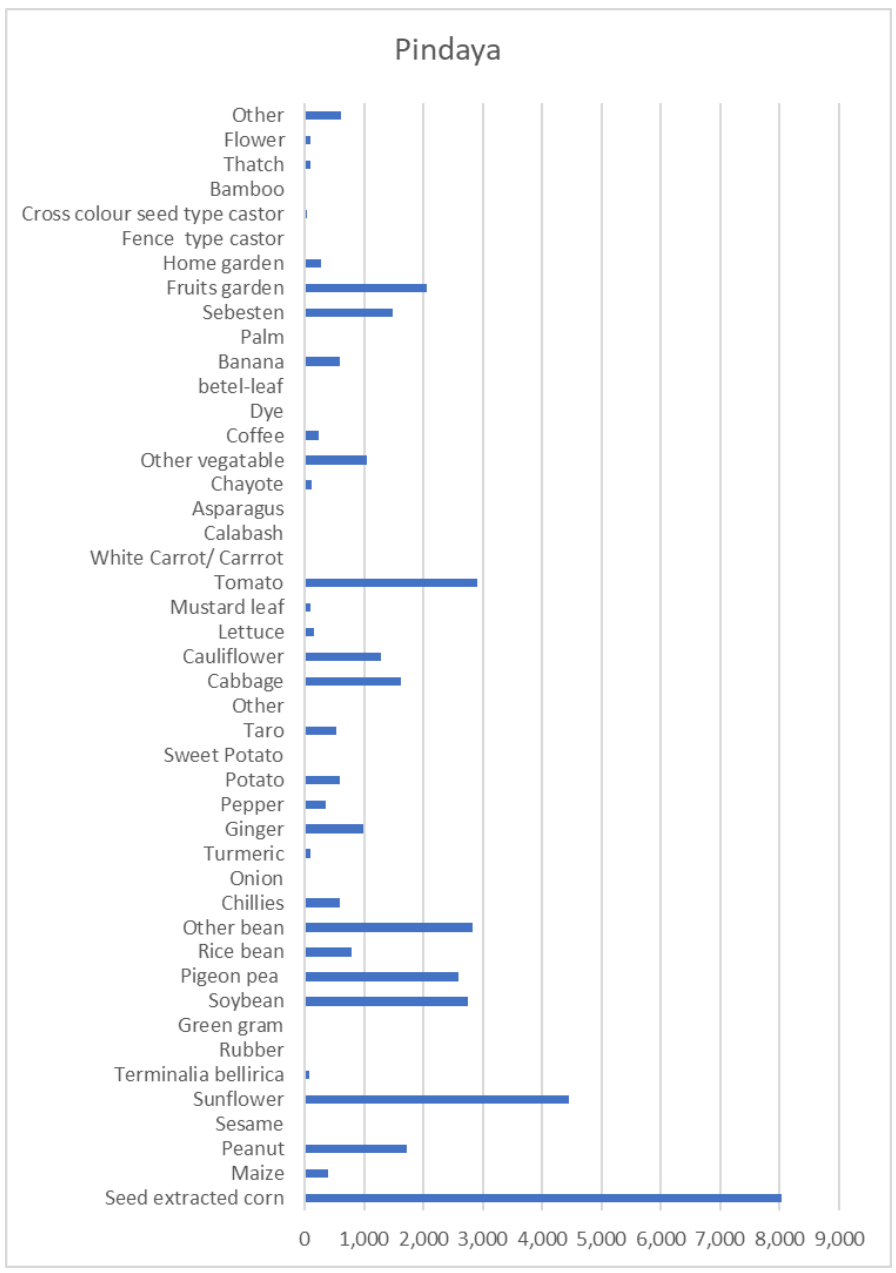
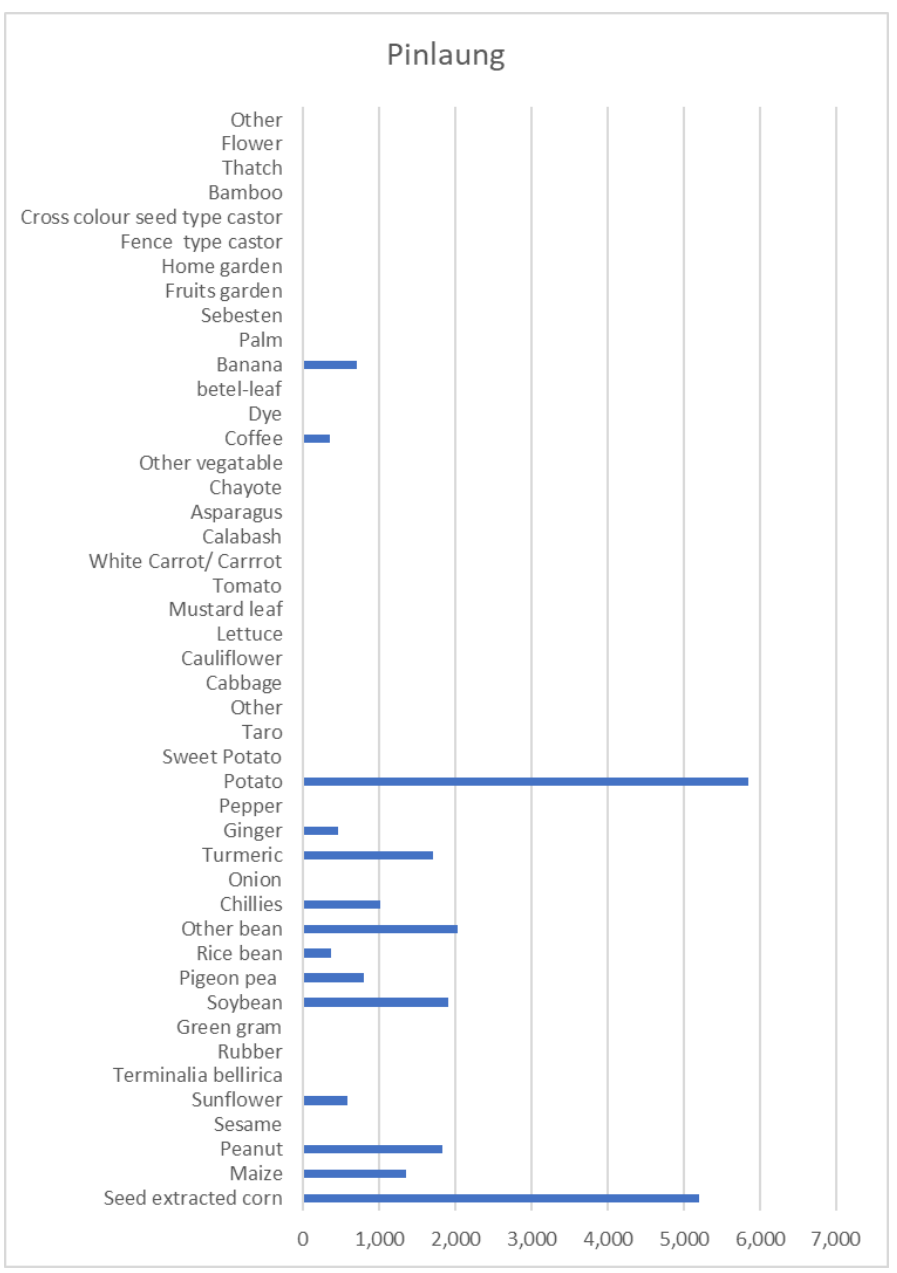
3,500
4,000
4,500


Pindaya
Other
Flower
Thatch
Bamboo
Cross colour seed type castor
Fence type castor
Home garden
Fruits garden
Sebesten
Palm
Banana
betel-leaf
Dye
Coffee
Other vegatable
Chayote
Asparagus
Calabash
White Carrot/ Carrrot
Tomato
Mustard leaf
Lettuce
Cauliflower
Cabbage
Other
Taro
Sweet Potato
Potato
Pepper
Ginger
Turmeric
Onion
Chillies
Other bean
Rice bean
Pigeon pea
Soybean
Green gram
Rubber
Terminalia bellirica
Sunflower
Sesame
Peanut
Maize
Seed extracted corn
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
9,000


Pinlaung
Other
Flower
Thatch
Bamboo
Cross colour seed type castor
Fence type castor
Home garden
Fruits garden
Sebesten
Palm
Banana
betel-leaf
Dye
Coffee
Other vegatable
Chayote
Asparagus
Calabash
White Carrot/ Carrrot
Tomato
Mustard leaf
Lettuce
Cauliflower
Cabbage
Other
Taro
Sweet Potato
Potato
Pepper
Ginger
Turmeric
Onion
Chillies
Other bean
Rice bean
Pigeon pea
Soybean
Green gram
Rubber
Terminalia bellirica
Sunflower
Sesame
Peanut
Maize
Seed extracted corn
0
1,000
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5,000
6,000
7,000

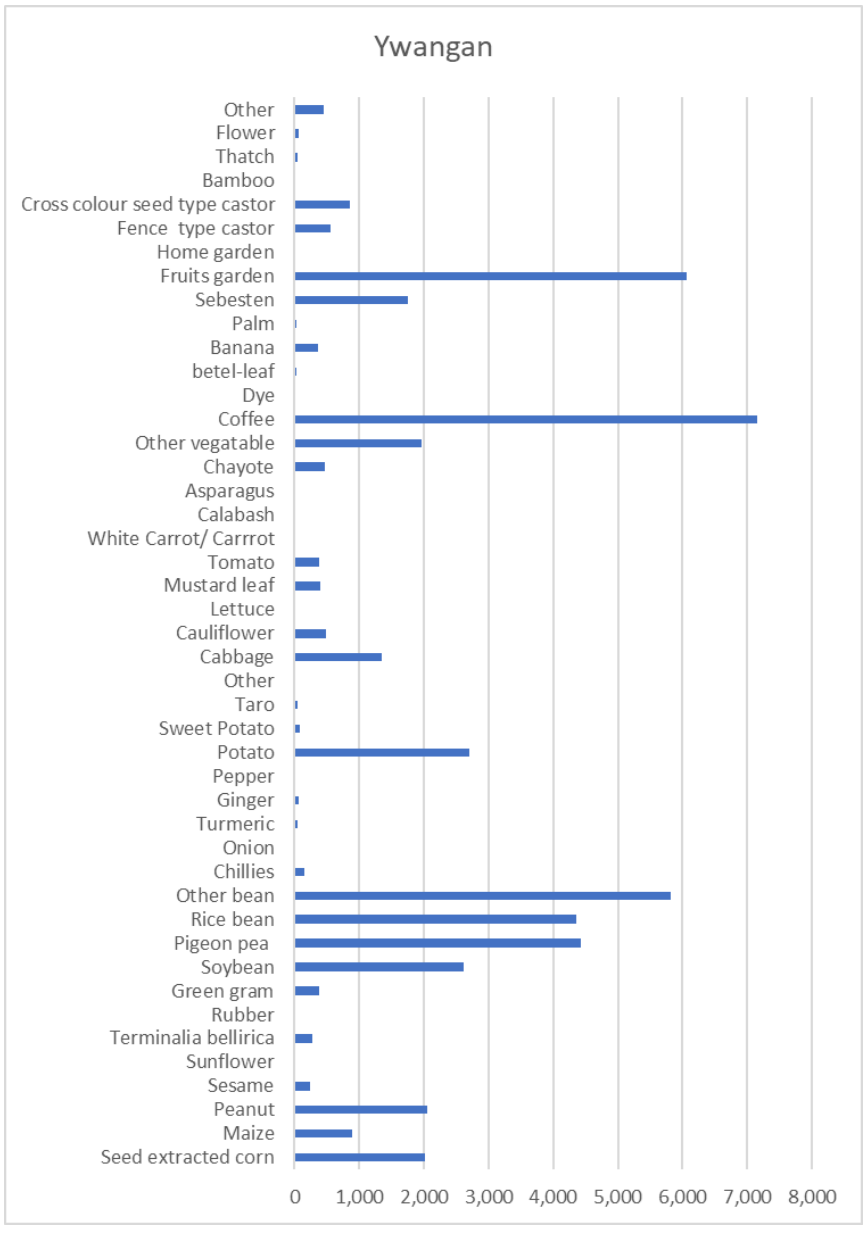

Figure 29: Area of Completing Condition of cultivated Rainfed Crops (Cultivated Acre) by Government statistics by township

* Completing Condition of cultivated Rainfed Crops (Cultivated Acre) at Kalaw, Pinlaung and Yuwangan in 2017–2018 season and at Nyaug Shwe and Pindaya in 2018–2019 season.

4.2.2 Survey results of the six markets

Market survey was conducted at the main six markets around Inle Lake, which are Aung Ban, Heho, Mine Thaunt, Nyaung Shwe, Shwe Nyaung, Than Daung (**Table 35**– **Table 43**).

Table 35: Market survey, Vegetables

Group: Vegetable

Market			Name																													
			Aspragus		Bamboo shoot		Basil leave		Bitter grout		Bitter Guar		Broccoli		Butter Bean		Cabbage		Carrot		Charyote leave		Chayote		Chayote leave		Chayote leaves		Chick Pea		Chilly pepper (hot)		Chinese Cabbage	
			bunch	Total	viss	Total	bunch	Total	viss	Total	viss	Total	no.	Total	can	Total	no.	Total	bunch	Total	bunch	Total	no.	Total	bunch	Total	bunch	Total	can	Total	viss	Total	viss	Total
Aung Ban	Mean	Unit price (MMK)	1,000	1,000	1,500	1,500			1,000	1,000					500	500	1,300	1,300	200	200									400	400	2,800	2,800		
	Minimum	Unit price (MMK)	1,000	1,000	1,500	1,500			1,000	1,000					500	500	1,300	1,300	200	200									400	400	2,800	2,800		
	Maximum	Unit price (MMK)	1,000	1,000	1,500	1,500			1,000	1,000					500	500	1,300	1,300	200	200									400	400	2,800	2,800		
	N	Unit price (MMK)	1	1	1	1			1	1					1	1	1	1	1	1									1	1	1	1		
Heho	Mean	Unit price (MMK)															1,200	1,200	300	300					350	350			400	400	3,000	3,000		
	Minimum	Unit price (MMK)															1,200	1,200	300	300					350	350			400	400	3,000	3,000		
	Maximum	Unit price (MMK)															1,200	1,200	300	300					350	350			400	400	3,000	3,000		
	N	Unit price (MMK)															1	1	1	1					1	1			1	1	1	1		
Mine Thaunt	Mean	Unit price (MMK)			2,000	2,000					1,200	1,200					500	500	300	300	300	300									2,000	2,000		
	Minimum	Unit price (MMK)			2,000	2,000					1,200	1,200					500	500	300	300	300	300									2,000	2,000		
	Maximum	Unit price (MMK)			2,000	2,000					1,200	1,200					500	500	300	300	300	300									2,000	2,000		
	N	Unit price (MMK)			1	1					1	1					1	1	1	1	1	1									1	1		
Nyaung Shwe	Mean	Unit price (MMK)			200	200	100	100	1,000	1,000					500	500	800	800	300	300									400	400	2,000	2,000	1,000	1,000
	Minimum	Unit price (MMK)			200	200	100	100	1,000	1,000					500	500	800	800	300	300									400	400	2,000	2,000	1,000	1,000
	Maximum	Unit price (MMK)			200	200	100	100	1,000	1,000					500	500	800	800	300	300									400	400	2,000	2,000	1,000	1,000
	N	Unit price (MMK)			1	1	1	1	1	1					1	1	1	1	1	1													1	1
Shwe Nyaung	Mean	Unit price (MMK)			2,000	2,000							200	200			1,200	1,200	300	300			200	200			300	300			3,000	3,000	800	800
	Minimum	Unit price (MMK)			2,000	2,000							200	200			1,200	1,200	300	300			200	200			300	300			3,000	3,000	800	800
	Maximum	Unit price (MMK)			2,000	2,000							200	200			1,200	1,200	300	300			200	200			300	300			3,000	3,000	800	800
	N	Unit price (MMK)			1	1							1	1			1	1	1	1			1	1			1	1			1	1	1	1
Than Daung	Mean	Unit price (MMK)			200	200			1,200	1,200							400	400	300	300											2,000	2,000		
	Minimum	Unit price (MMK)			200	200			1,200	1,200							400	400	300	300											2,000	2,000		
	Maximum	Unit price (MMK)			200	200			1,200	1,200							400	400	300	300											2,000	2,000		
	N	Unit price (MMK)			1	1			1	1							1	1	1	1											1	1		
Total	Mean	Unit price (MMK)	1,000	1,000	1,180	1,180	100	100	1,067	1,067	1,200	1,200	200	200	500	500	900	900	283	283	300	300	200	200	350	350	300	300	400	400	2,467	2,467	900	900
	Minimum	Unit price (MMK)	1,000	1,000	200	200	100	100	1,000	1,000	1,200	1,200	200	200	500	500	400	400	200	200	300	300	200	200	350	350	300	300	400	400	2,000	2,000	800	800
	Maximum	Unit price (MMK)	1,000	1,000	2,000	2,000	100	100	1,200	1,200	1,200	1,200	200	200	500	500	1,300	1,300	300	300	300	300	200	200	350	350	300	300	400	400	3,000	3,000	1,000	1,000
	N	Unit price (MMK)	1	1	5	5	1	1	3	3	1	1	1	1	2	2	6	6	6	6	1	1	1	1	1	1	1	1	3	3	6	6	2	2

Group: Vegetable

Market			Name																											
			Chive roots		Cow Pea		Cucumber		Culiflower		Cyhaote leaves		Egg plant		Garlic		Ginger		Gourd		Green bean		green cauliflower		Green pepper		Lady finger			Lentil		Lettuce	
			bunch	Total	can	Total	no.	Total	no.	Total	bunch	Total	viss	Total	viss	Total	viss	Total	no.	Total	viss	Total	no.	Total	viss	Total	bunch	viss	Total	viss	Total	bunch	Total
Aung Ban	Mean	Unit price (MMK)	250	250			350	350	300	300			800	800	1,600	1,600	2,300	2,300	500	500	1,000	1,000			3,000	3,000	200		200	3,500	3,500		
	Minimum	Unit price (MMK)	250	250			200	200	300	300			800	800	1,600	1,600	2,300	2,300	500	500	1,000	1,000			3,000	3,000	200		200	3,500	3,500		
	Maximum	Unit price (MMK)	250	250			500	500	300	300			800	800	1,600	1,600	2,300	2,300	500	500	1,000	1,000			3,000	3,000	200		200	3,500	3,500		
	N	Unit price (MMK)	1	1			2	2	1	1			1	1	1	1	1	1	1	1	1	1			1	1	1		1	1	1		
Heho	Mean	Unit price (MMK)	200	200			300	300	700	700			1,000	1,000	2,200	2,200	2,200	2,200	400	400	2,000	2,000			1,300	1,300	1,600		1,600				
	Minimum	Unit price (MMK)	200	200			300	300	700	700			1,000	1,000	2,200	2,200	2,200	2,200	400	400	2,000	2,000			1,300	1,300	1,600		1,600				
	Maximum	Unit price (MMK)	200	200			300	300	700	700			1,000	1,000	2,200	2,200	2,200	2,200	400	400	2,000	2,000			1,300	1,300	1,600		1,600				
	N	Unit price (MMK)	1	1			1	1	1	1			1	1	1	1	1	1	1	1	1	1			1	1	1		1				
Mine Thaunt	Mean	Unit price (MMK)					300	300	500	500			800	800	2,000	2,000	1,500	1,500	500	500					1,500	1,500		1,600	1,600				
	Minimum	Unit price (MMK)					300	300	500	500			800	800	2,000	2,000	1,500	1,500	500	500					1,500	1,500		1,600	1,600				
	Maximum	Unit price (MMK)					300	300	500	500			800	800	2,000	2,000	1,500	1,500	500	500					1,500	1,500		1,600	1,600				
	N	Unit price (MMK)					1	1	1	1			1	1	1	1	1	1	1	1					1	1		1	1				
Nyaung Shwe	Mean	Unit price (MMK)	800	800	300	300	200	200	1,000	1,000			800	800	4,000	4,000	2,000	2,000	500	500	1,600	1,600	700	700	2,000	2,000	200		200				
	Minimum	Unit price (MMK)	800	800	300	300	200	200	1,000	1,000			800	800	4,000	4,000	2,000	2,000	500	500	1,600	1,600	700	700	2,000	2,000	200		200				
	Maximum	Unit price (MMK)	800	800	300	300	200	200	1,000	1,000			800	800	4,000	4,000	2,000	2,000	500	500	1,600	1,600	700	700	2,000	2,000	200		200				
	N	Unit price (MMK)	1	1	1	1	1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1				
Shwe Nyaung	Mean	Unit price (MMK)					300	300	800	800			500	500	500	500	2,500	2,500	700	700	2,200	2,200			1,400	1,400	100		100			200	200
	Minimum	Unit price (MMK)					300	300	800	800			500	500	500	500	2,500	2,500	700	700	2,200	2,200			1,400	1,400	100		100			200	200
	Maximum	Unit price (MMK)					300	300	800	800			500	500	500	500	2,500	2,500	700	700	2,200	2,200			1,400	1,400	100		100			200	200
	N	Unit price (MMK)					1	1	1	1			1	1	1	1	1	1	1	1	1	1			1	1	1		1			1	1
Than Daung	Mean	Unit price (MMK)	1,000	1,000			100	100	300	300	300	300	1,200	1,200	1,500	1,500	2,500	2,500	400	400					1,200	1,200	200		200				
	Minimum	Unit price (MMK)	1,000	1,000			100	100	300	300	300	300	1,200	1,200	1,500	1,500	2,500	2,500	400	400					1,200	1,200	200		200				
	Maximum	Unit price (MMK)	1,000	1,000			100	100	300	300	300	300	1,200	1,200	1,500	1,500	2,500	2,500	400	400					1,200	1,200	200		200				
	N	Unit price (MMK)	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1					1	1	1		1				
Total	Mean	Unit price (MMK)	563	563	300	300	271	271	600	600	300	300	850	850	1,967	1,967	2,167	2,167	500	500	1,700	1,700	700	700	1,733	1,733	460	1,600	650	3,500	3,500	200	200
	Minimum	Unit price (MMK)	200	200	300	300	100	100	300	300	300	300	500	500	500	500	1,500	1,500	400	400	1,000	1,000	700	700	1,200	1,200	100	1,600	100	3,500	3,500	200	200
	Maximum	Unit price (MMK)	1,000	1,000	300	300	500	500	1,000	1,000	300	300	1,200	1,200	4,000	4,000	2,500	2,500	700	700	2,200	2,200	700	700	3,000	3,000	1,600	1,600	1,600	3,500	3,500	200	200
	N	Unit price (MMK)	4	4	1	1	7	7	6	6	1	1	6	6	6	6	6	6	6	6	4	4	1	1	6	6	5	1	6	1	1	1	1

Group: Vegetable

Market			Name																																			
			Long bean			Luffa		Mustard leaf			Onion		Potato		Pumpkin		Red pepper		roselle		Snow pea		Sweet Potato		Tamrined Leaf		Taro		Tomato		Water Cress		Total						
			bunch	viss	Total	no.	Total	bunch	no.	Total	viss	Total	viss	Total	no.	Total	viss	Total	bunch	Total	viss	Total	viss	Total	can	Total	viss	Total	viss	Total	bunch	Total	bunch	can	no.	viss	Total
Aung Ban	Mean	Unit price (MMK)		1,500	1,500	200	200	250		250	800	800	1,000	1,000	1,000	1,000	2,800	2,800			2,500	2,500			100	100	600	600	1,600	1,600	100	100	333	333	625	1,724	1,097
	Minimum	Unit price (MMK)		1,500	1,500	200	200	250		250	800	800	800	800	800	800	2,800	2,800			2,500	2,500			100	100	600	600	1,600	1,600	100	100	100	100	200	600	100
	Maximum	Unit price (MMK)		1,500	1,500	200	200	250		250	800	800	1,200	1,200	1,200	1,200	2,800	2,800			2,500	2,500			100	100	600	600	1,600	1,600	100	100	1,000	500	1,300	3,500	3,500
	N	Unit price (MMK)		1	1	1	1	1		1	1	1	2	2	2	2	1	1			1	1			1	1	1	1	1	1	1	1	6	3	8	17	34
Heho	Mean	Unit price (MMK)		1,600	1,600	200	200				800	800	800	800	1,000	1,000													2,000	2,000	200	200	530	400	633	1,690	1,080
	Minimum	Unit price (MMK)		1,600	1,600	200	200				800	800	800	800	1,000	1,000													2,000	2,000	200	200	200	400	200	800	200
	Maximum	Unit price (MMK)		1,600	1,600	200	200				800	800	800	800	1,000	1,000													2,000	2,000	200	200	1,600	400	1,200	3,000	3,000
	N	Unit price (MMK)		1	1	1	1				1	1	1	1	1	1													1	1	1	1	5	1	6	10	22
Mine Thaunt	Mean	Unit price (MMK)		200	200						800	800	800	800	500	500													1,500	1,500	50	50	217		460	1,325	943
	Minimum	Unit price (MMK)		200	200						800	800	800	800	500	500													1,500	1,500	50	50	50		300	200	50
	Maximum	Unit price (MMK)		200	200						800	800	800	800	500	500													1,500	1,500	50	50	300		500	2,000	2,000
	N	Unit price (MMK)		1	1						1	1	1	1	1	1													1	1	1	1	3		5	12	20
Nyaung Shwe	Mean	Unit price (MMK)				150	150		300	300	3,200	3,200	2,800	2,800	300	300	1,200	1,200	100	100	4,000	4,000	1,200	1,200					1,000	1,000	100	100	267	400	494	1,867	1,086
	Minimum	Unit price (MMK)				150	150		300	300	3,200	3,200	2,800	2,800	300	300	1,200	1,200	100	100	4,000	4,000	1,200	1,200					1,000	1,000	100	100	100	300	150	200	100
	Maximum	Unit price (MMK)				150	150		300	300	3,200	3,200	2,800	2,800	300	300	1,200	1,200	100	100	4,000	4,000	1,200	1,200					1,000	1,000	100	100	800	500	1,000	4,000	4,000
	N	Unit price (MMK)				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					1	1	1	1	6	3	8	15	32
Shwe Nyaung	Mean	Unit price (MMK)	300		300	200	200				800	800	1,000	1,000	1,000	1,000	2,000	2,000									600	600	1,500	1,500			240		575	1,446	946
	Minimum	Unit price (MMK)	300		300	200	200				800	800	1,000	1,000	1,000	1,000	2,000	2,000									600	600	1,500	1,500			100		200	500	100
	Maximum	Unit price (MMK)	300		300	200	200				800	800	1,000	1,000	1,000	1,000	2,000	2,000									600	600	1,500	1,500			300		1,200	3,000	3,000
	N	Unit price (MMK)	1		1	1	1				1	1	1	1	1	1	1	1									1	1	1	1			5		8	13	26
Than Daung	Mean	Unit price (MMK)	200		200	200	200	300		300	800	800	800	800									1,200	1,200					1,600	1,600			383		280	1,291	814
	Minimum	Unit price (MMK)	200		200	200	200	300		300	800	800	800	800									1,200	1,200					1,600	1,600			200		100	200	100
	Maximum	Unit price (MMK)	200		200	200	200	300		300	800	800	800	800									1,200	1,200					1,600	1,600			1,000		400	2,500	2,500
	N	Unit price (MMK)	1		1	1	1	1		1	1	1	1	1									1	1					1	1			6		5	11	22
Total	Mean	Unit price (MMK)	250	1,100	760	190	190	275	300	283	1,200	1,200	1,171	1,171	800	800	2,000	2,000	100	100	3,250	3,250	1,200	1,200	100	100	600	600	1,533	1,533	113	113	335	371	526	1,578	1,007
	Minimum	Unit price (MMK)	200	200	200	150	150	250	300	250	800	800	800	800	300	300	1,200	1,200	100	100	2,500	2,500	1,200	1,200	100	100	600	600	1,000	1,000	50	50	50	100	100	200	50
	Maximum	Unit price (MMK)	300	1,600	1,600	200	200	300	300	300	3,200	3,200	2,800	2,800	1,200	1,200	2,800	2,800	100	100	4,000	4,000	1,200	1,200	100	100	600	600	2,000	2,000	200	200	1,600	500	1,300	4,000	4,000
	N	Unit price (MMK)	2	3	5	5	5	2	1	3	6	6	7	7	6	6	3	3	1	1	2	2	2	2	1	1	2	2	6	6	4	4	31	7	40	78	156

Table 36: Market survey, Fruit

Group: Fruit

Market			Name																											
			Apple		Asian Pear		Avocado		Banana		Coffee		Dragon fruit		Grape		grapes		Jackfruit		Juck Fruit		Lime		lychee		Mango		melon		Orange	
			Unit		Unit		Unit		Unit		Unit		Unit		Unit		Unit		Unit		Unit		Unit		Unit		Unit		Unit		Unit	
			no.	Total	no.	Total	no.	Total	bunch	Total	Pack	Total	no.	Total	viss	Total	viss	Total	no.	Total	no.	Total	no.	Total	Pack	Total	no.	Total	no.	Total	no.	Total
Aung Ban	Mean	Unit price (MMK)	675.000	675.000			500.000	500.000	1666.667	1666.667	3500.000	3500.000											100.000	100.000			666.667	666.667				
	Minimum	Unit price (MMK)	350.0	350.0			500.0	500.0	800.0	800.0	3500.0	3500.0											100.0	100.0			200.0	200.0				
	Maximum	Unit price (MMK)	1000.0	1000.0			500.0	500.0	3500.0	3500.0	3500.0	3500.0											100.0	100.0			1500.0	1500.0				
	N	Unit price (MMK)	2	2			1	1	6	6	1	1											1	1			3	3				
Heho	Mean	Unit price (MMK)							1650.000	1650.000	2700.000	2700.000											200.000	200.000			205.000	205.000				
	Minimum	Unit price (MMK)							800.0	800.0	2700.0	2700.0											200.0	200.0			160.0	160.0				
	Maximum	Unit price (MMK)							2500.0	2500.0	2700.0	2700.0											200.0	200.0			250.0	250.0				
	N	Unit price (MMK)							2	2	1	1											1	1			2	2				
Mine Thaunt	Mean	Unit price (MMK)	300.000	300.000			600.000	600.000													4000.000	4000.000	100.000	100.000			200.000	200.000				
	Minimum	Unit price (MMK)	300.0	300.0			600.0	600.0													4000.0	4000.0	100.0	100.0			200.0	200.0				
	Maximum	Unit price (MMK)	300.0	300.0			600.0	600.0													4000.0	4000.0	100.0	100.0			200.0	200.0				
	N	Unit price (MMK)	1	1			1	1													1	1	1	1			1	1				
Nyaung Shwe	Mean	Unit price (MMK)	833.333	833.333			750.000	750.000	750.000	750.000	2700.000	2700.000	2500.000	2500.000			5000.000	5000.000	500.000	500.000			150.000	150.000	300.000	300.000	500.000	500.000	800.000	800.000	300.000	300.000
	Minimum	Unit price (MMK)	500.0	500.0			500.0	500.0	500.0	500.0	2700.0	2700.0	2500.0	2500.0			4000.0	4000.0	500.0	500.0			150.0	150.0	300.0	300.0	400.0	400.0	800.0	800.0	300.0	300.0
	Maximum	Unit price (MMK)	1200.0	1200.0			1000.0	1000.0	1000.0	1000.0	2700.0	2700.0	2500.0	2500.0			6000.0	6000.0	500.0	500.0			150.0	150.0	300.0	300.0	600.0	600.0	800.0	800.0	300.0	300.0
	N	Unit price (MMK)	3	3			2	2	2	2	1	1	1	1			2	2	1	1			1	1	1	1	3	3	1	1	1	1
Shwe Nyaung	Mean	Unit price (MMK)	750.000	750.000	600.000	600.000	800.000	800.000	650.000	650.000					4000.000	4000.000							200.000	200.000			250.000	250.000			600.000	600.000
	Minimum	Unit price (MMK)	500.0	500.0	600.0	600.0	800.0	800.0	600.0	600.0					4000.0	4000.0							200.0	200.0			250.0	250.0			600.0	600.0
	Maximum	Unit price (MMK)	1000.0	1000.0	600.0	600.0	800.0	800.0	700.0	700.0					4000.0	4000.0							200.0	200.0			250.0	250.0			600.0	600.0
	N	Unit price (MMK)	2	2	1	1	1	1	2	2					1	1							1	1			2	2			1	1
Than Daung	Mean	Unit price (MMK)															6000.000	6000.000	2500.000	2500.000			100.000	100.000			300.000	300.000				
	Minimum	Unit price (MMK)															6000.0	6000.0	2500.0	2500.0			100.0	100.0			300.0	300.0				
	Maximum	Unit price (MMK)															6000.0	6000.0	2500.0	2500.0			100.0	100.0			300.0	300.0				
	N	Unit price (MMK)															1	1	1	1			1	1			1	1				
Total	Mean	Unit price (MMK)	706.250	706.250	600.000	600.000	680.000	680.000	1341.667	1341.667	2966.667	2966.667	2500.000	2500.000	4000.000	4000.000	5333.333	5333.333	1500.000	1500.000	4000.000	4000.000	141.667	141.667	300.000	300.000	409.167	409.167	800.000	800.000	450.000	450.000
	Minimum	Unit price (MMK)	300.0	300.0	600.0	600.0	500.0	500.0	500.0	500.0	2700.0	2700.0	2500.0	2500.0	4000.0	4000.0	4000.0	4000.0	500.0	500.0	4000.0	4000.0	100.0	100.0	300.0	300.0	160.0	160.0	800.0	800.0	300.0	300.0
	Maximum	Unit price (MMK)	1200.0	1200.0	600.0	600.0	1000.0	1000.0	3500.0	3500.0	3500.0	3500.0	2500.0	2500.0	4000.0	4000.0	6000.0	6000.0	2500.0	2500.0	4000.0	4000.0	200.0	200.0	300.0	300.0	1500.0	1500.0	800.0	800.0	600.0	600.0
	N	Unit price (MMK)	8	8	1	1	5	5	12	12	3	3	1	1	1	1	3	3	2	2	1	1	6	6	1	1	12	12	1	1	2	2

Group: Fruit

			Name																															
			Papaya		Pear		Pears (Chinese Pear)		Pineapple		Pulm		Rambutan		Sapodilla plum		Strawberry		Sunkist		Tea			Unshu mikan		Water mellon		Total							
			Unit		Unit		Unit		Unit		Unit		Unit		Unit		Unit		Unit		Unit			Unit		Unit		Unit							
	Market		no.	Total	no.	Total	no.	Total	no.	Total	no.	Total	no.	Total	no.	Total	Busket	Total	no.	Total	Pack	viss	Total	no.	Total	no.	Total	bunch	Busket	no.	Pack	viss	Total
Aung Ban	Mean	Unit price (MMK)							1150.000	1150.000			150.000	150.000			2500.000	2500.000				5250.000	5250.000			3000.000	3000.000	1666.667	2500.000	854.545	3500.000	5250.000	2017.391
	Minimum	Unit price (MMK)							800.0	800.0			150.0	150.0			2500.0	2500.0				2500.0	2500.0			3000.0	3000.0	800.0	2500.0	100.0	3500.0	2500.0	100.0
	Maximum	Unit price (MMK)							1500.0	1500.0			150.0	150.0			2500.0	2500.0				8000.0	8000.0			3000.0	3000.0	3500.0	2500.0	3000.0	3500.0	8000.0	8000.0
	N	Unit price (MMK)							2	2			1	1			1	1				4	4			1	1	6	1	11	1	4	23
Heho	Mean	Unit price (MMK)							800.000	800.000			120.000	120.000			2000.000	2000.000				7000.000	7000.000					1650.000	2000.000	306.000	2700.000	7000.000	2544.167
	Minimum	Unit price (MMK)							800.0	800.0			120.0	120.0			2000.0	2000.0				6000.0	6000.0					800.0	2000.0	120.0	2700.0	6000.0	120.0
	Maximum	Unit price (MMK)							800.0	800.0			120.0	120.0			2000.0	2000.0				7500.0	7500.0					2500.0	2000.0	800.0	2700.0	7500.0	7500.0
	N	Unit price (MMK)							1	1			1	1			1	1				3	3					2	1	5	1	3	12
Mine Thaunt	Mean	Unit price (MMK)											200.000	200.000			2300.000	2300.000				4250.000	4250.000			1000.000	1000.000		2300.000	914.286		4250.000	1720.000
	Minimum	Unit price (MMK)											200.0	200.0			2300.0	2300.0				2500.0	2500.0			1000.0	1000.0		2300.0	100.0		2500.0	100.0
	Maximum	Unit price (MMK)											200.0	200.0			2300.0	2300.0				6000.0	6000.0			1000.0	1000.0		2300.0	4000.0		6000.0	6000.0
	N	Unit price (MMK)											1	1			1	1				2	2			1	1		1	7		2	10
Nyaung Shwe	Mean	Unit price (MMK)	900.000	900.000			1500.000	1500.000	1500.000	1500.000	50.000	50.000	120.000	120.000	20.000	20.000	2000.000	2000.000	8000.000	8000.000	700.000	6500.000	5050.000	120.000	120.000	1250.000	1250.000	750.000	2000.000	1056.667	1233.333	5900.000	1773.143
	Minimum	Unit price (MMK)	800.0	800.0			1500.0	1500.0	1500.0	1500.0	50.0	50.0	120.0	120.0	20.0	20.0	2000.0	2000.0	8000.0	8000.0	700.0	5500.0	700.0	120.0	120.0	1000.0	1000.0	500.0	2000.0	20.0	300.0	4000.0	20.0
	Maximum	Unit price (MMK)	1000.0	1000.0			1500.0	1500.0	1500.0	1500.0	50.0	50.0	120.0	120.0	20.0	20.0	2000.0	2000.0	8000.0	8000.0	700.0	7500.0	7500.0	120.0	120.0	1500.0	1500.0	1000.0	2000.0	8000.0	2700.0	7500.0	8000.0
	N	Unit price (MMK)	2	2			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	4	1	1	2	2	2	1	24	3	5	35
Shwe Nyaung	Mean	Unit price (MMK)			1500.000	1500.000			1000.000	1000.000												6250.000	6250.000			2500.000	2500.000	650.000		836.364		5800.000	2194.444
	Minimum	Unit price (MMK)			1500.0	1500.0			1000.0	1000.0												4000.0	4000.0			2500.0	2500.0	600.0		200.0		4000.0	200.0
	Maximum	Unit price (MMK)			1500.0	1500.0			1000.0	1000.0												8000.0	8000.0			2500.0	2500.0	700.0		2500.0		8000.0	8000.0
	N	Unit price (MMK)			1	1			1	1												4	4			1	1	2		11		5	18
Than Daung	Mean	Unit price (MMK)															2500.000	2500.000				4250.000	4250.000			500.000	500.000		2500.000	850.000		4833.333	2550.000
	Minimum	Unit price (MMK)															2500.0	2500.0				2500.0	2500.0			500.0	500.0		2500.0	100.0		2500.0	100.0
	Maximum	Unit price (MMK)															2500.0	2500.0				6000.0	6000.0			500.0	500.0		2500.0	2500.0		6000.0	6000.0
	N	Unit price (MMK)															1	1				2	2			1	1		1	4		3	8
Total	Mean	Unit price (MMK)	900.000	900.000	1500.000	1500.000	1500.000	1500.000	1120.000	1120.000	50.000	50.000	147.500	147.500	20.000	20.000	2260.000	2260.000	8000.000	8000.000	700.000	5750.000	5484.211	120.000	120.000	1583.333	1583.333	1341.667	2260.000	891.774	1980.000	5613.636	2038.585
	Minimum	Unit price (MMK)	800.0	800.0	1500.0	1500.0	1500.0	1500.0	800.0	800.0	50.0	50.0	120.0	120.0	20.0	20.0	2000.0	2000.0	8000.0	8000.0	700.0	2500.0	700.0	120.0	120.0	500.0	500.0	500.0	2000.0	20.0	300.0	2500.0	20.0
	Maximum	Unit price (MMK)	1000.0	1000.0	1500.0	1500.0	1500.0	1500.0	1500.0	1500.0	50.0	50.0	200.0	200.0	20.0	20.0	2500.0	2500.0	8000.0	8000.0	700.0	8000.0	8000.0	120.0	120.0	3000.0	3000.0	3500.0	2500.0	8000.0	3500.0	8000.0	8000.0
	N	Unit price (MMK)	2	2	1	1	1	1	5	5	1	1	4	4	1	1	5	5	1	1	1	18	19	1	1	6	6	12	5	62	5	22	106

Table 37: Market survey, Fish

Group: Fish

Market			Name																															
			Barbus		Carp		Catfish		Eel		featherback		Prawn		Promfert		red-eye gudgeon		River cash fist		river catfish		Sardine fish		Seabass		smoked sccobranch catfish		Snakehead fish		Synanceia		Tilapia		Total	
			viss	Total	viss	Total	viss	Total	viss	Total	viss	Total	viss	Total	viss	Total	viss	Total	viss	Total	viss	Total	viss	Total	viss	Total	viss	Total	viss	Total	viss	Total	viss	Total
Aung Ban	Unit price (MMK)	Mean					8,000	8,000	6,000	6,000			15,000	15,000											8,000	8,000	7,000	7,000	8,000	8,000			2,500	2,500	7,786	7,786
		Minimum					8,000	8,000	6,000	6,000			15,000	15,000											8,000	8,000	7,000	7,000	8,000	8,000			2,500	2,500	2,500	2,500
		Maximum					8,000	8,000	6,000	6,000			15,000	15,000											8,000	8,000	7,000	7,000	8,000	8,000			2,500	2,500	15,000	15,000
		N					1	1	1	1			1	1											1	1	1	1	1	1			1	1	7	7
Heho	Unit price (MMK)	Mean							12,000	12,000	7,000	7,000															6,500	6,500	10,000	10,000					8,875	8,875
		Minimum							12,000	12,000	7,000	7,000															6,500	6,500	10,000	10,000					6,500	6,500
		Maximum							12,000	12,000	7,000	7,000															6,500	6,500	10,000	10,000					12,000	12,000
		N							1	1	1	1															1	1	1	1					4	4
Mine Thaunt	Unit price (MMK)	Mean			9,000	9,000			6,000	6,000	5,000	5,000																	9,000	9,000	3,000	3,000			6,400	6,400
		Minimum			9,000	9,000			6,000	6,000	5,000	5,000																	9,000	9,000	3,000	3,000			3,000	3,000
		Maximum			9,000	9,000			6,000	6,000	5,000	5,000																	9,000	9,000	3,000	3,000			9,000	9,000
		N			1	1			1	1	1	1																	1	1	1	1			5	5
Nyaung Shwe	Unit price (MMK)	Mean	4,000	4,000	12,000	12,000			8,000	8,000	6,000	6,000			3,500	3,500					6,000	6,000	6,000	6,000			6,000	6,000	10,000	10,000	2,500	2,500			6,400	6,400
		Minimum	4,000	4,000	12,000	12,000			8,000	8,000	6,000	6,000			3,500	3,500					6,000	6,000	6,000	6,000			6,000	6,000	10,000	10,000	2,500	2,500			2,500	2,500
		Maximum	4,000	4,000	12,000	12,000			8,000	8,000	6,000	6,000			3,500	3,500					6,000	6,000	6,000	6,000			6,000	6,000	10,000	10,000	2,500	2,500			12,000	12,000
		N	1	1	1	1			1	1	1	1			1	1					1	1	1	1			1	1	1	1	1	1			10	10
Shwe Nyaung	Unit price (MMK)	Mean					6,000	6,000											7,000	7,000					13,000	13,000	6,500	6,500	7,000	7,000					7,900	7,900
		Minimum					6,000	6,000											7,000	7,000					13,000	13,000	6,500	6,500	7,000	7,000					6,000	6,000
		Maximum					6,000	6,000											7,000	7,000					13,000	13,000	6,500	6,500	7,000	7,000					13,000	13,000
		N					1	1											1	1					1	1	1	1	1	1					5	5
Than Daung	Unit price (MMK)	Mean			5,000	5,000					8,000	8,000					8,000	8,000																	7,000	7,000
		Minimum			5,000	5,000					8,000	8,000					8,000	8,000																	5,000	5,000
		Maximum			5,000	5,000					8,000	8,000					8,000	8,000																	8,000	8,000
		N			1	1					1	1					1	1																	3	3
Total	Unit price (MMK)	Mean	4,000	4,000	8,667	8,667	7,000	7,000	8,000	8,000	6,500	6,500	15,000	15,000	3,500	3,500	8,000	8,000	7,000	7,000	6,000	6,000	6,000	6,000	10,500	10,500	6,500	6,500	8,800	8,800	2,750	2,750	2,500	2,500	7,250	7,250
		Minimum	4,000	4,000	5,000	5,000	6,000	6,000	6,000	6,000	5,000	5,000	15,000	15,000	3,500	3,500	8,000	8,000	7,000	7,000	6,000	6,000	6,000	6,000	8,000	8,000	6,000	6,000	7,000	7,000	2,500	2,500	2,500	2,500	2,500	2,500
		Maximum	4,000	4,000	12,000	12,000	8,000	8,000	12,000	12,000	8,000	8,000	15,000	15,000	3,500	3,500	8,000	8,000	7,000	7,000	6,000	6,000	6,000	6,000	13,000	13,000	7,000	7,000	10,000	10,000	3,000	3,000	2,500	2,500	15,000	15,000
		N	1	1	3	3	2	2	4	4	4	4	1	1	1	1	1	1	1	1	1	1	1	1	2	2	4	4	5	5	2	2	1	1	34	34

Table 38: Market survey, NTFP

Group: NTFP

Market			Name													
			Honey		Mushroom		orchid				Total					
			bottle	Total	viss	Total	bunch	plant	pot	Total	bottle	bunch	plant	pot	viss	Total
Aung Ban	Unit price (MMK)	Mean	5,000	5,000	6,000	6,000	1,000		8,500	4,750	5,000	1,000		8,500	6,000	5,125
		Minimum	5,000	5,000	6,000	6,000	1,000		8,500	1,000	5,000	1,000		8,500	6,000	1,000
		Maximum	5,000	5,000	6,000	6,000	1,000		8,500	8,500	5,000	1,000		8,500	6,000	8,500
		N	1	1	1	1	1		1	2	1	1		1	1	4
Heho	Unit price (MMK)	Mean						1,000		1,000			1,000			1,000
		Minimum						1,000		1,000			1,000			1,000
		Maximum						1,000		1,000			1,000			1,000
		N						1		1			1			1
Mine Thaunt	Unit price (MMK)	Mean					1,000			1,000		1,000				1,000
		Minimum					1,000			1,000		1,000				1,000
		Maximum					1,000			1,000		1,000				1,000
		N					1			1		1				1
Nyaung Shwe	Unit price (MMK)	Mean	3,333	3,333			1,433			1,433	3,333	1,433				2,383
		Minimum	1,000	1,000			1,100			1,100	1,000	1,100				1,000
		Maximum	7,000	7,000			2,000			2,000	7,000	2,000				7,000
		N	3	3			3			3	3	3				6
Total	Unit price (MMK)	Mean	3,750	3,750	6,000	6,000	1,260	1,000	8,500	2,257	3,750	1,260	1,000	8,500	6,000	3,067
		Minimum	1,000	1,000	6,000	6,000	1,000	1,000	8,500	1,000	1,000	1,000	1,000	8,500	6,000	1,000
		Maximum	7,000	7,000	6,000	6,000	2,000	1,000	8,500	8,500	7,000	2,000	1,000	8,500	6,000	8,500
		N	4	4	1	1	5	1	1	7	4	5	1	1	1	12

Table 39: Market survey, Meat

Group: Meat

Market			Name																			
			Beef		Chicken		Chiken		Duck		Egg		Mutton		Pork		Port		quail egg		Total		
			viss	Total	viss	Total	viss	Total	no.	Total	no.	Total	viss	Total	viss	Total	viss	Total	no.	Total	no.	viss	Total
Aung Ban	Unit price (MMK)	Mean	16,000	16,000	12,000	12,000	8,000	8,000			130	130	36,000	36,000	6,750	6,750	7,000	7,000			130	13,214	11,579
		Minimum	16,000	16,000	12,000	12,000	8,000	8,000			130	130	36,000	36,000	5,500	5,500	7,000	7,000			130	5,500	130
		Maximum	16,000	16,000	12,000	12,000	8,000	8,000			130	130	36,000	36,000	8,000	8,000	7,000	7,000			130	36,000	36,000
		N	1	1	1	1	1	1			1	1	1	1	2	2	1	1			1	7	8
Heho	Unit price (MMK)	Mean	12,000	12,000			7,000	7,000			120	120			7,000	7,000	8,000	8,000			120	8,200	6,853
		Minimum	12,000	12,000			7,000	7,000			120	120			6,000	6,000	8,000	8,000			120	6,000	120
		Maximum	12,000	12,000			7,000	7,000			120	120			8,000	8,000	8,000	8,000			120	12,000	12,000
		N	1	1			1	1			1	1			2	2	1	1			1	5	6
Mine Thaunt	Unit price (MMK)	Mean	16,000	16,000			6,000	6,000			120	120			7,000	7,000					120	9,667	7,280
		Minimum	16,000	16,000			6,000	6,000			120	120			7,000	7,000					120	6,000	120
		Maximum	16,000	16,000			6,000	6,000			120	120			7,000	7,000					120	16,000	16,000
		N	1	1			1	1			1	1			1	1					1	3	4
Nyaung Shwe	Unit price (MMK)	Mean	16,000	16,000	12,000	12,000	6,000	6,000			183	183	26,000	26,000	5,250	5,250	5,750	5,750	40	40	154	10,250	6,367
		Minimum	16,000	16,000	12,000	12,000	6,000	6,000			100	100	26,000	26,000	3,500	3,500	5,500	5,500	40	40	40	3,500	40
		Maximum	16,000	16,000	12,000	12,000	6,000	6,000			400	400	26,000	26,000	7,000	7,000	6,000	6,000	40	40	400	26,000	26,000
		N	1	1	1	1	1	1			4	4	1	1	2	2	2	2	1	1	5	8	13
Shwe Nyaung	Unit price (MMK)	Mean	16,000	16,000			7,500	7,500	3,000	3,000	130	130			6,000	6,000	7,000	7,000			1,565	8,500	6,519
		Minimum	16,000	16,000			7,500	7,500	3,000	3,000	130	130			5,000	5,000	7,000	7,000			130	5,000	130
		Maximum	16,000	16,000			7,500	7,500	3,000	3,000	130	130			7,000	7,000	7,000	7,000			3,000	16,000	16,000
		N	1	1			1	1	1	1	1	1			2	2	1	1			2	5	7
Than Daung	Unit price (MMK)	Mean	16,000	16,000			6,000	6,000			105	105			7,000	7,000					105	9,667	5,842
		Minimum	16,000	16,000			6,000	6,000			100	100			7,000	7,000					100	6,000	100
		Maximum	16,000	16,000			6,000	6,000			110	110			7,000	7,000					110	16,000	16,000
		N	1	1			1	1			2	2			1	1					2	3	5
Total	Unit price (MMK)	Mean	15,333	15,333	12,000	12,000	6,750	6,750	3,000	3,000	144	144	31,000	31,000	6,400	6,400	6,700	6,700	40	40	373	10,194	7,453
		Minimum	12,000	12,000	12,000	12,000	6,000	6,000	3,000	3,000	100	100	26,000	26,000	3,500	3,500	5,500	5,500	40	40	40	3,500	40
		Maximum	16,000	16,000	12,000	12,000	8,000	8,000	3,000	3,000	400	400	36,000	36,000	8,000	8,000	8,000	8,000	40	40	3,000	36,000	36,000
		N	6	6	2	2	6	6	1	1	10	10	2	2	10	10	5	5	1	1	12	31	43

Table 40: Market survey, Basket

Group: Basket

Market			Name: Basket no.	Basket Total	Basket (Paline) no.	Basket (Paline) Total	Total no.	Total Total
Aung Ban	Unit price (MMK)	Mean	2,167	2,167	5,800	5,800	4,438	4,438
		Minimum	1,500	1,500	2,000	2,000	1,500	1,500
		Maximum	3,000	3,000	12,000	12,000	12,000	12,000
		N	3	3	5	5	8	8
Heho	Unit price (MMK)	Mean	3,550	3,550	6,875	6,875	5,767	5,767
		Minimum	1,600	1,600	2,000	2,000	1,600	1,600
		Maximum	5,500	5,500	12,500	12,500	12,500	12,500
		N	2	2	4	4	6	6
Nyaung Shwe	Unit price (MMK)	Mean	2,333	2,333	5,000	5,000	3,667	3,667
		Minimum	1,500	1,500	3,000	3,000	1,500	1,500
		Maximum	3,000	3,000	7,000	7,000	7,000	7,000
		N	3	3	3	3	6	6
Total	Unit price (MMK)	Mean	2,575	2,575	5,958	5,958	4,605	4,605
		Minimum	1,500	1,500	2,000	2,000	1,500	1,500
		Maximum	5,500	5,500	12,500	12,500	12,500	12,500
		N	8	8	12	12	20	20

Table 41: Market survey, Flower

Group: Flower

Market			Chrysanthemum 10 flowers	Chrysanthemum bunch	Chrysanthemum Total	Galdiolus bunch	Galdiolus Total	Rose 10 flowers	Rose bunch	Rose Total	Total 10 flowers	Total bunch	Total Total
Aung Ban	Unit price (MMK)	Mean		1,000	1,000				500	500		750	750
		Minimum		1,000	1,000				500	500		500	500
		Maximum		1,000	1,000				500	500		1,000	1,000
		N		1	1				1	1		2	2
Heho	Unit price (MMK)	Mean		350	350	1,200	1,200		500	500		683	683
		Minimum		350	350	1,200	1,200		500	500		350	350
		Maximum		350	350	1,200	1,200		500	500		1,200	1,200
		N		1	1	1	1		1	1		3	3
Mine Thaunt	Unit price (MMK)	Mean		500	500				800	800		650	650
		Minimum		500	500				800	800		500	500
		Maximum		500	500				800	800		800	800
		N		1	1				1	1		2	2
Nyaung Shwe	Unit price (MMK)	Mean	750		750			900		900	825		825
		Minimum	500		500			800		800	500		500
		Maximum	1,000		1,000			1,000		1,000	1,000		1,000
		N	2		2			2		2	4		4
Shwe Nyaung	Unit price (MMK)	Mean		500	500				300	300		433	433
		Minimum		500	500				300	300		300	300
		Maximum		500	500				300	300		500	500
		N		2	2				1	1		3	3
Than Daung	Unit price (MMK)	Mean		400	400				500	500		450	450
		Minimum		400	400				500	500		400	400
		Maximum		400	400				500	500		500	500
		N		1	1				1	1		2	2
Total	Unit price (MMK)	Mean	750	542	594	1,200	1,200	900	520	629	825	588	647
		Minimum	500	350	350	1,200	1,200	800	300	300	500	300	300
		Maximum	1,000	1,000	1,000	1,200	1,200	1,000	800	1,000	1,000	1,200	1,200
		N	2	6	8	1	1	2	5	7	4	12	16

Table 42: Market survey, Staple food

Group: Staple food

Market			Name																	
			broken rice		Maize		Rice		Sorghum			Wheat		Total						
			Pyi	Total	bud	Total	Pyi	Total	can	viss	Total	viss	Total	bud	can	Pyi	viss	Total
Aung Ban	Unit price (MMK)	Mean	1,050	1,050	250	250	1,573	1,573		450	450	1,600	1,600	250		1,468	1,217	1,249
		Minimum	1,050	1,050	250	250	1,000	1,000		450	450	1,400	1,400	250		1,000	450	250
		Maximum	1,050	1,050	250	250	2,208	2,208		450	450	1,800	1,800	250		2,208	1,800	2,208
		N	1	1	1	1	4	4		1	1	2	2	1		5	3	9
Heho	Unit price (MMK)	Mean			175	175	1,637	1,637	100		100	1,625	1,625	175	100	1,637	1,625	1,189
		Minimum			150	150	1,000	1,000	100		100	1,500	1,500	150	100	1,000	1,500	100
		Maximum			200	200	2,290	2,290	100		100	1,750	1,750	200	100	2,290	1,750	2,290
		N			2	2	5	5	1		1	2	2	2	1	5	2	10
Mine Thaunt	Unit price (MMK)	Mean					1,588	1,588								1,588		1,588
		Minimum					1,125	1,125								1,125		1,125
		Maximum					2,050	2,050								2,050		2,050
		N					2	2								2		2
Nyaung Shwe	Unit price (MMK)	Mean			500	500	1,820	1,820				1,267	1,267	500		1,820	1,267	1,489
		Minimum			500	500	1,100	1,100				1,000	1,000	500		1,100	1,000	500
		Maximum			500	500	2,300	2,300				1,500	1,500	500		2,300	1,500	2,300
		N			1	1	5	5				3	3	1		5	3	9
Shwe Nyaung	Unit price (MMK)	Mean	1,000	1,000	200	200	1,626	1,626	100		100	1,600	1,600	200	100	1,501	1,600	1,223
		Minimum	1,000	1,000	200	200	1,250	1,250	100		100	1,400	1,400	200	100	1,000	1,400	100
		Maximum	1,000	1,000	200	200	2,290	2,290	100		100	1,800	1,800	200	100	2,290	1,800	2,290
		N	1	1	1	1	4	4	1		1	2	2	1	1	5	2	9
Than Daung	Unit price (MMK)	Mean			70	70								70				70
		Minimum			70	70								70				70
		Maximum			70	70								70				70
		N			1	1								1				1
Total	Unit price (MMK)	Mean	1,025	1,025	228	228	1,663	1,663	100	450	217	1,494	1,494	228	100	1,605	1,390	1,269
		Minimum	1,000	1,000	70	70	1,000	1,000	100	450	100	1,000	1,000	70	100	1,000	450	70
		Maximum	1,050	1,050	500	500	2,300	2,300	100	450	450	1,800	1,800	500	100	2,300	1,800	2,300
		N	2	2	6	6	20	20	2	1	3	9	9	6	2	22	10	40

Table 43: Market survey, Wood

Group: Wood

Market			Name																		
			Bamboo		Chacoal		Firewood		Plywood		Tanaka		Timber		Tumaric Powder		Total						
			no.	Total	Sac	Total	bunch	Total	flat piece	Total	no.	Total	ton	Total	viss	Total	bunch	flat piece	no.	Sac	ton	viss	Total
Aung Ban	Unit price (MMK)	Mean	1,100	1,100	3,500	3,500	1,000	1,000	14,333	14,333			797,500	797,500	5,000	5,000	1,000	14,333	1,100	3,500	797,500	5,000	249,677
		Minimum	500	500	3,500	3,500	1,000	1,000	7,500	7,500			780,000	780,000	5,000	5,000	1,000	7,500	500	3,500	780,000	5,000	500
		Maximum	2,000	2,000	3,500	3,500	1,000	1,000	22,000	22,000			850,000	850,000	5,000	5,000	1,000	22,000	2,000	3,500	850,000	5,000	850,000
		N	3	3	1	1	1	1	3	3			4	4	1	1	1	3	3	1	4	1	13
Heho	Unit price (MMK)	Mean			3,000	3,000			14,900	14,900								14,900		3,000			11,925
		Minimum			3,000	3,000			8,000	8,000								8,000		3,000			3,000
		Maximum			3,000	3,000			22,500	22,500								22,500		3,000			22,500
		N			1	1			3	3								3		1			4
Mine Thaunt	Unit price (MMK)	Mean									3,500	3,500	780,000	780,000					3,500		780,000		521,167
		Minimum									3,500	3,500	780,000	780,000					3,500		780,000		3,500
		Maximum									3,500	3,500	780,000	780,000					3,500		780,000		780,000
		N									1	1	2	2					1		2		3
Nyaung Shwe	Unit price (MMK)	Mean	2,500	2,500	6,500	6,500			13,233	13,233			815,000	815,000				13,233	2,500	6,500	815,000		187,078
		Minimum	1,500	1,500	6,500	6,500			8,500	8,500			780,000	780,000				8,500	1,500	6,500	780,000		1,500
		Maximum	3,500	3,500	6,500	6,500			19,500	19,500			850,000	850,000				19,500	3,500	6,500	850,000		850,000
		N	3	3	1	1			3	3			2	2				3	3	1	2		9
Shwe Nyaung	Unit price (MMK)	Mean	1,833	1,833	3,500	3,500			14,833	14,833								14,833	1,833	3,500			7,643
		Minimum	1,000	1,000	3,500	3,500			7,500	7,500								7,500	1,000	3,500			1,000
		Maximum	3,000	3,000	3,500	3,500			23,000	23,000								23,000	3,000	3,500			23,000
		N	3	3	1	1			3	3								3	3	1			7
Than Daung	Unit price (MMK)	Mean									2,000	2,000							2,000				2,000
		Minimum									2,000	2,000							2,000				2,000
		Maximum									2,000	2,000							2,000				2,000
		N									1	1							1				1
Total	Unit price (MMK)	Mean	1,811	1,811	4,125	4,125	1,000	1,000	14,325	14,325	2,750	2,750	797,500	797,500	5,000	5,000	1,000	14,325	1,982	4,125	797,500	5,000	178,276
		Minimum	500	500	3,000	3,000	1,000	1,000	7,500	7,500	2,000	2,000	780,000	780,000	5,000	5,000	1,000	7,500	500	3,000	780,000	5,000	500
		Maximum	3,500	3,500	6,500	6,500	1,000	1,000	23,000	23,000	3,500	3,500	850,000	850,000	5,000	5,000	1,000	23,000	3,500	6,500	850,000	5,000	850,000
		N	9	9	4	4	1	1	12	12	2	2	8	8	1	1	1	12	11	4	8	1	37

4.2.3 Market chain of main agricultural products

Aung Bang market is the main market in the Inle lake watershed. The several shops in Aung Bang market which deal with main agricultural products were interviewed in June, 2019 by JICA expert with the local coordinator. The market chain of the main agricultural products is summarized below (**Figure 30**).

Cabbage

There are Chinese cabbages and Cabbages sold in the market. They are mainly sold to Meiktila and Bago in the dry zone.

Garlic

They are sold to Bago and Morayamin.

They are not exported.

Ginger

According to the shops, gingers are sold mainly to Bangladesh these days. Traders come from Yangon and they sell ginger to Bangladesh. Bangladesh market started three years ago. Amount of ginger exported from southern Shan is 10 million viss per year. Amount of ginger exported from Myanmar to Bangladesh is 30 million viss per year. There are about 50 shops who deal with gingers. There is no connection and meetings between the shops. French people came to promote production of organic ginger. But farmers refused because they felt it was tedious.

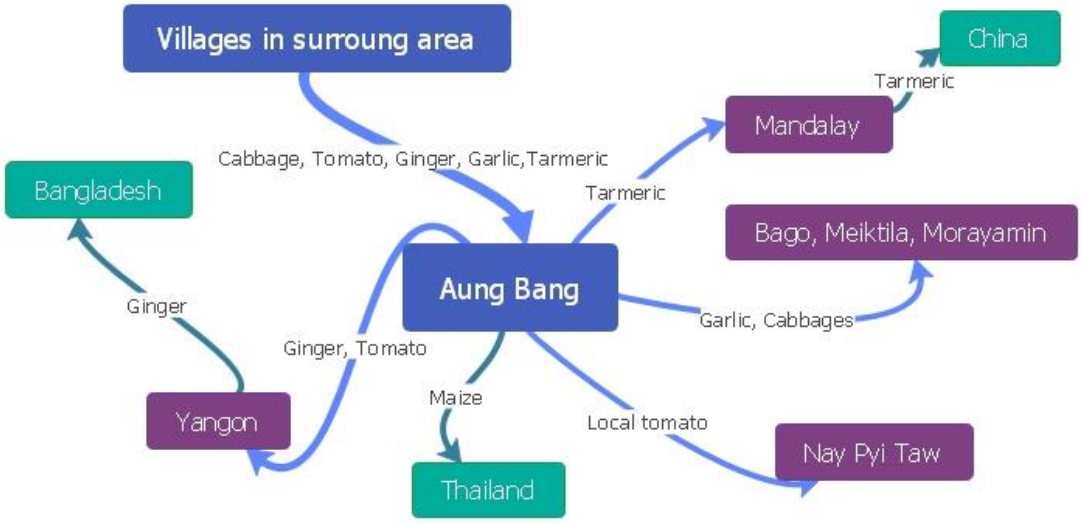

Figure 30: Market chain of main agricultural products

Maize

Previously main customers for maize was China. But, because the Chinese market has been recently closed for Myanmar, maize is sold to Thailand. In Thailand they are used for food for CP chicken.

Turmeric

Turmeric is sold to Mandalay's traders who sell them to China. There are a few such traders in Mandalay. At Aung Bang market, there are 4~5 shops who deal with Turmeric.

Tomato (Local)

Traders come to Aung Bang from NPT. There are 4-5 traders. There is enough demand for local tomato and it has been so for a long time. In June, four trucks of 2 tons capacity go to NPT. They grow well in the lowland paddy area (Lae). They are mainly produced in Pin Lang and Pindaya townships near Kalaw.

Tomato (Exotic)

Tomatoes are sold all over the country such as Mandalay, Yangon, Lasho, Morayamin, Mon etc. The shop manager knows 200–300 traders in the country and communicates to sell the products directly. No trading and shop organizations exist.

Table 44: Market interview at Aung Bang Market

Item	Buying price from farmers	Selling price to traders	Selling to:	Re-selling to	Remarks
Chinese cabbage	700 kyat per viss.	800 kyat per viss.	Meiktila, Bago in the dry zone.	Nil	
Cabbage	700 kyat per viss.	800 kyat per viss.	Meiktila, Bago in the dry zone.	Nil	
Ginger	2000 kyat per viss.	2100 kyat per viss.	Yangon	Bangladesh market	• There are about 50 shops who deal with gingers. Most of the shops are small. • There is no connection and meetings between the shops. • Before they were exported to India and

Item	Buying price from farmers	Selling price to traders	Selling to:	Re-selling to	Remarks
					China.
Turmeric (Ukon)	1800 kyat per viss. 1900 kyat per viss.	1900 kyat per viss.	Mandalay	China	• There are a few such traders in Mandalay. • There are 4~5 shops who deal with Turmeric. • The amount of Turmeric is 200 ton per month from Aung Bang.
Maize	380 kyat per viss.	400 kyat per viss.		Thailand	• In Thailand they are used for food for CP chicken.
Tomato (exotic)	1300 kyat for the large size and 800-900 for the small size per viss.	1200 and 750 for large and small	Mandalay, Yangon, Lasho, Morayamin, Mon etc.	Nil	• The shop manager knows 200–300 traders in the country. • In June, 10 trucks bring tomatoes form this shop. 30-40 baskets (30–40 m^3) are carried by one truck. • There are 4~5 shops in Aung Bang.
Tomato (local)	930 kyat per viss this year.	1,000	Nay Pyi Taw and Minchan.	Nil	• Brokers in Aungban charges 7%. from the farmer • It was 600-700 kyat in 2018 and 1700 kyat in 2016–2017. • There is enough demand. • They grow well in the lowland paddy area (Lae). • They are mainly produced in Pin Lang and Pindaya.
Garlic	3000 kyat for large size and 900-1000 for small per viss.	3100 to 3200 kyatfor large 1100-1200 for small pervis	Bago and Morayamin.	Nil	• Prices are not stable. • They are not exported.

4.3 Summary of the market survey results

In the Government statistical data, the agricultural lands were mainly used for upland and irrigated rice, corn and beans. But it seems recently tomato and ginger are becoming main products in the area and large lands have been used for those products. Also, as one of the newly introduced fruits, dragon fruit, was not even recorded in the data. In the future, field survey to obtain more realistic data should be conducted.

There was no statistical data obtained from the main six markets. Most probably there was no survey conducted before. So, the production volume of each crop is unknown. Based on the field interview at Aung Bang, the largest market in Inle watershed, the demand for tomato and cabbage was very high domestically. Ginger, turmeric and maize were traded internationally to Bangladesh, China and Thailand, respectively. Before, ginger was exported to China but now the Chinese market is closed and they are exported to mainly Bangladesh. As such, the international market demand is fluctuated.

One of the main problems for the villagers is the unstable price. There is not famers' associations such as a cooperative and they are negotiating with traders individually. This should be one of the causes of the unstable prices for their crops. In order to strengthen the negotiation and improve the current condition of the prices, it is recommended to establish a farmers' association.

Attachment 13
Guidelines and Checklists Used for Participatory Rural Appraisal

Guidelines on the Conducts of PRA Sessions

Activity	Target group	Aspects to be clarified or Key questions	Steps to be taken	Attentions to be paid	Necessary materials
Resource mapping/ Hazard mapping	Group of people (20 -30 pax) - village leaders - land owners - female - others	• Distribution of forest, and land uses, e.g., shifting farm, permanent farm, orchards, grazing land, and others • Major landmarks in the village (roads, paths, rivers/streams, village boundaries, etc.) • Land ownership, e.g., Government land, Communal land (land owned by village) and Private land (land owned by individuals) • Distribution of households/hamlets in the village • Distribution of important NTFP (such as bamboo, honey, others) • Distribution of major water resources with their use • Sacred places • Protected area (if any) • Areas for firewood collection • Location of natural hazards, e.g., forest fires and gully erosion • Extent of damages caused by above events	• Select a proper place for making a map in consultation with local people • Explain the purpose and time schedule of the exercise • Ask them to show the major resources and landmarks using locally available materials in a creative way and to make the map as representative as possible • Do not interfere. Allow them to do it on their own. In case they get stuck, help them out. • Listen carefully to the discussions they have while preparing the map. Note down the relevant points. • In case the participants do not represent the aspects that we intend, we could ask them un-intrusive questions without disturbing the process, like “What about …..?”, or “Can you show us ……..in the map?” • Ask them to explain the map including the various symbols, visuals and colours used. • At the end, ask them whether anybody would like to make any modifications or additions. • Copy the map onto a large sheet of paper with all details including legends. Also make a small-sized copy for reporting.	• Take note any comments by people who are not directly involved in drawing the map. • Classify the farmlands into upland farm (fixed), shifting farm, orchards, and others). • Classify forests by major species and density of forests, such as dense, medium and sparse. • Demarcate Community Forest and/or reserved forest and other protected forest (if any) • Identify the location of gully erosion/land slides/forest fires • Draw the map prepared by villagers soon after it being depicted. • Check seasonal changes in land use	<u>In case you use the ground for a matrix.</u> • Chalk or rope for boundaries • Piece of papers • Stones • Symbols • Other materials <u>In case you use the composite paper for a matrix.</u> • Large plywood • Composite paper • Pen ---------- • Flipcharts
Trend Analysis	Group of people (20 -30 pax) - People from different ages and different strata - Elders	• Historical changes in the situations of natural resource • Major items to be surveyed are: 1) income, 2) water 3) paddy (major-crops 1), 4) tomato (major-crops 2), 5) potato (major-crops 3), 6) other major farm products, 7) major NTFPs, 8) volume of firewood collection, 9) livestock, 10) land availability, 11) population, 12) forest, 13) landslide/gully erosion, 14) forest fires	• Explain the objective and time schedule of the exercise. • Ask them to make a grid with chalk or other materials on the ground or with a bold pen in a large composite paper. • Put the land mark years in the left column from top to bottom and aspects of natural resource, e.g., forests, land, production of major crops, • Take up one of the aspects and ask the participants to depict the situation today in the corresponding cell using symbols, visuals, seeds, sticks, stones, etc. Move to next time landmark so	• Landmark years should be used namely i) After 2011, ii) 2003/4 - 2011, iii) 1988 – 2003/4, iv) 1962 – 1988 and v) before 1962 • Take notes all the discussions made by the participants, not only the answers but also comments or suggestions made during the discussions.	<u>In case you use the ground for a matrix</u> • Chalk or rope for boundaries • Stone/seeds/other local materials

Activity	Target group	Aspects to be clarified or Key questions	Steps to be taken	Attentions to be paid	Necessary materials
			on. After the completion of one aspect, move to the next aspect and follow the same process till all the cells are filled in. • Once the diagram is ready, ask them whether they would like to make any changes. • Check if there are any aspects to be added to the matrix. • Ask the participants to explain the diagram. Encourage the participants to discuss their findings and reflect on them.		
Seasonal Calendar	Group of people (20-30 pax) - People from different ages and different strata	• Rainfall pattern • Farming practices of shifting cultivation • Farming practices of upland crops, and vegetables • Harvest seasons of major crops • Harvest seasons of industrial plants, NTFPs, Firewood and other products • Any events (Droughts, Fires, Slides) • Seasonal change in availability of water (river water and springs)	• Explain the objective and time schedule of the exercise. • Ask them to make a grid with chalk or other materials on the ground or with a bold pen in a large composite paper. • The grid has at least 13 columns and as many rows as the items that we like to study. The items to be studied shall be decided in consultation with the Team before the session. • Put the numbers of months or symbols of months in the top boxes in the grid in order, horizontally. • Put the symbols or drawings or letters of the aspects of which seasonal variations to be clarified. Ask the participants to show the months when the aspect or activity is on. Ask them to represent the magnitude of the activity using seeds or sticks of different size or writing the x-marks or any other symbols. • After completing one aspect or activity move to another, until all of them are similarly covered. • Ask the participants if any modifications are necessary. • Ask questions about aspects which you are not clear. • Facilitate discussions and analyses among the participants. • Copy the diagram on a piece of paper with legends and details of the participants, facilitators,	• Make and use a matrix of months and topics/resources • Use symbols (such as cross or tick mark) or local materials (such as stones) to express seasonal trends of the topics to be clarified	<u>In case you use composite papers for matrix.</u> • Plywood • Composite papers <u>In case you use the ground for a matrix.</u> • Chalk or rope for boundaries • Symbols or local materials showing the frequency/seasonal trend

Activity	Target group	Aspects to be clarified or Key questions	Steps to be taken	Attentions to be paid	Necessary materials
			location and date. •		
Separate group discussion on Current Status of Community Forest and Forest Resource Management	Separated group of people (10~20 pax/group) including the members of Community Forest User Groups (if any) - 10~20 women from different ages and different strata - 10~20 men from different ages and different strata	【For the village which already has been practicing CF】 • General Information of CF • Condition of forest in CF area • Main objectives of CF registration • Criteria of granting membership of CFUG • Land tenure of CF area • Basic rules relating to forest and land management in CF area • Process of establishment of CF • Afforestation/Reforestation made in CF area • Any forest management practices and activities conducted by CFUG • Major forest & NTFP products collected from CF • Mechanism of benefit sharing among CFUG members • Past and current support for CF activities from government, donors, NGOs, etc. • Future use of CF area • Incentive to participate in CUFG activities • Any changes in forest conditions in CF area • Any problems and concerns about management of CF area • Perception of improvement of ecosystem services 【For the village which has yet to introduce CF】 • Interest in participation in CF • Existing forest in the village • Perception of CF • Expectation from CF • Obstacles for apply to CF 【Forest Management in the Village (private land) and Status for Forests】 • Current status of forests • Forest fires	• Explain the objective and time schedule of the exercise. • Ask the questions according to the checklist prepared. • Once you get the answers from the participants, ask the reasons for the answers given. Facilitate the discussions among the participants. • Take notes all the discussions made by the participants, not only the answers but also comments or suggestions made during the discussions.	• Use a checklist (see Checklist 1) specifically for this meeting. • Take note any statements of the participants	• Checklist for semi-structured interview • Flipcharts

Activity	Target group	Aspects to be clarified or Key questions	Steps to be taken	Attentions to be paid	Necessary materials
		• Firewood collection • Conversion of forests • Importance of forest • Existing forest management practices • Protected areas or communal forests			
Separate group discussion on Farming practices and agricultural resources	Separated group of people (10~20 pax/group) - 10~20 women from different ages and different strata - 10~20 men from different ages and different strata	【Practice on Shifting cultivation】 • Number of plots owned by household for shifting cultivation • Practices of shifting cultivation • Intention to continue shifting cultivation 【Practice on Permanent Farming】 • Farming practices in permanent farms • Crop production • Soil conservation measures and agroforestry • Any concerns	• Explain the objective and time schedule of the exercise. • Ask the questions according to the checklist prepared. • Once you get the answers from the participants, ask the reasons for the answers given. Facilitate the discussions among the participants. • Take notes all the discussions made by the participants, not only the answers but also comments or suggestions made during the discussions.	• Use a checklist (see Checklist 2) specifically for this meeting. • Take note any statements of the participants	• Checklist for semi-structured interview • Flipcharts
Separate group discussion on Natural Resource Management	Separated group of people (10~20 pax/group) - 10~20 women from different ages and different strata - 10~20 men from different ages and different strata	• Important Natural Resources and Access to the Resources • Important Agricultural Products • Important Marketing Products	• Explain the objective and time schedule of the exercise. • Ask the questions according to the checklist prepared. • Once you get the answers from the participants, ask the reasons for the answers given. Facilitate the discussions among the participants. • Take notes all the discussions made by the participants, not only the answers but also comments or suggestions made during the discussions.	• Use a checklist (see Checklist 3) specifically for this meeting. • Take note any statements of the participants	• Checklist for semi-structured interview • Flipcharts

Checklist 1: Separate Group Discussion on Community Forest and Forest Resource Management

1. Current Status of Community Forest

1-1: For the village which already has been practicing CF

Points	Key Suggested Questions
1) General Information of CF	■No. of CFUG members, Area of CF, Year of registration, Composition of CFUG management
2) Condition of forest in CF area	■Dense or closed canopy, moderately closed canopy, sparse forest, or woodlot when it was registered?
3) Main objectives of CF registration	■What are the main objectives of CF registration?
4) Criteria of granting membership of CFUG	■What kinds of attributes/qualifications are required for being a member of CFUG?
5) Land tenure of CF area	■Was CF area the state land or private land? ■Why was CF area selected for CF?
6) Basic rules relating to forest and land management in CF area	■What are the basic rules on the use and management of CF area?
7) Process of establishment of CF	■What steps and activities were taken for establishment of CF from identification of the proposed site to registration of CF? ■How many meetings were organized during above process? ■How many villagers were involved in the process of establishment of CF?
8) CF management plan	■Did the community prepare CF management plan? ■If so, what steps were taken during preparation of CF management plan? ■If so, have CF management plan been implemented?
9) Afforestation/ Reforestation made in CF area	■Species planted, Area or No. of seedlings planed, Year of afforestation/reforestation
10) Any forest management practices and activities conducted by CFUG	■Have CFUG members engaged in any forest management activities? ■If so, what kinds of forest management activities have they conducted in CF area?
11) Major forest & NTFP products collected from CF area	■Have CFUG members collected any forest and non-timber forest products from CF area? ■If so, what kinds of products have they collected and what purpose have they collected such products for?
12) Mechanism of benefit sharing among CFUG members	■If the members can collect any commercial products from CF area, how does CFUG share the benefit from the products among its members? ■Please specify the rules on benefit sharing?
13) Past and current support for CF activities from government, donors, NGOs, etc.	■Year, Type of activities, Area/Size of support, and Organization
14) Future use of CF area	■Does CFUG like to change the condition of CF area? ■How does CFUG think CF area should be in future?

Points	Key Suggested Questions
	■What purpose does CFUG like to use CF area for? ■What kinds of trees or crops does CFUG like to plant in CF area?
15) Incentive to participate in CFUG activities	■What are the main incentives for CFUG members to participate in CF activities?
16) Any change in forest conditions in CF area	■Has the forest condition in CF area been changed? ■If yes, how has the conditions been changed (degraded or improved)?
17) Any problems and concerns about management of CF area	■Are there any problems or concerns about management of CF area (such as deforestation, encroachment, forest fire, gully erosion, etc.)? ■If there are any problems/concerns, what are the main causes of such problems/concerns? ■What kinds of interventions/supports are required for solving such problems/ concerns?
18) Perception of improvement of ecosystem services	■How far do CFUG members understand about ecosystem services provided by forests, particularly CF area, e.g., water availability, stability of slope?

1-2: For the village which has yet to introduce CF

Points	Key Suggested Questions
1) Interest in participation in CF	■Do communities know about CF? ■Do communities in the village like to allocate existing forest for CF? ■Do communities in the village like to bear responsibility for rehabilitation, management, and protection of degraded forest reserve adjacent to the village? ■If so, why do they like to introduce CF in the village? ■What kinds of benefits do they expect from CF?
2) Existing Forest in the Village	■Are there any natural forests which could be allocated for CF?
3) Perception of CF	■What do they think about CF? ■What are their understandings about CF? (less incentive but more obligations, etc.)
4) Expectation from CF	■What are the expectations of communities from CF? (any improvement of livelihood, protection of environment, no expectation)
5) Obstacles for apply to CF	■What kinds of negative aspects do communities foresee from the introduction of CF?

2. Forest Management in the Village (Private Land) and Status of Forests

Points	Key Suggested Questions
1) Current status of forests	■Have forest areas in the village been changed? ■If so, how have forest areas in the village been changed, decrease or increase? and what are the main reasons for the change? ■What are the main species of trees planted in private land and naturally grown in the village?

Points	Key Suggested Questions
2) Forest fires	■How often do forest fires occur in the dry season? ■Which parts of village do forest fires frequently occur (by using a resource map prepared by local communities)? ■When (or Which months) do forest fires occur usually? ■What do communities think the main causes of forest fires are? ■What do communities think frequent forest fires would cause in future?
3) Firewood collection	■How often does one household collect firewood in a week? ■Are there any specific areas used for collection of firewood? If so, please specify the area in the resource map prepared by local communities. ■How much of firewood does a household collect for one time collection? ■Which species or types of trees are used for firewood in general?
4) Conversion of forests	■Are forests in the village still converted into other forms of land use? ■If so, what kinds of land use are forests converted, vegetable farms, upland farms, and others?
5) Importance of forest	■Do communities consider forest as an important resource? ■If so, why or what points do they consider forest to be important? (e.g., a source of firewood, potential area for new farms, place for animal grazing, etc.)
6) Protected Areas or communal forests	■Is there any protected area or communal forest within the boundaries of the village? ■If so, what kind of rules or practices do communities follow to manage and protect the protected area / communal forest? ■If there are any rules on management, please specify the rules. ■Who will be responsible for management and protection of the protected area or communal forests?

Checklist 2: Separate Group Discussion on Farming Practices and Agricultural Resources

1. Practice on Shifting Cultivation

Points	Key Suggested Questions
1) Number of plots owned by household for shifting cultivation	■How many plots did communities used to use for shifting cultivation before? ■How many plots do communities use for shifting cultivation at present? ■If there is no shifting cultivation practice existing in the village, what made them change their practices?
2) Practices of shifting cultivation	■If shifting cultivation still exists, how large is the average size of the plot used by one household? ■How many years do communities use the same area for production of annual crops on average? ■What kinds of crops are produced in the plot of shifting cultivation? ■After production of annual crops, what do communities do in such an area? ■How many years do communities fallow the area after stopping the production of annual crops? ■What are the major good points in production of crops under shifting cultivation as compared to the production in permanent farms? ■What are the major difficulties (or bad points) in production of crops under shifting cultivation as compared to the production in permanent farms?
3) Intention to continue shifting cultivation	■Do communities like to continue shifting cultivation? ■If so, why do they like to continue such a practice? ■If no, why do they like to stop and what kinds of support are required for them to stop the practice?

2. Practice on Permanent Farming

Points	Key Suggested Questions
1) Farming practices in permanent farms	■What kind of crops does one household grow in their permanent farms? ■Do communities apply farm inputs for production of the respective crops grown in the permanent farms? ■Have communities grown the same crops since before?
2) Crop production	■Are there any change in production or productivity of crops? ■If the production/ productivity declines, what do they think the main causes of decrease of crop production? ■If the production/ productivity increases, what do they think the main reason for increase of crop production?
3) Soil conservation measures and agroforestry	■Have communities applied any soil conservation measures to their permanent farms? ■If so, how many percent of communities on average have applied soil conservation measures? and what kinds of soil conservation measures have they applied (such as bench

Points	Key Suggested Questions
	terracing, contour bunds, or putting crop residues along contours, etc.)? ■ In general, which types of farms do they apply the soil conservation measures (vegetable farms, upland farms, or no difference among types of farms)? ■ Have communities applied agroforestry practices to their own farms? ■ If so, how many percent of communities on average have applied agroforestry practices? and what kinds of agroforestry practices have they applied (such as taungya, Silvopastoral, etc.)? ■ How many plots does one household own such a type of farm (agroforestry farm) on average? (or how large is the agroforestry farm hold by one household on average?)
4) Any concerns	■ What are the major concerns about production of crops? ■ What kind of supports or intervention are needed to address such concerns and issues?

Checklist 3: Separate Group Discussion on Natural Resource Management

1. Important Natural Resources and Access to the Resources

Points	Key Suggested Questions
1) Important natural resources	■Please specify three most important natural resources including forest and non-timber forest products for their livelihoods. ■Please also specify the reasons why such products are selected as important resources. ■Please also classify them into resources to be marketed for cash income and those used/ consumed by household.
2) Practices of collection of important forest products and NTFPs	■Where, when, and how often do communities collect such resources (using a resource map for identification of the locations)? ■Are there any rules on collection of such resources in the village? ■If so, please specify the rules.
3) Access to resources	■Is there any difference in accessing to natural resources, particularly important natural resources among community members, such as between the sexes? ■If so, what kinds of resources that women or men have limitation to access to?

2. Important Agricultural Products

Points	Key Suggested Questions
1) Important agricultural products	■Please specify three most important agricultural products for their livelihoods. ■Please also specify the reasons why such products are selected as important products. ■Please also classify them into products to be marketed for cash income and those consumed by household.

3. Important Agricultural Products

Points	Key Suggested Questions
1) Marketing of important products and resources	■Where (in the village, market outside the village, nearby town, etc.) and to whom (company, groups of people, etc.) do communities sell the marketable important resources and products? ■Are there any difficulties in accessing to the market or buyers? ■If so, please specify what kinds of difficulties that they face in marketing the resources and products. ■Please specify how do communities market the respective resources and products, such as i) locations, ii) means of transportation, iii) cost for transportation, iv) volume of product per transaction. ■Please also draw market channels/flows of the respective resources and products with identification of key stakeholders/ players involved in the market flows.

Attachment 14
Report on the Results of PRA Survey

Republic of the Union of Myanmar
Ministry of Natural Resources and Environmental Conservation

Results of PRA in the Target Villages (Kone Ni, Pha Yar Phyu, Ein Yar and Nang Thon Villages)

Design Phase of Component 2 (Integrated Watershed Management in the Inle Lake Watershed) of The Project for Capacity Building for Sustainable Natural Resource Management

August 2019

Japan International Cooperation Agency (JICA)

NIPPON KOEI CO., LTD./
Japan Forest Technology Association/
Asia Air Survey Co., Ltd.

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1. Background

1.1 Selection of the Target Villages

In order to come up with the necessary measures at village level to reduce sediment flow to the Inle Lake, it is indispensable to grasp the social and economic conditions of the villages through data collection. To do so, the JICA Project Expert Team conducted socio-economic survey which consists of i) questionnaire survey and ii) Participatory Rural Appraisal (PRA). This report summarizes the results of the PRA survey conducted in June, 2019.

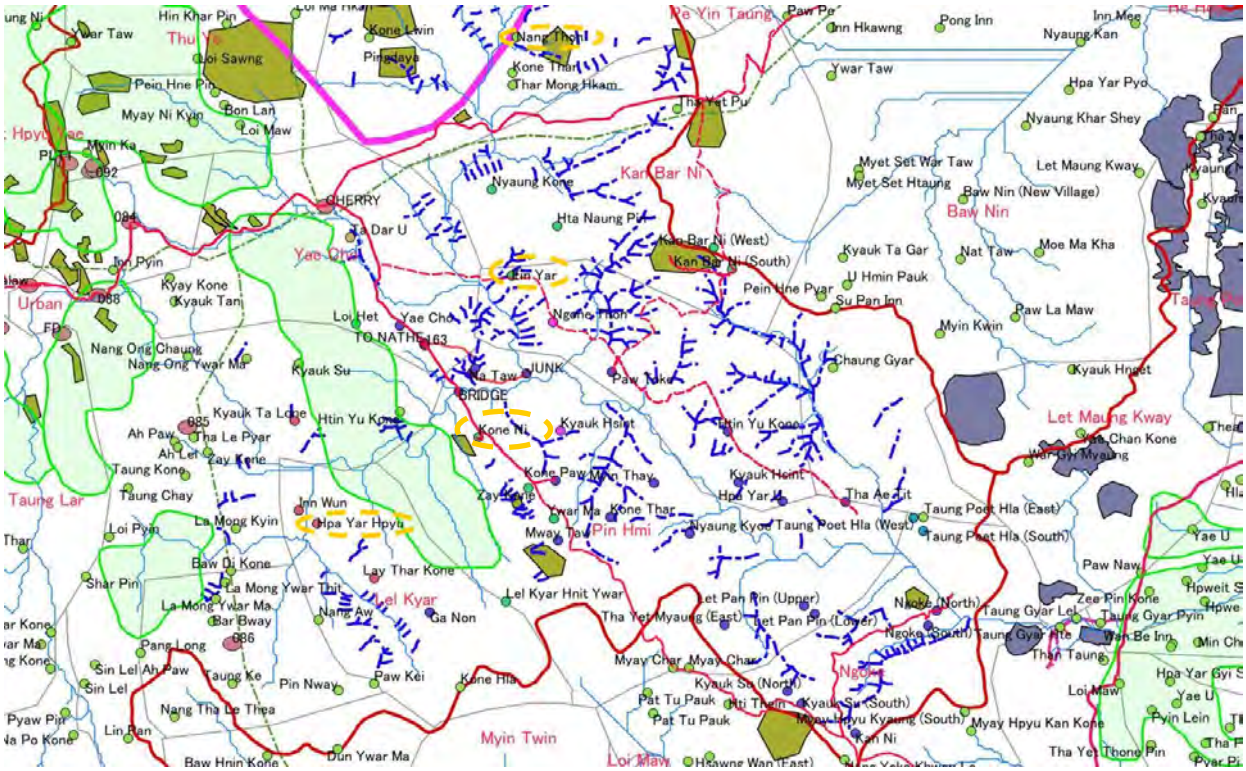
In selection of the target village for the socio-economic survey, the Expert Team selected 4 villages for PRA survey from the Kalaw township which occupied major part of Kalaw sub-watersheds, where the gully erosion is observed more than other sub-watersheds in Inle Lake watershed. The target villages were selected together with Kalaw FD, considering 1) accessibility, 2) ethnicity and existence of CF as shown below.

Target Villages selected for the Socio-Economic Survey

No.	Village	Village Tract	Accessibility	Ethnicity	Existence of CF
1	Kone Ni	Pin Hmi	Good	Paoh, Taung Yo	Registered
2	Pha Ya Phu	Lei Kyar	ditto	Taung Yo	Planned
3	Ein Yar	Kan Bar Ni	ditto	Danu	None
4	Nang Thon	Thar Mong Hkam	ditto	Danu	Registered

Source: JICA Project Expert Team (2019)

Consequently, the JICA Expert Team selected four (4) villages, e.g., Kone Ni, Ein Ya, Pha Ya Phu and Nang Thon. The location map of the villages is shown below.



Source: JICA Expert Team

1.2 Outlines of Participatory Rural Appraisal (PRA)

The JICA Expert Team contracted the NGO, FREDA (Forest Resource Environment Development) based in Myanmar. The NGO conducted the PRA sessions in the four target villages from May 31 to June 10, 2019. The following sessions/meetings were held in the target villages.

Sessions/Discussions organized in PRA

Sessions/discussions	Data and Information collected
1. Resource mapping/Hazard mapping	Present land use map Availability and locations of major natural resources Location of gully erosion Status of land (land ownership) in the villages
2. Trend analysis	Historical changes in natural resource uses and status of natural resources
3. Seasonal calendar	Seasonal major activities in farming, livelihood, and traditional events. Seasonal issues and natural hazards (e.g., water shortage, forest fires and gully erosion)
4. Group discussions on current status of community forest and forest resource management	- For the villages which already has established CF General information of CF Basic rules in natural resource management in CF area Process of establishment of CF Forest management practices in CF Incentives, problems and concerns in CF management - For the village without establishment of CF Interest in participation in CF Expectation from CF Obstacles for apply to CF - Forest Management in the village Current status and management practice of forest Importance of the forest including willingness to convert the area to other purposes
5. Group discussions on farming practices and agricultural resources	Practice of shifting cultivation Practice of permanent farming, including farming practices, crop production, and soil conservation measures.
6. Group discussions on Natural Resource Management	Important natural resources and access to the resources Important agricultural products Market flow of the major resources

Source: JICA Expert Team

Above group discussions were conducted separately by males and females.

Prior to the PRA sessions in the villages, the Project Team provided guidance to the NGOs using the guidelines and checklists for each session given in **Appendix –1**

1.3 Purpose of this Report

The main aim of this report is to analyze the present conditions of the four villages using the results of PRA carried out in the same.

2. Present Conditions of the Target Villages

2.1 Results of PRA at the Target Villages

The results of PRA at the four target villages are presented in Tables 1~32 and Figures 1~4, and outlined in the following sections. Appendix-2 shows some of the scenes of the PRA sessions conducted by the NGOs in the target villages.

2.2.1 Resource Mapping

The communities in four target village prepared resource maps of the respective areas as shown in Figures 1~4. Some findings observed during the resource mapping are highlighted below.

Kone Ni Village

i) The village is located on the right bank of the Kalaw river.

ii) The households in the village seem to gather close to the shrine and monastery.

iii) Natural pine forests are distributed on the mountainous area at western part of the village. Forest fires happen in this area.

iv) There is Community Forest (CF) covered mainly with the pine forest. Several gully erosions are found in CF area.

v) Most of the areas in the village are used for farming, mainly vegetable and paddy (both upland and lowland paddy).

vi) Some upland areas cannot be cultivated during the rainy season due to poor accessibility.

vii) The spring located in the pine forest at the mountainous area is the main water source in the village which is connected to the water tank close to the monastery.

viii) The villagers planted Banyan tree as sacred tree for religious purposes.

Pha Ya Phyu Village

i) The reserved forest consisted of pine trees is situated at the eastern part of the village.

ii) Two springs are located inside the reserved forest.

iii) The households in the village seems to gather at the center of the village.

iv) There is communal forest called "village forest plantation" surrounding the monastery, supported by UNDP. The species of trees planted are Yay Thin Win (*Milleta macrostachya*), Maezali (*Senna siamea*), and Malaegeia Pctauk (*Acacia auriculiformis*).

v) Firewood is collected from the shrubs along the river and gully erosion.

vi) Forest fires happen in the pine forest including the reserved forest.

Ein Yar Village

i) Pine forest is located in the southward behind the main stream. Though it is outside of the village, the villagers of Ein Yar have protected almost half of the area. The rest of the area is managed by the villagers of Ngone Thon.

ii) Forest fires have occurred in above pine forest every year possibly by accident.

iii) Shrub is extended along the stream where all the villagers collect the firewood since it is communal area.

iv) Some area flooded in the rainy season is used for grazing aria.

v) The households in the village seem to be located dispersedly.

vi) Grazing is just practiced in the fallow area and communal area.

vii) There are many gully erosions along the streams.

viii) There are 3 open wells, 1 water storage tank and 1 tube well in the village. Currently, water is provided to every household through connecting pipes from the tube well, supported by Rural Development Department.

ix) The stream bank area was converted from forest to the farms.

Nang Thon Village

i) There is almost no forest area and protected area. Mainly farmland is distributed in the village.

ii) CF was established 5 years ago close to the monastery.

iii) There is paddy area along the river.

iv) Communal area is located at the eastern part of the village, such as cemetery compound.

v) Honey is collected at the shrubs along the stream.

vi) Major water sources are tube well in the Thar Maing Khan village and Thar Maing Khan stream which is the village boundary.

vii) Firewood is collected along the stream as well as their home yards.

viii) Flood occurs along the stream every year without causing major damage to the surrounding area.

2.2.2 Trend Analysis

In the trend analysis, the current conditions and historical changes of natural resources as well as agricultural products in the target villages were evaluated by setting several landmark years for the analysis. The landmark years were decided through the discussion with the villagers. Especially, they could recall their memories in relation to the timing of implementation of the donor's projects such as provision of the water facilities. The landmark years set by the villagers are shown below.

Landmark years used for Trend Analysis

Village	Landmark years (reason for its selection)
Kone Ni	1) Before 2001 (before UNDP's project on the construction of water tank), 2) 2001- 2014 (after UNDP project), 3) 2014 – current (recent 5 years)
Pha Yar Phyu	1) Before 1988 (before election for military regime), 2) 1988 - 2001 (after UNICEF project for water), 3) 2001 – 2009 (after UNDP project for provision of the water tank), 4) 2009 – current (recent 10 years)
Ein Yar	1) Before 1988/1989 (before UNDP project), 2) 1988/99 - 2003 (after UNDP project), 3) 2003 – 2012 (after renovation of the school), 4) 2012 – current (after UNDP microfinance project)
Nang Thon	1) Before 2009 (before UNDP's project on the construction of water tank), 2)

	2009 - 2014 (after UNDP project) , 3) 2014 – current (recent 5 years)

Source: JICA Expert Team

The results of trend analyses of the four target villages are given in Tables 1~4. Some highlights found in the discussions are described below.

Kone Ni Village

a. The average yield of tomato has been increasing since 2001 possibly due to increase of application of chemical fertilizer.
b. Water availability both for drinking and irrigation has become limited due to population increase.
c. The average yield of ginger is getting reduced due to a drop of soil fertility.
d. Bamboo is decreased from 1) before 2001 to 2) 2001-2014 since the villagers harvested bamboo without replanting.
e. Amount of firewood collection has decreased since 2001 as the village leaders controlled the villagers not to sell the firewood and the villagers started to use charcoal.
f. Forest has reduced during 2001-2014 possible due to conversion of the forest to agricultural farms.
g. Forest fires have happened constantly, but its impact has been limited.
h. Occurrence of gully erosion has increased possibly due to deforestation.

Pha Ya Phyu Village

a. Availability of water both for drinking and agricultural use has been declined because of climate change and population increases.
b. The production of tomato has steadily improved due to introduction and increase of the use of the agricultural inputs, e.g., fertilizer, pesticides and non-local seeds.
c. The use of firewood has been almost maintained same. The villagers save the use of firewood by introduction of the cooking stoves.
d. Forest has been slightly decreased in these 10 years as the villagers cut the pine trees for house construction. Since the pine forest was designated as Reserved Forest 3 years ago, the villagers started to plant seedlings in the area.
e. Forest fire has been rarely occurred, 1-2 times per year for the whole period.

Ein Yar Village

a. Income level has got high notably after 2003 possibly because of increase of sales of agricultural products to meet high market demands especially of ginger.

b. The production of ginger has been improved especially after 2012 since more people started cropping ginger due to increase of market demands.

c. The villagers have enough drinking water since before 1998 as there have been many water sources and projects for provision of the water supported by UNDP and Department of Rural Development.

d. The average yield of upland paddy has been improving gradually due to the increase of application of fertilizer, pesticide and herbicide. The villagers believe that the more agricultural inputs, the more harvest they could obtain.

e. Water for irrigation has decreased especially between 1998 – 2003 because of increase of sedimentation in the streams, which resulted from the conversion of forest to the farm land.

f. Recently, the villagers use small amount of firewood due to electrification.

g. The number of the livestock, such as buffalo, reared in the village has risen since 2003 to collect its dung for fertilizer. Especially, more people has raised livestock since 2012 to earn the income by selling buffaloes.

h. Forest fire has been rarely occurred, 1-2 times per year for the whole period.

Nang Thon Village

a. Drinking water has been quite limited in the village to correspond to population increase. In 2017, they started to buy the water from the deep well located at Thar Maing Khan village.

b. Availability of water for irrigation has declined due to population increase and less stream water. Same as drinking water, they purchase water from Thar Maing Khan village.

c. The production of chayote, ginger and cauliflower has been improving due to increase of agricultural inputs, such as fertilizer and pesticides. The market price of the products depends on the size of products.

d. Bamboo has been decreased especially during 2009-2014 because of the increase of the harvest amount by the villagers who need construction materials for their houses.

e. Amount of firewood has been drastically declined due to the deforestation even though the villagers' high demand on the forest has been high because of the lack of electricity.

f. Due to the expansion of the agricultural land, there has been almost no forest in the village since 2017.

g. Since 2014, there are few gully erosions because of no more soil to be eroded.

h. Currently, forest fires do not occur since there is almost no forest area.

2.2.3 Seasonal Calendar

Seasonal changes in agricultural activities and natural events were analyzed by using a seasonal diagram method. The results of seasonal calendar are presented in Tables 5-8. Some seasonal characteristics of the target villages are highlighted below.

Kone Ni Village

a. Rainfall is the highest in October and November and lowest in January and May.
b. Land preparation for paddy is conducted in June, while other crops, e.g., tomato, ginger and peanuts from December to February. Seeds of upland and lowland paddy are sown at the field in July and other crops from January to March.
c. Harvest of tomato (dry and rainy seasons) is conducted from May to August.
d. Chemical fertilizer is applied to all the crops they listed up at the session, e.g., upland and lowland paddy, tomato, ginger and peanuts, while cow-dung is applied only to tomato after harvesting for preparation of the farm for next cropping year.
e. Firewood is collected in January and February.
f. Forest fires happen in March and April.
g. Gully erosion occurs in September and October when the rainfall increases.
h. The villagers face difficulty to get water both for drinking and irrigation in April and May.

Pha Ya Phyu Village

a. Rainfall starts in May and gradually increases from June to July with its highest peak in August and September. It stops raining in November.
b. Land preparation for paddy is conducted in May and June and other crops in May, September, October and November.
c. Chemical fertilizer is applied to the crops, e.g., paddy, tomato, ginger, garlic and Chinese cabbage, while cow-dung is only applied to ginger and tomato in March and May, respectively.
d. Application of pesticides to tomato is conducted once in 5-8 days from May to August.
e. Harvest of tomato is in July and August, while that of ginger is from November to February.
f. The village is prone to the forest fires in March and April.
g. Fire wood is collected in January and February.
h. There is lack of water for drinking and irrigation from March to May.
i. Bamboo is collected in January and March for the materials of house construction and from January to May for the materials of the poles for tomato plantation.

Ein Yar Village

a. The rainfall starts to increase from May with the highest peak between August and October.
b. Land preparation of the major crops, such as upland and lowland paddy, chayote, ginger and cauliflower, is conducted from March to July except June, and the crops are planted from May to August.
c. Major crops are harvested all the year, varying by the type of crop. Especially, ginger is harvested for 6 months from December to May and could be stored in the soil up to 2 years while chayote is harvested from July to November.
d. As for the use of fertilizer, chemical fertilizer is applied to all the major crops while cow-dung is used for chayote, ginger and cauliflower.
e. Herbicide is sprayed to ginger, and pesticide is applied to chayote and cauliflower.
f. The villagers collect honey from September to December for house consumption.
g. The village suffers from the scarcity of water both for drinking and agriculture from March to May.
h. Firewood is collected in February and March. For 2 months, the villagers collect the firewood for the consumption of 1 year.

Nang Thon Village

a. Farming activities varies depending on the crops. Land preparation of ginger is conducted in March, chayote in April, upland paddy and cauliflower in May and lowland paddy in July.
b. Upland and lowland paddy are harvested in November and December.
c. Ginger is harvested from November to May, while chayote from July to November and cauliflower in July and August.
d. Fertilizer is applied in the same month or 1-2 month later of the land preparation for the major crops. Cow dung is also applied to chayote, cauliflower and ginger at the same month of application of fertilizer.
e. Honey is collected from September to December.
f. The village suffers from the lack of water from March to May.

2.2.4 Group discussions on Current Status of Community Forest and Forest Resource Management

Prevailing practices on the management of Community Forest and forest resources in the villages were confirmed through the separate group discussions by male and female participants. The results of the discussions are shown in Tables 9~16, and some highlights in the discussions are summarized below.

Current Status of Community Forest and Forest Resource Management in the Target Villages

Theme	Kone Ni	Pha Yar Phyu
Current Status of Community Forest (CF)	• CF was established in 2013 and certificated in 2015 with support from Ecodev. It took 3 years for preparation of application of CF and 2 years for the process of approval by Land Record and Settlement Department. • Now, CF use group is composed of 89 members which is the representatives of all the HHs in the village. So, majority of CFUG is male. • Total area of CF is 40 acres and owned by the village. • The village leader is responsible in implementing CF activities. • CF management plan was prepared for CF implementation. The management plan includes 1) activities to be conducted by CF and 2) some rules such as prohibiting encroachment into CF area by outsiders. • Certification of CF reduced encroachment to the area by outsiders and has improved the condition of forest. • There is no area for further application of CF. • Major species found in CF is pine. Besides, there are Leucaena, Eucalyptus and Blue Jacaranda. • Women group showed their interest in planting teak trees and some fruit trees, such as avocado and pear in CF area. But they consider it difficult due to poor soil condition.	• There is no CF in the village. • They did not know about CF previously but now have interest in establishment of CF after explanation of the outlines of CF by FD and the NGO. • The area surrounding the monastery, where UNDP implemented the plantation could be suitable for CF site. This area is communal area. • Women group showed their willingness to get some income from CF by selling some forest products.
Forest Management in the Village	• In the home yard, Pin Sein is growing naturally which can be used for the firewood. • The villagers protect the forest surrounding the spring which belongs to the monastery. • The villagers from Tin Yu Kon cut the trees in the area of Kone Ni village. • The villagers do not cut the pine trees located at surrounding gully erosion but at the individual plantation. • Type of trees found in the village is Pin Sein (*Malus Sylvestris*), Zee Phyu (Indian gooseberry, *Phyllanthus Emblica*), Tha Pyay (*Eugenia Jambolana*), and Nyaung (Banyan tree, *Ficus Benjamina, Ficus Altissima*) • Since the Banyan tree is considered sacred, the villagers do not cut it. • Forest fires occurs once a year both in CF and natural pine forest possibly due to hunting animals. • Species of firewood are Pin Sein (*Malus Sylvestris*),Yin Huhm Thi Yan (Yay Mae, *Salix Tetrosperma Roxb*) and Pauk Too (*Diploknema Butyracea*). • They have no intention to convert the forest to the other use.	• In 1986, the boundary of Aung Ban Reserved Forest was set in the village. Reserved forest has been communal land. • FD put the signboard at the Reserved Forest with some rules. For example, the villagers are just allowed to collect firewood and timber in the reserved forest for their own use. • UNDP supported the plantation around the monastery consisted of the species, such as Pin Sein (*Malus Sylvestris*), Cherry and *Acacia Auriculiform*. • The villagers from Inn Wun also collect fire wood from the reserved forest as well as timbers for construction of houses. • If the outsiders come to the village to cut the trees, the villagers try to persuade them to only take the dried trees. • The villagers take resin from pine tree by cutting and peeling trees. After such harvesting, dried materials, such as fallen trees, branches and leaves are left which could occur fire rather easily. • Forest fires happen once a year in the pine forest in March and April. • Firewood is collected along the stream. Only dead trees could be collected as firewood. Major species of firewood is Pin Sein (*Malus Sylvestris*), Zee Phyu (Indian gooseberry, *Phyllanthus Emblica*), Thit Yar *(Schima Wallichii)* and shrubs. • They have no intention to convert the forest to the other use.

Theme	Ein Yar	Nang Thon
Current Status of Community Forest (CF)	• There is no CF in the village. • The participants do not have knowledge about CF and interest in CF. • If they can get some support to establish CF, they would like to do it at the pine forest, which is located outside the village and protected by the villagers based on the instruction by FD. • They would be interested in CF if they can plant cash crop.	• CF has been established in 2003 around the temple. The total area is about 2 acres. • The CF management plan was prepared. • In 2014, the half of the CF was converted to agricultural farms with the permission from the monk. • The people who borrow this land has to pay 40,000 kyat/acre per year to the monk.
Forest Management in the Village	• The villagers protect the pine forest before the instruction by FD as there is pagoda close to the forest. • They are allowed to cut trees for building houses. • Naw Taw village has been managing the half of the forest, southern parts from the ridge of the mountain. • At the pine forest, they cannot cut trees for selling, collect firewood and convert forest into agricultural land under management of FD. • The villagers used to clear the forest to open the farm land. Currently, there is no more available land to expand for agriculture. • Forest fires occurs once a year in the pine forest accidentally, which damage is not serious, just burning the grasses. • The villagers collect the firewood from shrubs along the river.	• The villagers collect firewood at the forest along the streams, which is the communal area. Also, the firewood is collected from another village, such as Thar Hmong Kham village at the village boundary. • They plant some of mango, avocado, jackfruits, bananas and bamboo in their home yards. • If the fruits trees are planted far from the house, they could be stolen by young people. • There is no forest fire. The villagers put fire at the farm to burn so that the new shoots come out for feeding their livestock. • They would like to plant 3,000 trees, such as Eucalyptus, Pines, Teaks and Mezalin (Casia stamea) at the place close to grave. The size of the area is estimated as 4-5 acre.

Source: JICA Expert Team

2.2.5 Group Discussions on Farming Practices and Agricultural Resources

Current farming practices as well as the production of major crops were confirmed through the separated discussion by male and female. Table 17~24 shows the results of the discussion, which are also summarized in the following table.

Farming Practices and Agricultural Resources in the Target Villages

Theme	Kone Ni	Pha Yar Phyu
Farming Practices	• There is no shifting cultivation • One person could have 4-5 acres of farm and use 2 acres for cropping. • Common farming practice in the village is: they plant ginger and paddy for the 1st and 2nd year, respectively. Then, they leave the area fallow for 3 years to recover soil fertility. • There is no practice of mix cropping. • The farmer who have several plots leave some area fallow to recover the soil fertility. • Major crops planted close to Kalaw stream is tomato in the rainy season and cabbage in the dry season. At the area far from the stream, crops, e.g., ginger and potato, are planted. Especially, 60 HHs out of 88 HHs in the village grow ginger.	• There is no shifting cultivation • Each HH has 4-7 plot of 0.5 acre/plot. • Common farming practice is: they plant ginger for the 1st year, upland paddy for the 2nd year, and peanuts or sesame for the 3rd year. After then, they leave the area fallow for 3-4 years to recover soil fertility. • At the farms close to river, there is no rotation farming practices as the soil fertility is better. • Major crops are lowland rice, peanuts, Chinese cabbage, cabbage and tomato.
Crop Production	• Productivity of crops has increased due to the introduction of improved quality seeds, fertilizer and cropping techniques. • Decrease or delay of the rain and pest attack can	• 33 HHs are growing ginger. • The production from the seeds of 0.08 kg of Chinese cabbage is 5,600 vis (8,000 kg) per acre. Chinese cabbage was introduced 8 years

Theme	Kone Ni	Pha Yar Phyu
	decline the crop productivity.	ago and the villagers can crop it 4 times per year. • The production from 30 g seeds of tomato is 4,500 vis (7,200 kg) per acre. The villagers consider that the increase of application of fertilizer, frequency of weeding and cutting of leaves has improved the productivity of tomato. • Ginger grows better in the red soil.
Introduction of Soil Conservation/ Agroforestry	• All the villagers have applied contour bands which has 20 to 25 feet of distance each line in the farm as instructed by Ecodev. • Around 10 HHs have an experience in planting orange seedlings with tomato. They grew tomato in-between orange seedlings. But they do not continue it due to low production.	• The villagers have introduced contour band, construction of embankment and digging channels for soil and water control.
Any concerns	• Delay of rain has affected the crop production.	• The market price is unstable. • Insects and diseases attack the crops. • There is no land available though they are interested in planting avocado and orange.
Application of Fertilizer/Insecticide	• The villagers apply pesticide and chemical fertilizer following instruction from the sales companies. For example, application of pesticide is once in 5 days. • As for tomato, 40 % of the sales is used for the purchase of fertilizer and pesticide. Some people borrow the money from the middlemen or they pay to the shop later when they get income by selling crops. • 30 HHs of 80 HHs total in the village can purchase agrochemicals without borrowing money. • Around 500 kg of the fertilizer is applied to 0.5 acre of tomato farm.	• The villagers use fertilizers, herbicides and fungicides. • 40 HHs out of 52 HHs in the village buy the fertilizer with the credit. • They also apply pesticides to lowland paddy and tomato. • They decide the application volume of fertilizer following the instruction at the packages sometimes being decided by themselves. • They apply pesticide once in 5-7 days for tomato during 4 months while once in 2-3 days for Chinese cabbage during 2-2.5 month.

Source: JICA Expert Team

Theme	Ein Yar	Nang Thon
Farming Practices	• There is no shifting cultivation in the village. • The villagers own around 3-10 acres of the farmland, including upland and lowland paddy. • Common farming practice in the village is: they plant ginger for the 1st year and upland paddy or peanuts in the 2nd year. Then, they leave the area fallow for 2-3 years to recover soil fertility. • Major crops are ginger, upland and lowland paddy, tomato and peanut. • Recently, they started cropping maize since some middleman at the Aung Ban told them that it could have the market overseas. • The villagers use own seeds of ginger and non-native seeds of tomato. • They grow tomato also on the embankment of lowland paddy.	• There is no shifting cultivation in the village. • The size of farming area varies from 2-4 acres/HH and each HH has 2-3 plots. • Main crop is chayote, ginger, cauliflower, peanuts, and upland and lowland rice. • Common farming practice is: they plant ginger for the 1st year and upland paddy for the 2nd year. Then, they leave the area fallow for 3 years.
Crop Production	• Crop production has been variable by the volume of application of cow-dung and stability of the weather condition. • The ginger production sometimes decreases due to the fluctuation of the rainfall.	• The crop production has increased year by year as they use more fertilizer and herbicide. • Harvest volume of chayote is 10,000 pcs/acre. • The production of upland paddy has increased due to the use of ginger stalks as fertilizer. • As for the ginger, the production has reduced

Theme	Ein Yar	Nang Thon
	• In general, the crop production has been improved every year because of the increase of application amount of fertilizer and herbicide. • The productivity of tomato sometimes decreases due to low quality seeds. All tomato farmers use the seeds from Thailand. • They use their own ginger roots for the next cropping season.	because of the delay of rain.
Introduction of Soil Conservation/ Agroforestry	• Although UNDP introduced contour band, the villagers do not practice it as it is laborious. • They install embankment surrounding their farms on the flat area for all the crops to prevent erosion. • For the upland farming, there is no installation of soil conservation measures as the slope is gentle. • The villagers dig the channels in the rainy season to prevent soil erosion.	• Lowland rice is cropped on terraces. • There are no soil conservation measures for upland farming as the slope is gentle. • As for some similar activities to agroforestry, peanuts and cauliflower are intercropped under the shade of chayote leaves.
Any concerns	• The rainfall tends to be delayed. So, the water scarcity is the problem. • Crop production is unstable. • The market price is fluctuated. • The knowledge level of the villagers on the agricultural techniques is low.	• Water is limited. • They need more agricultural land.
Application of Fertilizer/Insecticide	• Fertilizer is applied to ginger, upland and lowland paddy and tomato. In case of tomato, they use also cow dung. • The villagers follow the instruction on application of fertilizer given by the shop. • The villagers apply salt as herbicide.	• They apply fertilizer and herbicide. • They use ginger stalk as fertilizer. • Application of fertilizer to chayote is once in 15 days for 5 months.

Source: JICA Expert Team

2.2.6 Group Discussions on Natural Resource Management

Important natural and agricultural resources and their market flows were confirmed through the separated discussion by male and female. Table 25~32 shows the results of the discussion which is also summarized in the following table.

Natural Resource Management in the Target Villages

a. Kone Ni Village

Topics	Descriptions
List of important natural resources	➢ Had identified a number of natural resources available in the village, the male and female participants selected the important natural resources for their livelihoods with their priority as follows. Group: Male — Priorities: 1. Water, 2. Land, 3. Bamboo, 4. Forest (pine forest), 5. Road. Group: Female — Priorities: 1. Bamboo, 2. Firewood ➢ The male participants considered the utility of resources for agriculture and other productive purpose as most important, while the female participants selected the products used for own consumption.
List of important agricultural resources	➢ The male and female participants selected following agricultural resources and products with their priority. Group: Male — Priorities: 1. Paddy, 2. Peanuts, 3. Tomato, 4. Ginger Group: Female — Priorities: 1. Paddy, 2. Peanuts, 3. Tomato ➢ Both male and female identified similar agricultural products. Paddy and peanuts are important for self-consumption, while tomato for selling.

Topics	Descriptions
Market Conditions of the Major Products	➢ Tomato is sold to the middlemen/women and/or whole seller in Aung Ban. The price is 1,100 kyat/viss. (1 viss is equivalent to 1.6 kg.). Production of tomato can earn more income than other products because its unit price is rather higher. ➢ Cabbage, cauliflower, ginger and potato are sold to the middlemen/women and/or at Aung Ban market. The middlemen come from all over the country to purchase vegetables there. ➢ Ginger could be sold throughout a year with the price of 2,200 kyat/viss. ➢ Accordingly, the communities carry the products/commodities to Aung Ban by small or large tracks including power trailer. In case of tomato, the transportation cost is 10 kyat/viss.

Source: JICA Expert Team

b. Pha Yar Phyu Village

Topics	Descriptions
List of important natural resources	➢ The participants identified the important natural resources available in the village and prioritized as shown in the following table separated by male and female groups. Group: Male — Priorities: 1. Water, 2. Land, 3. Forest, 4. Bamboo Group: Female — Priorities: 1. Water, 2. Firewood, 3 Land ➢ Both male and female participants selected water as most important natural resources as vital for drinking, domestic and agricultural uses. ➢ As for the firewood, they collect them mostly from the Reserved Forest since the bank stream is the private land.
List of important agricultural resources	➢ The male and female participants selected following agricultural resources and products with their priority. Group: Male — Priorities: 1. Tomato, 2. Chinese cabbage, 3. Cauliflower, 4. Peanuts, 5. Ginger Group: Female — Priorities: 1. Paddy, 2. Ginger, 3. Tomato, 4. Chinese cabbage ➢ The male participants put priority in the marketability of the products while female selected crops for their own consumption, e.g., paddy, and long-sales, e.g., as ginger.
Market Conditions of the Major Products	➢ Ginger is sold to the brokers at Aung Ban township. One of them is based in Tun Tauk sales center. Price of ginger is 380-400 kyat/viss in 2018 and 800-2200 kyat/viss in 2019. At the broker's place, they need to pay labor fee to carry the harvest. The labor fee is 200 kyat/basket. ➢ The villager sell tomato to the brokers in broker's center in Aung Ban. Brokers sell the seeds of tomato to the villagers. The price of tomato is 100-900 kyat/viss in 2018 and 400-800 kyat/viss in 2019. ➢ Cauliflower is sold at Aung Ban township. ➢ Chinese cabbage is sold both to the middlemen coming to the village and brokers at Aung Ban township. ➢ Transportation cost is 20 kyat/viss by power trail or small track.

Source: JICA Expert Team

c. Ein Yar Village

Topics	Descriptions
List of important natural resources	➢ The male and female groups separately discussed to identify the important natural resources with its priority as tabulated below. Group: Male — Priorities: 1.Forest, 2. Stream, 3. Bamboo, 4. Honey/Honey bee, 5. Turmeric Group: Female — Priorities: 1. Water, 2. Land, 3. Firewood, 4. Bamboo ➢ The male group appreciates the forest as providing fertile soil as well as moderating climate. ➢ Both male and female group put priority on water and water source (stream) since all the HHs are connected to piped water now. ➢ Some villagers sell small bamboo at 1,500 kyat/unit and big bamboo at 3,000 kyat/unit, and weave basket to sell at 4,000 kyat/unit.
List of important agricultural resources	➢ After discussion to identify the important agricultural resources/products in the village, the participants prioritized the agricultural resources/products as shown below. Group: Male — Priorities: 1. Ginger, 2. Tomato, 3. Cabbage, 4. Peanuts, 5. Paddy Group: Female — Priorities: 1. Ginger, 2. Tomato

Topics	Descriptions
	➢ Both male and female groups listed ginger and tomato as main income generating crops at HH level. Especially, they appreciate ginger as long-sales crop which can be stored up to 2 years.
Market Conditions of the Major Products	➢ Major market outlets of ginger are i) broker's sales center at Aung Ban township (more than 90 % of total sales) and ii) brokers coming to the village. The brokers come to the village from Lae Kyar, Naung San Phu and Nan Tine villages. The villagers pay 10 % of sales to the broker. The brokers buy the product by acre. ➢ Price of ginger is 250-450 kyat/viss in 2018 and 1,500-2,300 kyat/viss in 2019. Every month they sell the ginger as it could be stored for 2 years. ➢ Tomato is sold at the broker's sales center at Aung Ban, which is same as ginger. ➢ Cabbage is sold to the brokers in Aung Ban market. The brokers buy the product by acre. ➢ Price of tomato is 50 kyat/viss in 2017. ➢ Cost of transportation, such as power trailer is 10 kyat/viss.

Source: JICA Expert Team

d. Nang Thon Village

Topics	Descriptions
List of important products/resources	➢ Having listed up the importance of existing natural resources in the village, the male and female participants prioritized the natural resources respectively as follows. Group: Male — Priorities: 1.Forest, 2. Bamboo Group: Female — Priorities: 1. Firewood, 2. Bamboo ➢ The male group consider the forest most important to moderate climate condition of the village and supply fire woods, while female group ranked the firewood as 1st priority for the necessary daily use. ➢ Also, both group members appreciated bamboo as materials for construction.
List of important agricultural resources	➢ The participants consider the following agricultural resources/products important and put its priority of importance as follows. Group: Male — Priorities: 1. Chayote, 2. Ginger, 3. Cauliflower Group: Female — Priorities: 1. Chayote, 2. Ginger, 3. Cauliflower ➢ Both male and female groups selected same products, which may reflect the limited water and land availability in the area.
Market Conditions of the Major Products	➢ Main market outlets of chayote are i) brokers in Aung Ban market who opened buying station at Thar Hmong Kham village, ii) brokers in Aung Ban Township, and iii) other brokers coming to the village only when the price of chayote arises. 10 % of the sales is given to the broker. The current price of chayote is 150 kyat/pcs. ➢ Almost all the harvest of ginger is sold at Aung Ban market where many brokers stay. Some brokers come to the village to purchase the product when the price arises. The current price of ginger is 2,300 kyat/viss. ➢ Cauliflower is sold at Aung Ban market. The price of the product ranges from 250 to 270 kyat/viss. ➢ For transportation, the villagers use power trailers, small and big tracks. The cost of transportation varies by the type of the crop.

Source: JICA Expert Team

3. Strengths, Weaknesses, Opportunities, and Threats of the Target Villages on Natural Resource Management

Based on the results of PRA in the four target villages, the JICA Expert Team provisionally assesses the strengths, weaknesses, opportunities, and threats of the target villages on natural resource management. The results of the assessments are summarized below.

Results of SWOT Analysis

Kone Ni Village

Strengths	Opportunities
➢ The village leader has strong leadership to implement village activities. ➢ They have set up CF with management plan which could enable them to manage forest area sustainably. ➢ There is no shifting cultivation practiced. ➢ The yield of tomato has been increasing with agricultural inputs. ➢ The villagers have learnt techniques on soil conservation, such as contour bund. ➢ Income level is getting higher enough to buy charcoal, which have reduced the use of firewood.	➢ The accessibility to the market is getting better through construction of road. ➢ The village have got several supports from Ecodev, such as introduction of CF and application of soil conservation measures. ➢ The village may ask support from FD such as seedling provision, with priority as CF village.
Weaknesses	**Threats**
➢ Availability of water is getting limited even the village is located close to Kalaw stream. ➢ Soil is degraded possibly due to high use of chemical fertilizer.	➢ Gully erosion is expanding. ➢ The population in the village may continue increasing. ➢ Further increase of agricultural inputs may reduce soil fertility.

Pha Ya Phyu Village

Strengths	Opportunities
➢ The village have managed the communal area in the reserved forest and plantation around the monastery. ➢ The yield of cash crops, such as tomato and garlic has been increasing with agricultural inputs. ➢ The villagers have used cooking stoves to save the use of firewood, ➢ Income is gradually increasing due to higher production of agriculture.	➢ External supports have been provided from the organizations, such as UNDP and PACT. ➢ The participants at the PRA sessions have interest in implementing CF in the village.
Weaknesses	**Threats**
➢ Water availability is getting limited due to the reduction of the water in the springs. ➢ There is no land available to expand the agricultural farms. ➢ The community may not be able to access freely to the shrub along the stream since that is private area. ➢ Accessibility to Aung Ban is worse than other target villages.	➢ Rainfall is fluctuated. ➢ Gully erosion is gradually expanding. ➢ Further increase of agricultural inputs may reduce soil fertility. ➢ Market price of crops is unstable. ➢ Population may constantly be increasing.

Ein Yar Village

Strengths	Opportunities
➢ The villagers have protected the pine forest located outside the village based on the instruction by FD. ➢ The women seem active in participating village activities. ➢ Drinking water is supplied to all the households. ➢ Electrification was implemented which could have reduced the amount of firewood use. ➢ Income has been notably increased due to high crop production with the application of agricultural inputs. ➢ Especially, the production of ginger has been drastically increased so they can choose the market outlet based on the price offered.	➢ FD has a plan to register the pine forest, located outside the village but protected by the Ein Yar villagers, as CF. ➢ The villagers also may have interest in establishment CF if they can plant cash crops. ➢ The market of ginger, which is major cash crop, seems expanding.
Weaknesses	**Threats**
➢ Irrigation water has reduced drastically due to increase of sedimentation at the streams.	➢ Rainfall is fluctuated. ➢ The population in the village may increase drastically.

➢ There is no more available land to open the agricultural area.	➢ Further increase of agricultural inputs may reduce soil fertility. ➢ Market price of crops is unstable. ➢ There would be almost no forest as deforestation is drastically progressing.

Nang Thon Village

Strengths ➢ The yield of main cash crops, such as chayote, ginger and cauliflower has been increasing due to higher application volume of fertilizer. ➢ The yield of paddy is stable for own consumption.	**Opportunities** ➢ There are some farmers who try to diversify the crops who could be a role model for other villagers. ➢ There is CF management plan.
Weaknesses ➢ In general, natural resources, water, forest and bamboo are degrading. ➢ There is almost no more forest in the village except along the streams. ➢ The options are limited to reduce the use of firewood, such as electrification, use of cooking stove and charcoal, etc. ➢ Even though there is CF, the half of the area has been converted into the agricultural farms. ➢ Variety of crops produced in limited possibly due to difficulty in accessing to irrigation water. ➢ There is no supply of the drinking water inside the village.	**Threats** ➢ The community is facing with the lack of energy sources. ➢ The population might be drastically increasing. ➢ Rainfall is fluctuated. ➢ Further increase of agricultural inputs may reduce soil fertility.

Tables

Table 1 Results of Trend Analysis at Kone Ni Village

Period	Income	Water (drinking)	Water (Irrigation)	Tomato	Ginger	Paddy	Sesame	Bamboo
Before 2001	2 • Low agricultural production • Low quality seeds • Poor road condition to the market • Crop productivity: 1 harvest time/year • Buyer coming to the village 2 days/week	5 • Enough quantity of water due to limited households (30 HHs)	5 • No flowing directly into Kalaw stream due do sharing water with Aung Ban/military facilities • Pipeline pumping system	1 • Low production due to low quality seeds and less fertilizer application	5 • Better production due to good soil condition due to clearing forest area by slash & burn practices	3 • Mono-cropping of paddy	5 • Delay of rainy seasons	7 • Grown more bamboo in the forest • Could sold at the market
2001-2014	3 • Improvement of road condition covered with tarmac • Crop production: all the year harvest. since 2012 • Buyer coming to the village 5 days/week since 2012 • Expansion of Aungban & Heho market	3 • Less water available due to population increase (80 HHs in 2014)	3 • Less water available due to population increase	4 • More available quality seeds at Aungban market • More fertilizer used	3 • Production reduced due to degraded soil quality • Needs to use more fertilizer	3 • Mainly mono-cropping od paddy • Part of farm with paddy mixed with vegetables • Application of fertilizer started	3 • Delay of rainy seasons which caused delay of cropping	2 • Consumption by households without planting
2014-2019	5 • Introduction of quality seeds of tomato • Construction of road in 2016	2 • Less water available due to population increase (Around 100 HHs currently)	2 • Less water available due to population increase • Less water available from Kalaw river since the river water has been deviated from Nang Ong Ywar Mar village to the army camp and Aun Bang	5 • Private company coming to the village to provide technical assistance to seed planting (they can harvest 3 times in a year) • More fertilizer used	2 • ditto	3 • No significant changes	2 • Delay of rainy seasons • Poor soil conditions	1 • Harvest only for self-consumption, not for selling

Results of PRA Survey at Kone Ni Village

Trend Analysis

Period	Firewood	Livestock	Land availability	Population	Forest	Gully erosion	Forest fires
Before 2001	5 • Various tree species of firewood collected at the natural forest • Sold at the market	5 • Enough area of grazing existed	3 • Land size is same because of no change of land ownership even after the children has inherited from fathers.	1 • 30 HHs estimated at that period	5 • Good condition of forest • Logging mainly pine trees at forest area with collection of firewood due to poor income	2 • Less gully erosion due to large forest area	3 • Little impact caused by the forest fire although it happens every year. The fire could not extend because there was water
2001-2014	3 • Collected just for self-consumption • Collected both at farms and natural forest • Controlled by the village administrator and village administration team not to sell the firewood	3 • Reduce livestock, because of the population increase and used more land for farming. Less grazing	3 • Same as above	4 • 50 HHs estimated at that period	3 • Reduction of logging due to increase of income by agriculture since ginger production became common • No harvest of trees after 2011	3 • Gully erosion happened due to decrease of forest area	3 • Same as above
2014-2019	2 • Reduction of firewood collection due to the use both of charcoal and firewood for cooking. (they buy charcoal at Aun Bang market. No one make charcoal in the village.)	2 • There is no grazing land	3 • Same as above	5 • 89 HHs existing with 300 people • Birth control started by the government	2 • No harvest of trees because they have enough income to buy charcoal • Forest area encroached by the peoples from other villages and slash & burn practiced since 2015 (No opening the forest area by the villagers of Kone Ni)	5 • Same as above	3 • Same as above

Table 2 Results of Trend Analysis at Pha Yar Phyu Village

Trend Analysis	Income	Water	Irrigation Water	Tomato	Upland Paddy	Lowland Paddy	Ginger	Garlic
Before - 1988	2 - Limited transportation which derived difficulty to access market - No power trailers/trucks to transport agricultural products to the market - They could not grow paddy without money to buy the seeds	9 - Around 20 springs existed in the village - Sufficient water	6 - Sufficient water for irrigation from Nang Aww Stream, Lamine Stream and Taung Bat Stream. - Less population engaged in agriculture	2 - Grew crops in the rainy season with native seed - Grew tomato just in rainy seasons.	2 - Grew paddy with rotational farming practice as after tomato (1 year), grow paddy (1 year) then left the land as fallow for 2-3 years - No use of fertilizer but cow dung	2 - Weed expansion affected production. - No application of fertilizer	2 - Low population rate (only 25 HH in 1997) - Use of just cow dung and no fertilizer - Use of own seeds	1 - Grew for own consumption - Bought seeds
1988 - 2001	3 - Drought for 1 year - Started to grow paddy - Grew Gladiolus because it got a good price and could be sold in Yangon	6 - Water springs reduced to around 10 - Difficulty to get water - Less water in the spring even in the rainy seasons	5 - Population increased - More agricultural land - Few HH started using water pump	3 - Grew crops in the rainy season with native seed - More people cropping tomato - Increase of - Higher production of tomato - Started using chemical fertilizer and pesticides - Increase of population - Some brokers to access to the market	3 - Started using fertilizer - Use of cow-dung - Believed that the more fertilizer, the more production. - Some HHs selling small amount of the paddy at the market. (No brokers coming to the village.)	3 - Started using fertilizers and used only once in the cropping season	2 - Small amount of sales at Aung Ban market. - No brokers coming to the village - Few people growing ginger	2 - Grew with their own seed - Sold at Aung Ban market. They walk to the market.
2001 - 2009	4 - UNDP provided microcredit and also supported for water pump, agricultural tools and garlic seed for vulnerable groups in the village - UNDP upgraded village road, supported construction of two bridges and connection of pipe line from spring to the water tank to	4 - No. of water springs reduced to 4 locations - No water in the springs located at the south of the village	3 - Limited accessibility to the stream water because of the use of the water for agriculture by surrounding villages - Increase of No. of pumping machines	4 - Grew crops both in rainy and dry seasons - Started using non-native seed - More use of fertilizers and pesticides - More people growing tomatoes	3 - Kept almost same amount of fertilizer as they realized that increase of fertilizer did not result in improvement of production - Applied fertilizer only once in the cropping season - If applied more than once in the cropping season, the ears of	4 - Application of fertilizers for 2 times per cropping season - Use of cow dung	2 - Limited land - Few people growing ginger	3 - Expansion of the market - Grew with their own seed - Sold at Sale Center at Aung Ban and to the brokers in Aung Ban township - Practiced rotative cropping with cabbage, cauliflower and tomato

Trend Analysis	Income	Water	Irrigation Water	Tomato	Upland Paddy	Lowland Paddy	Ginger	Garlic
	distribute the water to all the HHs. - Bought seeds from agriculture shop at Aung Ban				paddy could not develop.			
2009 - Now	5 - Grow more vegetables, e.g., cabbage, bean, bell pepper and cauliflower - Get knowledge about new seeds - Buy seeds from Agriculture shop at Aung Ban - PACT Myanmar started the microfinance program from 4 years ago. 20 HHs joined this program.	3 - 3 water sources remaining. - 4 year has passes since they started accessing to the water source close to the monastery. - There is water in the pond behind the monastery only in the rainy seasons. - The spring near the stream can only be used for domestic purposes. It is necessary to pump up to the village, which cost is 5,000 kyats per time for fuel for the pumping machine. - For drinking water, the spring supported by UNDP is used through the pipeline to the water tank.	2 - Digging a hole in the stream and to pump up the water in the dry season especially March and April - Each HH has 2-3 units of pumping machine	5 - Grow more seeds in double - More use of fertilizers and pesticides - Some buy the agricultural inputs with credit from agriculture shop - Change a new seeds whenever it reach to the agriculture shop	3 - Grow same as before - Keep same production rate	4 - The snails eat weeds and paddy leaves - The snails disappeared when the villagers irrigate the farm.	3 - Better market condition - More people growing ginger (currently, 30 HH)	3 - Grow own seed - Cannot expand the farm due to the limitation of land availability - 30 HHs growing garlic - Practice rotative farming

Results of PRA Survey at Pha Yar Phyu Village

Trend Analysis

Trend Analysis	Firewood	Bamboo	Livestock	Land Availability	Population	Forest	Land Slide/ Gully Erosion	Forest Fire
Before - 1988	4 - Sufficient volume of firewood - Collected near the village and own farmland	5 - Sufficient bamboo - Low population - Less usage of bamboo	2 - Low population - Few households - Less cows and buffalos - Needed to rent livestock from other villages	5 - Owned 3-4 plot of land area per HH	2 - Not much people	4 - Dense Forest extended around the village - Controlled by the Forest Department 30 years ago - Villagers cut trees	2 - Less occurrence of gully erosion	1 - Forest fire happened once a year in March, caused accidentally.
1988 - 2001	4 - Less population - Sufficient volume of firewood - Collected from own farmland and near the village - Rapid regeneration of trees after cutting their branches as firewood	4 - Increase of population numbers - Started to use for house construction - Bridges were also constructed by bamboo	4 - More livestock, especially buffalos by breeding	4 - The land availability decreased because of the population increase. Parents inherited their farmland with their son and daughters.	3 - Population increase - More families - Each family had a lot of children - Migrants from other village by marriage	4 - Dense forest extended - Forest Department also planted some tree species. - Villagers worked as a daily labor for the above planting. - Villagers did not cut forest, but trees around their farms	3 - Gradual increase of gully erosion gradually year by year in the rainy season	1 - ditto
2001 – 2009	3 - Less use of the firewood - Started using cooking stove as they saw other village's people use it - Decrease of the number of trees	3 - Started using for as materials for tomato farms	6 - Ditto	3 - The land availability decreased because of increase of family members	4 - ditto	3 - Some outsiders collected firewood from the pine trees. - Villagers cut the pine trees for house construction	4 - Gradual increase of gully erosion gradually year by year in the rainy season - Drainage channel from the farmland to the gully caused more erosion	2 - Forest fire occurred twice a year, possibly - Forest fire increased possibly due to leaving dry leaves left after collection of firewood at pine trees
2009 - Now	3 - Still using cooking stoves - collect firewood along the bank of the stream, from fallow area and the Reserved Forest	2 - More people own tomato farms - Some people weaving basket for own use	2 - Sell the livestock to buy the agricultural machines such as water pump and hand tractor. In the village, there are 6 cultivating machines and 40 pumping machines	2 - No land for opening new farms - Family members need to share their parent's farmland for cropping.	5 - ditto	3 - Forest Department conducts thinning activities in every three years. - People from the village collect firewood in the Reserve Forest - The pine forest was designated by FD as reserved forest 3 years ago and FD and they planted pine trees there. Even before the registration	5 - Installation of simple structure with bamboo and wood to prevent the progress of erosion near the farmland - The biggest gully erosion is now nearly 50 feet in width.	2 - ditto

Results of PRA Survey at Pha Yar Phyu Village

Trend Analysis

Trend Analysis	Firewood	Bamboo	Livestock	Land Availability	Population	Forest	Land Slide/ Gully Erosion	Forest Fire
						as the Reserved Forest, the villagers protected area especially from outsiders.		

Table 3 Results of Trend Analysis at Ein Yar Village

Trend Analysis	Income	Irrigated Water	Drinking Water	Upland Paddy	Lowland Paddy	Tomato	Ginger
Before – 1998/1999	1 - Grew crops naturally - Plowed with cows - Weeding by hand - Less market opportunity - Low market price - Less use of fertilizer - No use of pesticide - Pest and disease problem - Use burnt cow-dung - Low ginger production because no fallow period was set.	10 - Plenty of water in the stream - No fishing or battery shock to catch the fish in the stream	9 - Plenty of stream water - Collection of stream water from Thar Hmong Kham Stream and boiling it for drinking - Use of spring water for drinking	2 - Cultivate only by themselves (no machine, trailer) - No technical knowledge - Very little amount of fertilizers used	5 - More rainfall - Better weather condition	4 - Cultivate with their own seed - No use of fertilizer but cow-dung - No insect attack	1 - Not every house grow ginger - No market and demand Use of just cow dung
1998/1999 – 2003	2 - Increase of crop production - Started to use pesticide - Still low market price	3 - Use of electrical fish catcher - Sedimentation into the stream - Blocking the stream for catching of fish - Expanding of agricultural land, which caused sedimentation and shortage of water	9 - Water from open well supported by UNDP - Use of the stream water	3 - More use of fertilizers with various kinds	3 - Less rain - Cultivated using stream water by pumping	2 - Pest and insect problem occurred - No use of pesticide since they did not have knowledge on how to use pesticides	2 - Start to sell at Aung Ban market through some buyers or directly bringing the products to the market - No fertilizer used but cow-dung
2003 – 2012	8 - Better market price of the crops - Started use of fertilizer - Expansion of agriculture - Use of pesticides - For buying fertilizer/pesticide, they rent money from the shop if they have no enough money	2 - Sedimentation occurred as no tree was left because of the expansion of the farm land - Shortage of water along the stream	9 - Start the use of two open wells for providing water	4 - Started using fertilizers, pesticides and herbicides, including salt - Believed that more usage of agricultural inputs would provide good production. - Use of Hand tractor	2 - Unstable rainfall - Less stream water - Pest and disease problem	3 - Started use of non-native seeds without enough knowledge about it - Started using fertilizer, herbicide and pesticide based on understanding on how to use them	3 - More market demand in Aung Ban - More people growing ginger - No use of pesticides - Start using of fertilizer with cow dung - Cow dung used by all HHs
2012 – Now	10 - More agricultural inputs, e.g., fertilizers, pesticides and herbicides - More crop production	1 - Less water because of too much sedimentation - There has been no water left in the stream for the dry season	10 - Started the use of deep tube-well from 1.5 years ago by the support from Department of Rural	5 - Started using large tractor - More use of fertilizers which results in higher production rate	1 - Delayed rainy season - Less rainfall - Depending just on rainfall	4 - All household who grows tomatoes use non-native seed for almost 7 years.	10 - Use fertilizers and pesticides for high production - Buyers/middlemen come to the village to buy ginger

Results of PRA Survey at Ein Yar Village
Trend Analysis

Trend Analysis	Income	Irrigated Water	Drinking Water	Upland Paddy	Lowland Paddy	Tomato	Ginger
	- More income - Only 35% of the villagers buy fertilizer on credit	(March, April and May) in 5 years.	Development (10 mill kyat of budget), providing water to all HHs by water pipe - No difficulty to obtain drinking water	- Lack of rain does not affect the production of Taunggya paddy - Rotate crop production by year, ginger, peanuts and paddy, and leave the area fallow from 1 to 3 years		- More use of agricultural inputs and also use some kind of chemical to get big-size and colorful products	- The villagers can choose buyers/middlemen or market based on the offered price. - Better to sell to middlemen at Aung Ban market because there is no transportation cost. - They confirm the price from the middlemen at Aung Ban market by phone.

Results of PRA Survey at Ein Yar Village
Trend Analysis

Trend Analysis	Firewood	Bamboo	Livestock	Land Availability	Population	Forest	Land Slide/ Gully Erosion	Forest Fire
Before – 1998/1999	5 - Collect firewood from shrub along the bank of the stream (communal area) - Extension of dense forest - Low population - 6-10 carts for one household	6 - Plenty of bamboo trees - Construction of all houses with bamboo	1 - The grazing land was flooded during rainy season - Raising only 1 buffalo by HH - Cows could not survive in the wetland.	2 - Few HH work for farming - Low population	2 - Only 10 HHs in the village	10 - Extension of dense forest - Forest covered along the stream/river.	1 - Less erosion due to the coverage of dense forest	2 - Forest fire occurred
1998/1999 – 2001/2003	4 - Sparser forest as more people cut down the trees - Use of firewood from shrub, which regeneration takes 5 years - Population increased - Started using cooking stove distributed by UNDP for all villagers (2 unit per HH) - Decrease of area for firewood collection due to the expansion of farmland	5 - Used for their housing, fence, etc.	2 - No. of livestock increased	3 - More expansion of agricultural land especially along the stream and gully area because of the population growth	4 - Increase of population - 30 HHs in total in the village - UNDP program providing the information of birth control	8 - Decrease of forest due to the expanding of farmland and collecting of fire wood	2 - Less erosion due to the coverage of dense forest - Start expansion of farmland	2 - Forest fire occurred 2 times per year
2003 – 2012	3 - Less trees and shrubs - Expansion of agricultural land - Use of cooking stoves	4 - Clearance of bamboo for the expansion of farmland	6 - More buffalo raised , which dung was used for fertilizer	4 - ditto	6 - Increase of population - 60 HHs in total in the village	5 - Decrease of the forest area due to the expansion of farmland	4 - Expansion of farmland - Cutting down of tree	2 - Forest fire occurred
2012 – Now	1 - Less use of firewood due to electrification	1 - Clearance of bamboo by construction of electric power grit	10 - More buffalo raised - They can buy more fertilizers by the	6 - ditto	10 - Increase of population	2 - ditto	7 - No forest to stabilize soil	1 - Forest fire in pine forest once a year

	- Expansion of agriculture land with agricultural machine - Currently 1 cow cart per HH		earnings by livestock raising, - Use of animal dung for ginger and tomato growing		- 80 HHs in the village with more than 300 people - No migrants - More population through increasing number of HHs by marriage - Health officers come to the village for providing information of birth control.			

Table 4 Results of Trend Analysis at Nang Thon Village

Period	Income	Water (drinking) Tube well	Stream Water (for agriculture use)	Chayote	Ginger	Cauliflower	Rice	Bamboo
Before 2009	3 - Low income - Low production rate because they used mainly cow dung but also used small portion of fertilizer - Low market price. - Less productivity of tomato: 1 harvest time/year	0 - Provided from the open well - Tried to dig a well in the village near the temple and the school, but it failed.	10 - Used water from the stream - High water availability due to crop tomato only in the rainy season in a year	2 - Mainly used cow dung - Less use of fertilizer	2 - Mainly used cow dung - Less use of fertilizer	0 - No production	3 - Limited use of cow dung. - Did not know about the chemical fertilizer	8 - Plenty of bamboos - Used for house construction, weaving bamboo basket and poles at the chayote plantation
2009-2014	4 - More use of fertilizers - More market demands - Higher production rate and price of the crop	0 - Less water available due to the population increase	3 - Less water available due to population increase - Increase of sediment in the stream - Grow crops for three times harvest per year	3 - Mainly used cow dung - Increase of amount of application of fertilizer	3 - Increase of amount of application of fertilizer and agricultural inputs	4 - Started production - Use of fertilizers which resulted in producing bigger crops with higher market price	4 - Increase of the amount of application of cow dung, which resulted in the increase of production - Also, some chemical fertilizer were used.	4 - Bamboo forest gradually decreased because of more use for house construction by population increase
2014-2019	5 - More use of fertilizers - More market demands - Higher production rate and price of crop	2 - Less water available due to population increase (Around 67 HHs currently) - Started buying water from Thar Maing Khan village deep tube well since 2017. - They have to pay 2000 kyat per 1m^3	1 - Use the stream and deep tube well from Thar Maing Khan village - Lower water level in the stream - Started buying water from Thar Maing Khan village deep tube well since 2017. They have to pay 2000 kyat per 1m3 - Less water available due to population increase	5 - Use fertilizer and the production became much. - Use of pesticides every seven days for the first month of cultivation. - Increase of current production rate by 50 % - Higher market price.	6 - Use of pesticides every seven days which results in increase of production about 3 times higher than before. - Use of more fertilizer	6 - Increase of amount of application of fertilizer which results in producing bigger products with higher price	4 - Use chemical fertilizer - Use cow dung for the land preparation - In upland farm (mountain rice), from 1 basket (1 basket is 20.9 kg) of paddy seed they can produce 6 baskets of rice. - In Lowland farm, from 1 basket of volume of paddy seed they can produce 12 baskets of rice.	3 - Less bamboo forest - Buy bamboo from outside (Pin Laung) with the price of 1300 kyat for small one. - For the chayote farm with 1,000 plants, 1,500 bamboo trees are needed.

Results of PRA Survey at Nang Thon Village

Trend Analysis

Period	Firewood	Livestock	Land availability	Population	Forest	Gully erosion	Forest fires
Before 2009	9 - Plenty of wood nearby - Collected at the natural forest around the village - Only for household use	4 - Average 1~2 cows per household	3 - Limited land availability due to inherit to many children of them	3 - 20 HHs	6 - Good condition of forest/ plenty of trees.	4 - Occurred at the eastern part of cliff	6 - Forest fire occurred because of the hunting of wild animals
2009-2014	5 - Less trees nearby - Collected firewood around the steam Started cutting forest at the area far from the village (Outside of the Thar Hong Khan monastery planation compound - - Only for household use	5 - More livestock due to increase of population.	3 - Same land availability as there are no expansion of their farm land	4 - Population increase. One of the reasons is by marriage with the person from other villages	3 - Less forest for the expansion of the agricultural land	7 - Serious gully erosion occurred	3 - Less forest fire due to deforestation
2014-2019	1 - Necessity of firewood collection due to the lack of electricity - Due to deforestation around the village, they collect the firewood at other village boundary, Outside of the Thar Hong Khan monastery planation compound. - Collect the firewood around 4~5 bullock cart for each household per year.	6 • ditto	3 - ditto	7 - 67 HHs with 253 people - No migration from other village	0 - In 2016, almost the all of the tree in the forest around the village was cut down to expand the farmland.	2 - No gully erosion occurred because there was no more soil to be eroded.	0 - No more forest fire because there is no forest.

Table 5 Results of Seasonal Calender at Kone Ni Village

NO	ACTIVITY	MONTH												Note
		4	5	6	7	8	9	10	11	12	1	2	3	
1	**Rain**	--	--					++	++		--			
2	**Upland Paddy**													
2-1	Land preparation			×										
2-2	Sowing seeds				×									
2-3	Weeding					×								
2-4	Application of fertilizer			×		×								
2-5	Harvesting								×					
3	**Lowland Paddy**													
3-1	Land preparation			×	×									
3-2	Sowing at seedbeds			×										
3-3	Planting at the field				×									
3-4	Application of fertilizer				×	×								
3-5	Application of pesticide						×							
3-6	Harvesting									×				
4	**Tomato (Dry Season)**													
4-1	Land preparation									×				
4-2	Sowing seeds at the seedbeds										×			
4-3	Planting											×		
4-4	Application of fertilizer											×	×	
4-5	Weeding												×	
4-6	Placing posts												×	
4-7	Arranging ropes												×	
4-8	Watering by irrigation	×	×	×										
4-9	Application of pesticide	×	×	×										Applying once in 5 days
4-10	Harvesting		×	×										Taking the harvested crops to their houses for storage
4-11	Application of cow-dung									×				
4-12	Trenching									×				
5	**Tomato (Rainy Season)**													
5-1	Land preparation											×	×	
5-2	Sowing seeds												×	
5-3	Planting	×												
5-4	Application of fertilizer	×	×										×	
5-5	Application of cow-dung												×	
5-6	Making trench												×	
5-7	Making mound		×											
5-8	Installing posts		×											
5-9	Arranging ropes		×											
5-10	Spraying pesticide			×										
5-11	Spraying fungicide	×	×	×	×	×							×	
5-12	Harvesting				×	×								

Table 5 Results of Seasonal Calender at Kone Ni Village

NO	ACTIVITY	MONTH												Note
		4	5	6	7	8	9	10	11	12	1	2	3	
6	**Ginger**													
6-1	Land preparation										×	×		
6-2	Making mound												×	
6-3	Sowing seeds												×	
6-4	Application of cow-dung												×	
6-5	Weeding			×										
6-6	Seed collection for next cropping seasons				×									
6-7	Application of fertilizer				×									
6-8	Making mound				×									
6-9	Harvesting								×	×	×			
6-10	Selecting seeds for next cropping year											×		
7	**Peanuts**													
7-1	Seed selection											×	×	
7-2	Sowing seeds		×											
7-3	Weeding			×										
7-4	Application of pesticide					×								
7-5	Harvesting						×							
7-6	Application of fertilizer		×											
8	**Bamboo**													Naturally grown
8-1	Cutting for building houses									×	×			
8-2	Cutting for posts for tomato farms											×	×	
9	**Firewood**										×	×		Collection of firewood for 1 year-use. Volume collected of 3-4 bultrack/HHs. (1 bultrack = 250 vics)
10	**Honey**								×	×				Encroachment by the villagers of Tin Yu Kon even in the CF area to collect honey
11	**Drought**			×	×	×								Usually occuring once a 3 years. Impact to the harvest of crops. Needs sometimes to sell their livestocks to survive
12	**Gully erosion**						×	×						Happening every year along the river lane
13	**Forest fire**	×											×	Happening every year. Accidentally occurred.
14	**Water resources (drinking water)**													
14-1	Period for more water available				×	×	×	×	×					
14-2	Period for less water available			×						×	×	×		
14-3	Period for least water available	×	×											
14-4	Cleaning of water tank and spring			×									×	
15	**Water resource (illigation use from Kalaw stream)**													
15-1	Period for more water available				×	×	×	×	×					
15-2	Period for less water available		×	×						×	×	×		
15-3	Period for least water available	×											×	
15-4	Period for most using water	×	×								×	×	×	

Table 6 Results of Seasonal Calendar at Pha Yar Phyu Village

NO	ACTIVITY	MONTH												Note
		4	5	6	7	8	9	10	11	12	1	2	3	
1	**Rain**		+	+	+	+	+	+	+					Rainfall starts in May and gradually increases in June, July and Heavy rainfall in August and September and then stop raining in November
2	**Upland Paddy**													
2-1	Land Preparation		×											
2-2	Sowing seeds			×										
2-3	Application of fertilizer				×									
2-4	Application of herbicides			×										20 HH of 50 HH in total spraying herbicides after sowing seeds
2-5	Apply salt for weeding					×								
2-6	Harvesting								×					
3	**Lowland Paddy**													
3-1	Land Preparation			×										
3-2	Sowing Seeds			×										
3-3	Transplanting				×									Applying fertilizer soon after transplanting
3-4	Application of fertilizer				×	×								Applying pesticides twice: soon after transplanting and in August
3-5	Application of pesticides					×	×							
3-8	Harvesting								×	×				
4	**Tomato (Rainy season)**													
4-1	Sowing Seeds	×												
4-2	Land Preparation		×											
4-3	Digging		×											
4-4	Application of cow dung		×											
4-5	Application of fertilizer		×	×										Application of fertilizer 2 times. 1st time is after digging and 2nd time is after 15 days from planting.
4-6	Planting		×											
4-7	Weeding		×	×										Manual weeding without using machine
4-8	Application of pesticides		×	×	×	×								Applying pesticides once a 5-7 days
4-9	Making mound			×										
4-10	Placing post			×										
4-11	Arranging ropes			×										
4-12	Cutting leaves				×									Cutting leaves 3-4 times in a month
4-13	Harvesting				×	×								
5	**Ginger**													
5-1	Land Preparation						×	×	×					Plowing with hand tractor or tractor
5-2	Making ditch												×	
5-3	Planting												×	
5-4	Application of cow dung												×	
5-5	Application of fertilizer				×								×	
5-6	Weeding		×				×							Manual weeding

Table 6 Results of Seasonal Calendar at Pha Yar Phyu Village

NO	ACTIVITY	MONTH												Note
		4	5	6	7	8	9	10	11	12	1	2	3	
5-7	Making mound				×									
5-8	Colleting parent seeds				×									
5-9	Spraying tonic						×	×						The agriculture shop advise them to use it.
5-10	Harvesting								×	×	×	×		
5-11	Selecting of new seed for the next year										×			
6	**Garlic**													
6-1	Land Preparation								×					
6-2	Planting								×					
6-3	Application of fertilizer								×		×			
6-4	Watering								×	×	×	×		Watering once in ten days
6-5	Application of herbicides								×					
6-6	Harvesting	×											×	
7	**Chinese Cabbage**													
7-1	Land Preparation							×						
7-2	Sowing seeds						×							
7-3	Planting								×					
7-4	Applying cow dung								×					
7-5	Application of fertilizer								×					Applying 3 times and once in every ten days
7-6	Application of pesticides								×	×	×			Spraying once in every 2-3 days
7-7	Harvesting										×			
8	**Firewood**										×	×		firewood is collected from their farm, bank of the stream, surrounding gully area and the Reserved Forest
9	**Bamboo**													
8-1	House construction or repairing										×		×	
8-2	For tomato planting	×	×								×	×	×	
9	**Forest fire**	×											×	Forest fire occurs twice a year in the Reserved Forest.
10	**Gully erosion**					×	×							Gully erosion occurs every year when it comes rain heavilly.
11	**Drinking Water**													
11-1	Period for less water	×	×									×	×	Water piping from the spring to the water storage tank
11-2	Period for enough water			×	×	×	×	×	×	×	×			
12	**Irrigation water**													
12-1	Period for less water	×	×										×	Using stream water
12-2	Period for enough water			×	×	×	×	×	×	×	×	×		

Table 7 Results of Seasonal Calender at Ein Yar Village

NO	ACTIVITY	MONTH												Note
		4	5	6	7	8	9	10	11	12	1	2	3	
1	**Rain**													Heavy rainfall in August and September
2	**Upland Paddy**													
2-1	Land Preparation		×	×										Plowing 3 times with hand tractor
2-2	Sowing seeds			×										
2-3	Application of fertilizer				×									Applying fertilizer only one time
2-4	Application of salt				×									Use as herbicide
2-5	Harvesting								×					
3	**Lowland Paddy**													
3-1	Preparation of seedbed			×										Applying fertilizer for 2 times, one times is when plowing
3-2	Land Preparation				×									Plow 7 times with hand tractor
3-3	Transplanting of seedlings and cultivation				×									
3-4	Application of fertilizer				×	×								Applying fertilizer after cultivation after 15 days and one month after transplanting
3-5	Watering to the farm				×	×	×	×	×					Blocking of the Thar Hmong Khan stream for 5 months to irrigate the farm
3-6	Spraying pesticide					×								Starting from last 2 years
3-7	Application of fertilizer						×							Shwe Nagar Fertilizer can be use as both fertilizer and herbicide
3-8	Harvesting									×				
4	**Ginger**													
4-1	Land Preparation						×			×	×			Plowing 3 times with tractor
4-2	Procurement of cow-dung											×		Buying cow dung from central aera of Myanmar
4-3	Making ditch												×	
4-4	Planting												×	
4-5	Application of cow-dung												×	
4-6	Spraying herbicides			×										
4-7	Turning over the soil				×									
4-8	Collecting the mother seed					×								
4-9	Application of fertilizer					×								
4-10	Making mound						×							
4-11	Selecting seeds for next cropping year										×			

Table 7 Results of Seasonal Calender at Ein Yar Village

NO	ACTIVITY	MONTH												Note
		4	5	6	7	8	9	10	11	12	1	2	3	
4-12	Harvesting	×	×	×									×	The people who want to grow lowland paddy needs to harvest ginger in June and those who do not grow lowland paddy keep ginger in the soil unitl next year
5	**Peanuts**													
5-1	Making ditch		×											
5-2	Direct seed sowing		×											
5-3	Spraying herbicides		×											Only 50% from the village used herbicide.
5-4	Mounding soil			×										
5-5	Harvesting						×							
6	**Tomato (Rainy season)**													
6-1	Sowing seeds	×												
6-2	Land Preparation						×			×	×			Plow 3 times with tractor, but if the farm that grow tomatoes after harvest of gigner, they need to plow just once.
6-3	Making trench		×											
6-4	Application of cow dung		×											
6-5	Application of fertilizer		×	×										Some apply fertilizer during making trench. All farmers apply fertilizer after making mound.
6-6	Planting		×											
6-7	Watering		×	×										
6-8	Making mound			×										
6-9	Spraying pesticide			×	×	×								Application of pesticides 1ce in 4-5 days for 3 months
6-10	Harvesting				×	×								
7	**Firewood**										×			Collection of firewood along the bank of the Thar Hmong Kham Stream
8	**Bamboo**										×			Naturally grown at their bamboo groves. They need to buy the bamboo if they do not have bamboo grove. But for newly married couple, they provide bamboo for free to constuct a new house.
9	**Drought**			×	×	×	×							Occuring once a 3 years. This year too.
10	**Forest fire**	×											x	Occuring every year in natural pine forest
11	**Gully erosion**						×	×						Occuring every year in rainy season
12	**Water resource (irrigation use from thar mine khan stream)**													
12-1	Period for more water available						×	×						
12-2	Period for less water available			×	×	×			×	×	×			
12-3	Period for water dry up	×	×										x	

Table 8 Results of Seasonal Calender at Nang Thon Village

NO	ACTIVITY	MONTH												Note
		4	5	6	7	8	9	10	11	12	1	2	3	
1	**Rain**	+	++	++	+++	++++	++++	++++	++			+	+	
2	**Upland Paddy**													
2-1	Land preparation		×											
2-2	Sowing seeds			×										
2-3	Application of fertilizer			×										
2-4	Spraying herbicide			×										During 3-4 days
2-5	Soil covering			×										
2-6	Manual weeding					×	×							
2-7	Harvesting								×	×				
3	**Lowland Paddy**													
3-1	Sowing at seedbeds			×										
3-2	Land preparation				×									
3-3	Planting at the field				×	×								
3-4	Application of fertilizer						×							
3-5	Harvesting								×	×				
4	**Chayote**													
4-1	Trenching	×	×											
4-2	Sowing seeds	×	×											
4-3	Application of fertilizer & Cow dung		×	×										
4-4	Making bamboo trestle	×											×	
4-5	Spray pesticides		×	×										Once in a week for 2 months
4-6	Placing posts for new shoots		×	×										
4-7	Harvesting				×	×	×	×	×					
4-8	Buying bamboo												×	Procure to built bamboo testle for growing chayote
5	**Ginger**													
5-1	Land preparation												×	
5-2	Making ditch												×	
5-3	Sowing seeds												×	
5-4	Application of cow-dung												×	
5-5	Soil covering												×	
5-6	Spraying herbicide				×	×							×	
5-7	Collection of seed for next year				×	×								
5-8	Application of fertilizer				×	×								
5-9	Soil covering				×	×								
5-10	Manual weeding						×							
5-11	Harvesting	×	×						×	×	×	×	×	Can store the harvest in the soil up to 2 years

Table 8 Results of Seasonal Calender at Nang Thon Village

NO	ACTIVITY	MONTH												Note
		4	5	6	7	8	9	10	11	12	1	2	3	
6	**Cauliflower**													
6-1	Land preparation		×											
6-2	Sowing seeds	×												
6-3	Making ditch		×											
6-4	Application of fertilizer & Cow dung		×	×	×									
6-5	Transplanting of seedlings		×	×										
6-6	Spraying pesticide		×											Once a week till start harvesting
6-7	Weeding			×	×									
6-8	Harvesting				×	×								
7	**Bamboo**										×	×		For house construction and selling
8	**Firewood**											×	×	Collection of firewood during 5 days continuously for the volume of 1 year's consumption (equivalent to 1 cart)
9	**Honey**						×	×	×	×				For household consumption
10	**Drought**			×				×						Delay of rain in the previous 4 years
13	**Forest fire**	×											×	
14	**Flood along the stream**					×	×	×						
15	**Water resource (illigation use) + Tube well (drinking and domestic use of water)**													
15-1	Period for more water available				×	×	×	×	×	×				
15-2	Period for decrease of available water			×							×	×		
15-3	Period of less water available	×	×										×	

Table 9 Results of Group Discussions with Male Group on Community Forest and Forest Resource Management at Kone Ni Village

Theme	Discussions
Current Status of Community Forest/Forest management in the village	➢ 83 members belong to the CF user group in the beginning and now CFUG members are increased to 89 people composed of all households of the village. ➢ CF was established in 2013 and certificated in 2015. ➢ Total CF area is 40 acres, owned by the village. ➢ CF consists of chairman, vice chairman, secretary and other members. ➢ Most of the CFUG members are male. ➢ Major species of CF is pine. ➢ Ecodev supported the village to introduce CF. ➢ Before establishment of CF, some outsiders encroached to the area to cut the trees. ➢ CFUG set rules to charge villagers 3,000 kyats per 1 tree extracted from CF area. Such money shall be managed as CF fund. CFUG would like to apply microfinance using CF fund which could be used for funeral ceremony and medical expenses at low rate of interest. ➢ The villagers do not collect firewood in CF. Just dried trees are collected for free. ➢ There are some farms inside CF which were opened prior to the establishment of CF. Opening new farms in CF is not allowed. ➢ During the process of CF application, the meeting of CFUG was organized once a month. ➢ Ecodev supported the CFUG members to measure the CF area and installation of signboards. ➢ It took 3 years to obtain the certificate of CF, which is composed of 1 years for preparation for application of CF and 2 years for the process of approval by Land Record and Settlement Department. ➢ CF management plan was prepared during preparation for CF application. The management plan includes 1) activities to be conducted by CF such as making firebreak and 2) some rules such as prohibiting entrance into CF area by outsiders, not cutting trees in CF without permission, not extending farms within CF, not firing CF area intentionally and replanting seedlings at the available area in CF. ➢ In 2017, FD supported CFUG to provide 2,400 seedlings of pine, which was non-native species. The seedlings were planted at 2 plots separately. ➢ In CF, other species is also permitted to be planted but available area is limited for plantation. ➢ CFUG conduct weeding in CF once a year. No firebreak has been applied by CFUG due to the difficulty of techniques. ➢ Fire happens inside CF but its impact is small, just burning the grasses under the trees along the road. Main cause of the fire seems to be cigarette littering by un-identified person. ➢ Other possible cause for the fire is clearing area for hunting of wild animals, such as wild bird, wild cat, peacock and rabbit by the outsiders including the people from adjacent villages. ➢ CFUG practices pruning in CF to enrich the plantations for making housing pillars and furniture. ➢ Honey is not harvested due to the risk to stung by bees. Villagers buy the honey at the

Theme	Discussions
	market. ➢ Ecodev and FD have supported CF activities since 2017, which is solely external support to CF. Ecodev and FD have provided technical and financial supports, respectively. ➢ CF seems to be denser than before. ➢ In future, CFUG has willingness to make CF area covered by pine trees. ➢ There is no other possible area to apply CF in the village. ➢ Beside pine tree, Eucalyptus could be planted at CF area. Teak and fruits trees might be difficult to be planted. Eucalyptus is used for housing pillars. ➢ There is no practice on agroforestry because the crops cannot grow well in the area. ➢ There is no space to plant ginger in CF and no grazing practice in CF. ➢ Incentive of CF is to avoid encroachment of the land succeeded from ancestors by the outsiders. Before, some village area was going to be occupied by the military camp and to be used by the companies to cut trees. ➢ CFUG appreciate the support by Ecodev for CF activities. ➢ Some un-identified person take resin from the pine trees. CFUG members do not practice it to conserve the forest. ➢ Some stone walls were installed within CF to control gully erosion. ➢ CFUG has willingness to protect CF for future. ➢ Pine trees are naturally grown in the CF area. ➢ In their own land, trees for firewood, such as Binsain are grown naturally. ➢ Other villagers open the farmland in the unclassified forest located at the border of the village. ➢ Forest is important as source of construction materials for houses, mitigating impacts of climate change and protecting water. ➢ The forest surrounding the spring is belong to the monastery, so the people do not cut the trees in the area. There is no fire happened in such area. ➢ The villagers from Tin Yu Kon cut the trees in Kone Ni village. ➢ The villagers do not cut the pine trees at the gully erosion area but at the individual plantation.

Table 10 Results of Group Discussions with Female Group on Community Forest and Forest Resource Management at Kone Ni Village

Theme	Discussions
Current Status of Community Forest	➢ CF was established in 2015-2016. ➢ The establishment of CF aims to green the area, conserve Inle Lake, to get more rain, and to get more spring water. ➢ They know that there are CF management committee. ➢ The village leader has responsibility in implementing CF activities. ➢ Whey CF relevant meeting is organized, there are no women participants. There is no sharing information among men and women even at home. ➢ Criteria for selection of CF members are those got the opportunity of education and could express their opinion without hesitation. ➢ Some encroachment to the area, such as cutting trees was happen before registration for CF. After its registration, it is prohibited to cut the trees and the forest is better than before. ➢ Type of trees in CF and along the roadside are: Leucaena Glauca, Eucalyptus, Pine, Blue Jacaranda (seedlings distributed by FD) ➢ If there is some space, they would like to plant teak tree which can sold at the market, e.g., eucalyptus and some fruit tree such as avocado and pear. But they consider that it is difficult to grow such trees inside CF due to poor soil condition.
Rule of CF	There is some signboard at the boundary of CF with the following rules: ➢ Do not cut firewood ➢ Do not burn the area ➢ Inform the village leader when seeing outsiders cutting trees ➢ Help forestry activities, such as planting trees and clearing the area. ➢ Village leader is responsible for the management and protection of CF.
Forest management in the village	➢ Forest was degraded because of firewood collection before. The status of the forest is improved now. ➢ One of the reasons why they do not cut the trees now is that they could earn enough income to buy timber from outside the village and that they use electricity instead of charcoal. ➢ They villagers conserved community forest for 4 years. ➢ The monk (Kan Lon Taw Ya) protects the mountain forest for 12 years. The monastery also conserved wildlife animals. ➢ Type of trees distributed in the village are: Binsain, Eastern gooseberry (*Emblica officinalis*), Eugenia, Banyan tree. ➢ They do not cut Banyan tree because they believe that the spirit (NAT) stay in this tree and that he drought will occur if they cut such trees.
Forest Fire	➢ It occurs once a year in both CF and natural pine forest area accidentally. ➢ Possible cause of the fire is hunting of the wild animals, such as rabbit, jungle fowl, wild cat, peacock and barking deer in the natural forest. Hunting seems to be conducted by outsiders. ➢ The forest fire occurs every year.
Firewood	➢ They collect the firewood from 3 to 5 days to secure consumption for 1 year. ➢ They collect firewood only from their farm.

Theme	Discussions
	➢ Type of trees is Binsein, Yin Kuhm Thi Yar and Pauk Too.
Conversion of Forest	➢ They do not expect to convert the forest area to the other use, such as agricultural land.
Importance of Forest	➢ Forest is important to get more rain and collect materials for house construction, though they agree on the restriction of cutting trees.

Table 11 Results of Group Discussions with Male Group on Community Forest and Forest Resource Management at Pha Yar Phyu Village

Community Forest	
Theme	**Discussions**
Current Status of Community Forest	➢ There is no Community Forest in this village. ➢ They did not know about CF previously ➢ They would like to establish Community Forest ➢ They want to establish CF in the plantation area around the monastery, which was supported by UNDP. ➢ If they can establish this area to be CF, this plantation will be legally owned by the village and they will also protect under the instruction of Forest Department. ➢ They consider that CF establishment will result in creating better environment with trees and that they can access forest products for local use. ➢ It is necessary to discuss with other villagers for the establishment of CF.
Current status of the forest	➢ There were large trees in the forest long time ago. ➢ They collect resin from pine trees but the amount became less because its market is getting small. ➢ In 1986, the boundary marks of Aung Ban Forest Reserve were set, and they had been seen until two years ago. Now it is disappeared. ➢ Outsider comes to cut the trees in the reserved forest. If they notice the outsider is coming they tell the outsiders to only take the dried trees.
Forest fires	➢ Forest fire happens once a year in March and April. ➢ No. of the forest fire become less than before. ➢ Outsider came and cut large pine trees for collecting of pine fuel stick (it is a stick used for litting fire) and the pine trees. In the dry season, the pine trees were dried up and easy to be lit a fire. So, if someone set the fire, it could burn the whole dry pine trees.
Firewood collection	➢ Firewood is collected along the stream. After collecting the firewood, tree branches are regenerated and be ready for the next collection after 2~3 years. ➢ In the forest area, only dead woods are collected for the firewood. ➢ In the past they use 3~4 m3 of firewood per 1 year by HH but now reduced to 2~3 m3 per year by HH because of the use of improved stoves introduced by UNDP. ➢ Both men and women collect fire woods. ➢ They can collect the firewood from the same tree back after 4 year of previous cutting in the reserved forest. ➢ If they do not use the bullock cart, they can only carry 2 bunches of firewood on their shoulder. ➢ They cut species such as Pin Sein, Zee Phyu, Thit Yar and shrubs
Conversion of forests	➢ There is no more degradation in the forest area.
Importance of forest	➢ The villagers recognize the importance of forest because they provide good climate, timbers for construction and water. ➢ Dense forest can provide more water and prevent soil erosion ➢ Improvement of the forest could give more habitat to the wild animals and create better climate and moderate rainfalls.
Existing forest management practices	➢ At the reserved forest, the villagers are just allowed to collect firewood and timber for their use. When outsider come to the area to cut the tree, the villagers do not allow it and tell them to take dried trees. ➢ They marked the place where they do not cut trees with a sign board. ➢ At night, people from other villages cut trees at the reserved forest. ➢ Bamboo are sold to those do not own it. ➢ Bamboo poles are used for tomato plantation.
Protected areas or communal forests	➢ There is no rule for grazing. They use the area for grazing if there is an open space. ➢ Plantation around the monastery is a communal land

Table 12 Results of Group Discussions with Female Group on Community Forest and Forest Resource Management at Pha Yar Phyu Village

Theme	Discussions
Current Status of Community Forest/Forest management in the village	➢ There is no Community Forest in the village. ➢ They have interest in establishing CF. ➢ They think that they have to grow trees in the CF and need to protect the planted trees from forest fire. ➢ They expect to get some firewood from CF as well as income from selling trees. ➢ They also expect to cultivate some crops inside CF. ➢ There is a Reserved Forest in the village, which could be candidate site for CF. ➢ Once the CF will be established, they expect that the forest will be dense and that the soil moisture will be improved. ➢ They consider that good condition of forest will result in less gully erosion and better rainfall in the area, more volume of firewood collection and more water at the springs. ➢ It is necessary to discuss among the villagers for the establishment of CF. Some villagers will not be interested in CF due to the lack of information on CF. ➢ Men have to lead such discussion among the community for CF establishment. ➢ They do not foresee any negative impacts from CF.
Current status of forest	➢ There was a dense forest about 34 years ago. ➢ The forest is gradually degraded year by year. ➢ Do not think that the forest has more degraded in future. ➢ Inn Wun and Pha Yar Phyu villages collect firewood except the pine trees from this Reserved Forest ➢ Also, they collect a few pine trees for the construction of the houses. ➢ They consider that the forest is depleted because of forest fire, cutting trees, collecting of firewood. ➢ Due to population increase, they cut even small trees as firewood. ➢ For taking pine resin, they cut/peel the pine trees. When the pine trees fall down, it hits small trees. Such site is easy to occur forest fires because of lot of dried materials in the forest. ➢ Outsiders come and illicit cutting of pine fuel sticks for burning pine trees. ➢ Around the monastery, they planted Binsain, Cherry and Acacia Auriculiform with support from UNDP in 2009 to green the surrounding area and procure firewood for the monastery.
Forest fires	➢ Forest fires occur twice a year in the Pine Forest accidentally in March and April. ➢ Possible causes of the forest fire is: people grazing animals, playing with fire, hunting and smoking ➢ If the village have right to protect the forest, they would control the forest fire by installing the signboard, weeding inside the forest, constructing fire breaks and clearing the dry leaves. FD installed firebreak when they registered the pine forest as the Reserved Forest.

Theme	Discussions
Firewood collection	➢ Firewood is collected in January and February. ➢ They gather firewood for once a day during one month by carrying on the head. ➢ They collect firewood from the Reserved Forest, shrubs around the stream and gully area. ➢ They need to walk at least 1 hour to collect firewood. ➢ Species used for the firewood are Thit Ae, Zee Phyu, Thit Yar.
Conversion of forests	➢ They do not plan to convert the forest area to agricultural land as the pine forest area is owned by the State and not allowed to transform to other forms. ➢ If the forest is transformed into the agriculture land the villagers do not have a place to collect firewood and timber ➢ FD demarcated the Reserved Forest by putting poles.
Importance of forest	➢ They consider forest important as production place to get materials for construction and firewood. Also, forest is important for them as grazing area.
Existing forest management practices	➢ FD put signboard at the Reserved Forest where some rules were written. ➢ The regulation in the Reserved Forest are: - Do not open the area for agriculture - Do not cut pine trees for selling. - Do not cut small trees - Can collect firewood and cut timbers for their own consumption ➢ Responsible person from Forest Department come twice a year ➢ They prevent cutting trees with chain saw by outsiders by reporting when they see the outsiders passing the village to the Reserved Forest.
Protected areas or communal forests	➢ Reserved forest and forest plantation close to the monastery are communal land

Table 13 Results of Group Discussions with Male Group on Community Forest and Forest Resource Management at Ein Yar Village

Community Forest	
Theme	**Discussions**
Current Status of Community Forest	➢ There is no Community Forest in this village. ➢ They do not well understand the status of CF.
Current status of forest	➢ Two years ago, Forest Department officer came to the village and requested villages to protect the mountain in the south-west part of the village. ➢ They have been protecting the pine forest even before that time because there is a Pagoda. ➢ There are bamboo forests in the village compound. ➢ There is no expansion for agricultural land anymore. ➢ They collect firewood from shrubs not from the pine tree ➢ They protect the above-mentioned pine forest because it is closed to the ancient pagoda (Shwe U Hmin). ➢ The villagers want to establish the Community Forest. ➢ If CF is established, the forest areas becoming denser with larger trees. Also, the boundary of CF is clearly demarcated. ➢ FD give a contact number to inform for illegal cutting. ➢ There is no special committee for protection of the pine forest and but the area is protected by all the villagers ➢ People from outside cut the pine trees in the past. ➢ The Pagoda festival is held in March.
Forest fires	➢ There is no forest fire. ➢ The grasses under the trees in the forest was burnt because of hunting by other villagers.
Firewood collection	➢ Firewood collection is conducted along the river are collected as fire wood. ➢ There is no owner of these trees, so villagers collect fire wood freely from there. ➢ Each year in the dry season, each household collects 1 m^3 of fire wood. ➢ Before they have got the electricity, they collected more firewood around 4~5 bullock cart. ➢ The amount of firewood for each household is decreased after electrical power is supplied a year ago.
Conversion of forests	➢ The forest area has not been expanded.
Importance of forest	➢ Villagers recognize the importance of forest because it provides good climate, timbers for construction and water. ➢ Also, there is a pagoda in the center of the forest.
Existing forest management practices	➢ They protect forests. When people like to build a house, they are allowed to harvest trees. ➢ They also collect small trees. ➢ It is not allowed to cut trees for commercial purposes. ➢ They do not allow people from other villages to cut trees. ➢ Na Taw village has been managing the half of the pine forest, southern parts from the ridge of the mountain. ➢ Bamboo are sold who do not own it. ➢ Bamboo poles are harvested in January. ➢ To transplant bamboos, the stump of bamboo is taken and planed.
Protected areas or communal forests	➢ The forest is conserved because there is a pagoda.

Table 14 Results of Group Discussions with Female Group on Community Forest and Forest Resource Management at Ein Yar Village

Theme	Discussions
Current Status of Community Forest/Forest management in the village	➢ There are no Community Forest in the village ➢ They do not have a knowledge about CF and interest in CF. ➢ If they get some technical support from outside, they want to establish CF in the pine forest ➢ There is a pine forest protected by the villagers based on the instruction by FD. They cannot sell the tree and collect firewood under management by FD. ➢ There is rock under pine forest and it is seemed that no plants can grow there. ➢ Women cannot decide to establish the community forest. ➢ If they can plant some cash crops, they will be interested in CF.
Current status of forest	➢ 50 years ago, there was a dense forest. ➢ 30 years ago, saw-mill cutting started by outsiders from Aung Ban township. ➢ 20 years ago, the villagers cut pine trees and sell firewood at other villages. ➢ After cutting of pine tree, they burn the area to open the agriculture land. ➢ 10 years ago, they started expanding agriculture land along the bank of the stream. ➢ There has been no land to expend for agriculture from 3 years ago. ➢ The pine forest near the village is protected by them since one and a half year ago based on the instruction by FD ➢ In the past, villagers from surrounding villages cut pine tree in this area. ➢ After starting protection of this area, there is no cutting of pine tree.
Forest fires	➢ It occurs once a year in the pine forest area accidentally. ➢ They do not know why the fire occurs. ➢ The forest fire occurs in March. ➢ The damage of the forest fire is not serious, just burning the ground.
Firewood collection	➢ They collect firewood once a year in January from their farmland or along the bank of the river. ➢ They cut mostly shrubs for firewood.
Conversion of forests	➢ There is no more forest land to convert to other type of land use.
Importance of forest	➢ Forest is important for securing water. ➢ It is also important to regulate rainfall. ➢ The pine trees can also use for construction materials for houses. ➢ The whole village is responsible to protect pine tree forest.
Existing forest management practices	➢ Not allowed to cut trees ➢ No expansion for agricultural land. In case of violation to the pine forest, FD will take action.
Protected areas or communal forests	➢ They feel the responsibility to protect the pine forest from the encroachment by other villages

Table 15 Results of Group Discussions with Male Group on Community Forest and Forest Resource Management at Nang Thon Village

Community Forest	
Theme	**Discussions**
Current Status of Community Forest	➢ It has been established in 2003. ➢ The details of the CF and CFUG are unknown. ➢ There was CF around the temple but in 2014 half of the forest area was transformed to agriculture land under the permission of the monk. ➢ This area was registered as CF area with preparation of CF management plan. ➢ The people who borrow this land has to pay 40,000 MMK per acre per year to the monk.
Forest management	
Theme	**Discussions**
Current status	➢ Firewood is harvested in the and outside of the village. They collect firewood from other village, such as Thar Hmong Kham village boundary area. ➢ In each house there are some mango, avocado, jackfruits, bananas and bamboo. They are belonging to the households. ➢ If fruit trees are planted far from the house, the fruits may be stolen by young people.
Forest fires	➢ There is no forest fire. ➢ Villager put fire in the farm field when grass is too dry for the grazing purposes. The new grasses come out after the fire which is soft and easy to be eaten by cows.
Firewood collection	➢ There are trees left along the stream, which is communal area. ➢ The villagers collect firewood from above area since there is no owner of the trees. ➢ Also, there is a forest outside of the village, Thar Hmong Kham Monastery Compound where the villagers collect the firewood. It takes two hours to reach there on foot. People carry the firewood on their shoulder or bring by cow. ➢ There is no difference in gender for firewood collection. ➢ In every the dry season (2 months in Jan & Feb), each household collects 4~5 m^3 of fire wood. ➢ There are no people who purchase firewood and charcoal. ➢ People buy bamboos for 1500 kyat for small ones and 3,500 kyat for large ones.
Conversion of forests	➢ In 2014, the half of forest around the temple was transformed to agriculture land under the permission of the monk. ➢ According the CF management plan, this area was registered as CF area.
Importance of forest	➢ The villagers recognize the importance of the forest because they provide good climate, firewood and timbers for construction. They also mentioned that they can get water easily if there is forest near the village.
Existing forest management practices	➢ People plant fruit trees inside of their household compound. ➢ They are owner of the trees and control it.
Protected areas or communal forests	➢ There is a communal land near the grave yard where they want to plant 3,000 trees. ➢ The forest along the stream is communal area. ➢ The size of the area is 4~5 acre. ➢ They want to plant Eucalyptus, Pines, Teaks, Mezalin (Casia stamea).

Table 16 Results of Group Discussions with Female Group on Community Forest and Forest Resource Management at Nang Thon Village

Community Forest	
Theme	**Discussions**
Current Status of Community Forest	➢ CF has been established since18 years ago. The total area is about 2 acres. ➢ They do not know if their family members participated CF activities or not. And then, they do not recognize that CFUG was organized or not because if there were meetings in the village, only their husbands attended the meetings. ➢ They think that the purpose of the establishment of CF is for getting firewood. ➢ Some parts of CF located behind the monastery have been used to open agricultural land since five years ago ➢ The farmers using CF areas for their farm land need to pay the monk 40,000 MMK per acre per year.
Current status of forest	➢ There was a dense forest near the village in last 30 years ago, but the forest becomes degraded year by year because of firewood collection. Currently, there is no forest near the village except some trees along the bank of the stream.
Forest fires	➢ There is no forest fire.
Firewood collection	➢ Firewood is collected along the bank of the stream. ➢ All villagers can collect from the area. ➢ Also the firewood can be collected from the outside of Thar Mong Khan Monastery Forest Compound, located in the other village area. ➢ Firewood is collected in November, December and January in every year. ➢ They carry two bundles of firewood in one time and need to collect every day for one month for one household for the consumption in one year. ➢ There is no difference in gender for firewood collection. It means that both males and females go to collect firewood for their household consumption.
Conversion of forests	➢ There is no forest to convert to other land use except some parts of the CF Area situated behind the monastery are used as the agriculture land.
Importance of forest	➢ They think that a forest is a place to get the firewood.
Existing forest management practices	➢ They don't know.

Table 17 Results of Group Discussions with Male Group on Farming Practices and Agricultural Resources at Kone Ni Village

Theme	Discussions
Practice on Shifting Cultivation	➢ There is no practice on shifting cultivation
Practice on Permanent Farming	➢ One person could have 4-5 acres of farm and use 2 acres for cropping. ➢ The villagers have farms and paddy field in the dispersed area. ➢ The farmer who has several plots for farming leave some plots as fallow area. If the person has 3 plots, s/he leaves 2 plots as fallow area and use just 1 plot. ➢ They move to other plot after farming of 3 years at the same plot. ➢ Major crops planted close to Kalau stream is tomato in the rainy season and cabbage in the dry season while ginger (March-April), potato (in the rainy season), sesame and upland rice are cropped at the area far from the stream. ➢ The order of planting is: 1st ginger, 2nd peanuts, 3rd paddy in the dry season and 1st tomato and 2nd cabbage in rainy season ➢ There is no mix cropping.
Crop Production	➢ Productivity of crops has increased due to the improved quality of seeds, fertilizer and cropping techniques. They purchase seeds for tomato, cabbage and potato. ➢ Harvest volume of tomato is 16 ton or 10,000 vecs/0.5 acre ➢ Before, they used their own seeds for tomato and ginger. ➢ Production of tomato has increased more than double. ➢ To avoid decrease of productivity, they rotate cropping area.
Introduction of Soil Conservation Measures/Agroforestry	➢ They install contour band which has 20 to 25 feet of distance between each line in the farm as soil conservation measure instructed by Ecodev. All the villagers applied such technique. They use hand tractor to make contour bunds. They consider better to install contour bands to maintain soil fertility. ➢ There are no agroforestry practices by the villagers.
Any Concerns	➢ In recent years, the rainfall has been decreased with the delay of rainy season.
Application of Fertilizer/Insecticide	➢ They follow the way of application of chemical fertilizer and pesticide as instructed by the sales companies. ➢ For the application of agrochemicals, they use spray. ➢ They use various type of insecticide depending on the type of the insects on the crops. Application of insecticide is once in 5 days following instruction by the sales company. ➢ As for tomato, 40 % of the sales is used for the purchase of fertilizer and pesticide. Some people borrow money with the rate of 10 % to buy the agrochemicals. Sometimes, they borrow money from the middleman or put it on their tab at shops where selling agrochemicals. ➢ 30 HHs of 80 HHs total in the village can purchase agrochemicals without borrowing money. Another 10 HHs cannot pay back the money. ➢ Around 500 kg of the fertilizer is applied to 0.5 acre of tomato farm. ➢ They purchase fertilizer individually renting vehicle from other villagers. ➢ They follow the instruction of application of fertilizer also written at the package, which is for the central area of the country. So the application amount could be higher than required

Theme	Discussions
	at the field. ➢ The government recommend not to use so much chemical fertilizer and pesticide. ➢ It is difficult to reduce agrochemicals, such as pesticide, insecticide, fungicide. ➢ They do not use natural pesticide. ➢ Even in dry season, they apply the pesticide to tomato once in 5 days.

Table 18 Results of Group Discussions with Female Group on Farming Practices and Agricultural Resources at Kone Ni Village

June 01, 9 participants

Theme	Discussions
Practice on Permanent Farming	➢ Main crops: tomato, cauliflower, ginger (60 HHs out of 88 HHs in total grow ginger), paddy, cabbage, peanuts and sesame. ➢ Agricultural inputs: cow dung, chemical fertilizer (Armo, Aung Kabar, Pan Pue (Parerl, Urea), Kaung Thu Ka, Thee Sone, Than Kwin), pesticide, fungicide and herbicide. ➢ For all the crops they put chemical fertilizer. ➢ They use pesticides to the crops except ginger, fungicide to cabbage and tomato and herbicide to upland paddy.
Crop Production	➢ Production of the following crops are decreased due to the below reasons: - Paddy: Rain at night time when ear of paddy is bearing. - Peanuts/Sesame: Delay of rain - Tomato: Pest especially in September and October. It can be controlled by spraying pesticide everyday or every two days. ➢ On the other hand, the production of the following crops is increased because of the reason below: - Tomato: Increase of the input of cow dung and chemical fertilizer - Cabbage and cauliflower: Increase of input of chemical fertilizer - Ginger: Improvement of soil condition due to the increase of input of cow dung.
Introduction of Soil Conservation Measures/Agroforestry	➢ After harvesting ginger, they crop paddy. After harvesting paddy, they leave the plot fallow for 3 years to recover the soil fertility. Then, they plant ginger. ➢ They install embankment at all the type of farms as soil conservation measures. They mound the embankment every year. ➢ As some similar measures to agroforestry, around 10 HHs has experience in planting orange and tomato together 10 years ago. They grew tomato in-between the orange trees. They changed such practice due to low production of orange.
Expenses of Crop Production	➢ Major expenses for crop production are cost of e.g., cow dung, fertilizer, seeds, pesticide, fungicide and herbicide, hiring tractor (need to plow 3 times per acre), irrigation, and hiring labor

Table 19 Results of Group Discussions with Male Group on Farming Practices and Agricultural Resources at Pya Ya Pyu Village

Theme	Discussions
Practice on Shifting Cultivation	➢ There is no practice on shifting cultivation
General information	➢ Each household has 4~7 plots and each plot has around 0.5 acre. ➢ The villagers have farms and paddy field in the dispersed area. ➢ They leave some plots fallow for 3~ 4 years. ➢ After harvesting of ginger, they grow upland paddy and peanut or sesame and after harvesting, they leave this area fallow for 3~ 4 years ➢ If the farmers have 4 plots, he/she only grow in 2 plots and 2 plots leave fallow. ➢ There is no fallow period at plots near the river because soil fertility is better in the area as the fertile soil comes from the upper-stream. ➢ In the permanent farm, villages mainly grow low land rice, peanuts, Chinese cabbage, cabbages and tomatoes. ➢ They also grow eggplants and green pepper.
Crop production	➢ The production from 30g of seeds of cauliflower is 6,000 pieces per acre. ➢ The production from 0.8 kg of mustard leaf is 5,600 vis (8,000 kg). ➢ The production of 30 g of seeds of tomatoes is 4,500 vis (7,200 kg) per acre. ➢ The productivity of crops depends on the accessibility of water and soil fertility including the usage of fertilizer. ➢ The production of ginger is better planted in red soil.
Soil conservation measures and agroforestry	➢ The villagers made soil conservation measures for their farms located close to the gully erosion, such as digging channel to divert water flow. ➢ They use contour terrace farming technique for 7 to 8 years. Through this method, all the farmland gets irrigated. ➢
Concerns	➢ The price of agricultural products is unstable.
Application of Fertilizer/Insecticide	➢ The villagers use fertilizers, herbicides and fungicides. ➢ 40 HH out of 52 HH buy the fertilizer with the credit and make the payment after they produce and sell agriculture products. ➢ They also applied pesticides for lowland paddy and tomato. ➢ They has increased the amount of application of fertilizer since 10 years ago ➢ They buy fertilizer from agriculture Shop at Aung Ban ➢ Applying of fertilizer ratio is made by own decision. ➢ Some villagers buy the They need to pay 1,000 – 2,000 kyats extra as credit per pack of fertilizer. ➢ 3 bottles of pesticide are used for one acre of cauliflower, which costs 45,000 kyat. ➢ 10 bottles of herbicides are used for one acre of cauliflower which costs 200,000 kyat. ➢ 24 bottles of pesticides are used one acre of mustard-leaf which costs 330,000 kyat. ➢ Three bottles of pesticides are used for one acre of cabbage which costs 45,000 kyat.

Table 20 Results of Group Discussions with Female Group on Farming Practices and Agricultural Resources at Pha Yar Phyu Village

Theme	Discussions
Practice on Shifting Cultivation	➢ There is no practice on shifting cultivation
Practice on Permanent Farming	➢ The villagers have farms and paddy field in the dispersed area. ➢ The villagers own around 0.5 to 3 acres of farmland, including upland and lowland paddy field. ➢ There are around 5 household who does not own a farmland. ➢ After harvesting of lowland paddy, they do not grow any other crops until next cultivating season. ➢ Upland paddy, peanut, ginger and sesame are cultivated in upland farmland which is far from stream and difficult to be irrigated. ➢ Upland paddy field which is close to the stream and able to do irrigation, they grow also Chinese cabbage, tomato, cauliflower, cabbage and garlic ➢ The rest of the farmland they normally grow Chinese cabbage, tomato, cauliflower, cabbage, garlic and bell pepper ➢ The farmer who has several plots for farming leave some plots as fallow area from 2 to 4 years especially for ginger. ➢ After harvesting of ginger, they grow upland paddy or peanut. After harvesting them, they leave the area fallow for 2 to 3 years ➢ Major crops are paddy (upland and lowland), ginger, tomato and Chinese cabbage
Crop Production	<u>Lowland Paddy</u> ➢ Fertilizer used are Tizon and Palae. 2 bags (equivalent to 40 viss) are used for 0.5 acres. ➢ Pesticide used is Jetlcat. 0.5 litters are applied to 0.5 acre. ➢ Production is 21 baskets (equivalent to 210 viss/0.5 acre. <u>Upland Paddy</u> ➢ Fertilizer used are Tizon and Palae. 1 bag of Tizon and 10 pcs of Palae are used for 0.5 acres. ➢ Herbicide used is Amo and salt. 1.0 litter of Amo is applied to 0.5 acre, while 30 viss of salt is applied to 0.5 ha. <u>Ginger</u> ➢ 2 power trailers of cow dung is applied to 0.5 acre. ➢ Fertilizer: Same as upland paddy ➢ They apply supplement which has function of fertilizer and been recommended by the shop. 1 viss is used for 0.5 acre. ➢ 500 viss of seeds is used for 0.5 acre. ➢ Production is 1,400 – 1,900 viss/0.5 acre. ➢ Ginger productivity is depending on soil type. The production of ginger is good in red soil. <u>Tomato</u> ➢ 3 bags of seedlings (below 1 viss) is used for 0.5 acre.

Theme	Discussions
	➢ 7 bags of cow dung is used for 0.5 acre. ➢ Fertilizer used are Tison, Palae and Amo. 10 pcs of Tison, 1 bag each of Palae and Amo are applied to 0.5 acre. ➢ There two type of pesticide used. ➢ Production is 1,000 – 1,500 vis/acre. ➢ Productivity of tomato has increased by applying more fertilizer, weeding and cutting of tomato leaves. <u>Chinese cabbage</u> ➢ They start cultivation of Chinese cabbage 8 years ago. Before they grew potato but they shifted to Chinese cabbage due to insect attack to potato. ➢ They buy the seeds at Aung Ban. Some brokers introduced the seeds to the village. ➢ They can crop Chinese cabbage 4 times per year. ➢ 7 bags of cow dung is applied to 0.5 acre. ➢ Fertilizer used are Tizor, Palae and Amo. They use 1 bag each for 0.5 acre. ➢ Pesticide used is Jake. They apply 0.5 litter to 0.5 acre. ➢ Production is 2,500 – 4,000 viss/0.5 acre. ➢ Productivity of Chinese cabbage is depending on pest problem.
Introduction of Soil Conservation Measures/Agroforestry	➢ After harvesting ginger and paddy, they leave the plot fallow for 2 to 4 years to improve soil condition. ➢ They dig the cannel to between the farmland to divert the flow of water and built an embankment to protect the soil erosion by rainwater. ➢ Two household cultivate mix cropping, one farmer grows orange and Chinese cabbage and the other farmer grow orange and upland paddy
Any Concerns	➢ The markets of the products are unstable. ➢ They also have problem on disease and insect attack to the crops. ➢ There is no land available for new farm though they are interested in planting avocado and orange.
Application of Fertilizer/Insecticide	➢ They buy fertilizer from Agriculture Shop at Aung Ban and some farmers buy fertilizers with credit from the Agriculture Shop. ➢ Applying of fertilizer ratio is made by own decision. ➢ For pesticides, fungicides and herbicide they buy the Agriculture shop from Aung Ban. ➢ They use pesticides, fungicides and herbicides by following the instruction on the bottle and sometimes deciding by themselves. ➢ They apply pesticides once in 5-7 days for tomatoes in May, June, July and August. ➢ They apply pesticides once in 2-3 days for Chinese cabbage for 2-2.5 month.

Table 21 Results of Group Discussions with Male Group on Farming Practices and Agricultural Resources at Ein Yar Village

Theme	Discussions
Practice on Shifting Cultivation	➢ There is no practice on shifting cultivation
General information	➢ There are 10 households out of 80 HH who do not have their own lands. Those who do not have land work for others' land. ➢ The size of farming area ranges from 1 to 5 acres. ➢ Each household has 1~5 plots. The person who has five plots use 3 plots and leave 2 plots fallow. ➢ In the permanent farm, generally villages mainly grow ginger, rice, peanuts and tomatoes. ➢ They also grow cabbages and maize. ➢ The maize has started recently because the merchant at Aung Bang told them there will be a market in other countries. ➢ After the production of ginger, the land should be used for other crops such as rice and peanuts for two years. ➢ After harvest of peanut, leave this area fallow for 2 years.
Crop production	➢ The agricultural production increases every year because they use more fertilizers and herbicide. ➢ About 50 years ago, the market at Aung Bang was small and there was small demand for the agriculture products. They sold at the traditional five days market. ➢ The production from 1,000 vis (1600 kg) of ginger seed is 5000 vis (8000 kg) per acre if it is in good condition of weather and soil. The production from 1,000 viss (1,600 kg) of ginger seed is only 2,000~3,000 viss i if the rainfall is decreased and soil condition is not good due to less application of fertilizer. ➢ The production from 45.44 kg of rice seed at upland is 3300 kg per acre. ➢ The production from 2 baskets (45.44 kg) of peanuts seed is 50 baskets (1,136 kg). ➢ The production of 25 g of seeds of tomatoes is 4,800 kg. ➢ The production rate is depending on the rainfall pattern. ➢ Spreading of salt as a weed killer applying to upland paddy.
Soil conservation measures and agroforestry	➢ For upland framing, there is no soil conservation measures because the slope is gentle. ➢ FD has installed check dams in the gullies near the village. ➢ There are sediments of soils. ➢ They dig a channel in rainy season to prevent the sedimentation. ➢ They prevent the erosion with embankment in flat land.
Concerns	➢ The scarcity of water for agriculture is problem in the village. ➢ They have a plan to make a pond in the center of the village for agriculture use.
Application of Fertilizer/Insecticide	➢ Villagers use fertilizers, herbicides and fungicides. ➢ For upland paddy, they use fertilizer which also contains herbicides. ➢ At upland paddy, for the first ploughing they use around 200 kg of salt for weeding.

Theme	Discussions
	➢ For ginger, they use herbicide. ➢ Use 100 kg of fertilizer per acre for Ginger ➢ Applied 2 litter of herbicide for ginger. ➢ For tomatoes, they use pesticides every 4~5 days for three months. ➢ Use 100 kg of fertilizer per acre for Tomato. ➢ 4 -6 viss of fungicide are applied in one acre of tomato cultivation ➢ They follow the instruction by the shop to apply fertilizer, herbicide and pesticide. ➢ They purchase fertilizer individually at the market. ➢ 30% of the farmers buy fertilizers with credit from the agriculture shop. ➢ Buying of fertilizer with credit need to cost 1,000 kyats extra per pack. If the price of the bag is 20,000, the cost including credit is 21,000 kyat. But if the price is 40,000 kyat per bag, the price including credit will be 42,000 kyat per bag.

Table 22 Results of Group Discussions with Female Group on Farming Practices and Agricultural Resources at Ein Yar Village

Theme	Discussions
Practice on Shifting Cultivation	➢ There is no practice on shifting cultivation
Practice on Permanent Farming	➢ The villagers have farms and paddy field in the dispersed area. ➢ The villagers own around 3 to 10 acres of the farmland, including upland and lowland paddy. ➢ The farmer who has several plots for farming leave some plots as fallow area from 2 to 3 years especially for ginger. ➢ After harvesting of ginger, they grow upland paddy or peanut and they leave this area as a fallow from 2 to 3 years after harvesting. ➢ Major crops are ginger, paddy (upland and lowland), tomato and peanut. ➢ They use own seeds for ginger while non-native seeds for tomato. ➢ They have experience in growing pigeon pea and upland paddy together under UNDP project ➢ They grew pigeon pea along the counter lines during growing season of lowland paddy. ➢ They changed this practice because there was less market for pigeon pea and growing with contour terrace made them busy. ➢ Nowadays they construct the embankment in their own upland farms. ➢ They grow tomatoes on the embankment of lowland paddy.
Crop Production	➢ Productivity of crops has increased by applying more cow-dung and having good weather (especially rainfall) . ➢ In case of ginger, - They apply Amo, Thison and Pulae, 1 bag each of fertilizer to produce 1,000 viss. - They use 2 litters of herbicide to produce 1,000 viss. - They apply 5 units of power trailers of cow-dung to produce 1,000 viss. - 1,000 viss of seeds can produce 3,000 – 5,000 viss of ginger. - Ginger productivity has decreased because of unstable rainfall. Both less rain and heavy rain can decline the productivity of ginger. ➢ In case of upland paddy - They apply fertilizer, Pulae & Thison, 1 bag each for 1 acre. - They apply salt as herbicide by 3 bags (equivalent to 90 viss) for 1 acre. - Production of upland paddy is 22-25 bags per 1 acre. - Upland paddy production is decreased because of unstable weather and they can't apply cow-dung. ➢ In case of lowland paddy - They apply fertilizer Tison, 2 bag (equivalent to 100 kg) for 1 acre. - They apply 0.25 litter of pesticide for 1 acre. - Shoppers gave an instruction to the villagers on how to use the fertilizer and pesticide.

Theme	Discussions
	- They apply salt as herbicide by 3 bags (equivalent to 90 viss) for 1 acre. - Production of low land paddy is 10-15 bags (equivalent to 15 - 22.5 kg) for 1 acre. - If the rain starts in right time, the production of lowland paddy is increased. - The production of lowland paddy is decreased because of less rain and pests, and less application of cow dung. They need to buy cow dung. Unit price of cow dung are: ・500,000 kyat/1 big car which has 12 feet *32 feet ・250,000 kyat/1 medium car which has 12 feet * 4 feet ・230,000 kyat /1 small car which has 10 feet * 4 feet ➢ In case of tomato - They apply both cow-dung and fertilizer, Amo & Thison. They apply 1 bag each of Amo & Thison for 8,000 seeds. - They also apply two types of pesticide. The application volume of 1st pesticide is 1.5 litters for 4 bags of seeds (equivalent to 8,000 seeds). - Production is 2,000 – 5,000 viss/HH per year. - Productivity of tomatoes is decreased because of low-quality seedlings and no rain. There is also disease attacking seedlings. - If there is no disease in seedling or the rains start in a proper timing, the productivity of tomato increases. - Even applying fertilizer to Tomato, if there is no rain, the tomatoes cannot be flourished. ➢ All tomato farmers use seeds from Thailand. ➢ They used their own ginger roots as seeds for the next season. ➢ They use their own paddy seeds for both lowland and upland paddy and own seed of peanut for the next season.
Introduction of Soil Conservation Measures/Agroforestry	➢ As soil conservation measures, they leave the farm land fallow for 2 to 3 years after cropping ginger and paddy or peanuts. ➢ Also, UNDP introduced contour band to the village but currently they do not practice it as it is laborious. ➢ Instead, they install embankment surrounding the farms for all the crops to prevent erosion.
Any Concerns	➢ They are worried about unstable weather especially late rain. ➢ They also worried about the production rate and unstable market. ➢ They need to know the agricultural techniques to improve their cropping style.

Table 23 Results of Group Discussions with Male Group on Farming Practices and Agricultural Resources at Nang Thon Village

Theme	Discussions
Practice on Shifting Cultivation	➢ There is no practice on shifting cultivation
General information	➢ The size of farming area varies from 2 to 4 acres. ➢ Each household has 2-3 plots. ➢ In the permanent farm, generally villages grow chayote, ginger and upland and lowland rice. ➢ After the harvest of ginger, they plant other crops or leave the area fallow for three years. ➢ They use fertilizers and herbicide. ➢ If the agricultural production of the last cropping year is low and they have no money for the preparation of rice field, they sell livestock such as cows but never borrow money.
Crop production	➢ The agricultural production increases year by year because they use more fertilizers and weed killers. ➢ If the production is decreased because of degraded soil fertility, they do not use the land for a while. ➢ Harvest volume of Chayote is 10,000 pieces per acre.
Soil conservation measures and agroforestry	➢ Lowland rice is cropped on the terraces. ➢ For upland framing, there is no soil conservation measures because the slope is gentle. ➢ Under the chayote plantation, peanut and cauliflower are intercropped until chayote's leaves make shades.
Concerns	➢ Water scarcity is problem in the village.
Application of Fertilizer/Insecticide	➢ Application of fertilizer for chayote is once in fifteen days for five months. ➢ Application of insecticide is once in 5 days following the instruction by the sales company. ➢ They use various type of insecticide depending on the type of the insects attacking the crops. ➢ They purchase fertilizer individually at the market.

Table 24 Results of Group Discussions with Female Group on Farming Practices and Agricultural Resources at Nang Thon Village

Theme	Discussions
Practice on Shifting Cultivation	➢ There is no practice on shifting cultivation
General information	➢ In the permanent farm, grow upland and lowland paddy, ginger, chayote, cauliflower and peanut. ➢ In upland farm (Yar), after the harvesting of ginger, paddy is grown and after harvesting of the paddy, the land is left fallow for three years. ➢ Villagers use fertilizers, herbicides and ginger stalks. Ginger stalks are used as fertilizer. ➢ In lowland farm (Lae), only paddy is only grown every year.
Crop production	➢ The agricultural production is increased year by year because they use more fertilizers and herbicides ➢ For upland farm (Yar), paddy production is increased because of using ginger stalks. ➢ For Ginger, some farmers said that the production is decreased because of the delay of rain
Soil conservation measures and agroforestry	➢ They develop terraces to plant lowland crops. ➢ For upland farm used for paddy and ginger, farmers build the embankment and change the crops by year for soil conservation.
Concerns	➢ Water is insufficient. ➢ They need more agriculture land.
Application of Fertilizer/Insecticide	➢ Application of fertilizer for Chayote is 1 in seven days for four moths (the person do not use Armo). If they add Armo, the apply fertilizer 1 in fifteen day for four months for Chayote. ➢ Insecticide is applied every seven days for two months in Chayote. ➢ Application of fertilizer for Cauliflower is 2 times before they harvest. ➢ In cauliflower. Insecticide is use for once in seven days until they harvest.

Table 25 Results of Group Discussions with Male Group on Natural Resource Management at Kone Ni Village

Theme	Discussions
Important Natural Resources	➢ The important natural resources and its reasons for importance are: 1st. Water: For agricultural use 2nd. Land: For cropping 3rd. Bamboo: For materials of tomato farms and house construction. 4th. Forest (pine trees): As source of clean air 5th. Road: As transportation ➢ Both firewood and bamboo are found everywhere in the village. Bamboo are freely cut by anybody and anywhere.
Role by Gender	- Role of major cropping activities by gender are: land cultivation (Male and Female), plowing (M), sowing seeds (M&F), application of fertilizer (M&F), application of insecticide (M: spraying insecticide is hazardous for women), harvesting (M&F), firewood collection (M&F) cutting of pine trees (M), and harvesting bamboos (M).
Important Agricultural Resources	➢ The important agricultural resources and its use are: 1st. Rice: For self-consumption 2nd Peanuts: For self-consumption, Used for extraction of cooking oil 3rd. Tomato: As cash crop 4th. Ginger, 5th. Potato and Cabbage: same as above
Marketing of Important Products and Resources	➢ Tomato - Tomato is not sold in the village but to the middlemen/women and/or whole seller in Aun Bang. The price is 1,100 kyat/viss. - Price is more fluctuating than other products. - Tomato sales earns more income than other products due to rather high unit cost. - The villagers usually take the products by themselves using/borrowing tracks small or large tracks including power trailer depending the volume of harvest. Transportation cost is 10 kyat/viss. They transport the products from 1 to 8 times per year. - Average harvest of the product is 10 t/person. - They call the middlemen/women to inform their harvest before transporting the products. - If the volume of harvest is limited, they gather products to transport. ➢ Cabbage/Cauliflower - Cabbage/cauliflower is sold i) to the middlemen/women and ii) at Aun Bang market. - The price of the product is 600 kyat/viss at the market and 500 kyat/viss sold to the middlemen. - In the rainy season, 50 % of the products is sold each to middlemen/women and to Aun Bang market, while only 10 % of the products is sold at the market and its 90% is sold to the middlemen/women in the dry season. In the rainy season, trading amount by middlemen is reduced since they can go to other villagers to buy the product due to increase of the number of farmers cultivating the crops. So, the villagers produce more tomato in the rainy season.

Theme	Discussions
	- The product is transported by small tracks (15,000 kyat/time) and large tracks (20,000 kyat/time). ➢ Ginger - Ginger is produced whole a year. Sales price is 2,200 kyat/viss. - All the products are taken to the Aun Ban market. At the market, the middlemen check the quality of the product to set the price. Price is decided mainly based on the size of the product, which is same for tomato and cabbage. - Transportation cost is 10 kyat/viss not depending on the size of track. - They sell the ginger when they need the cash since the products can be stored at houses and even at the field planted for 1 year. ➢ Potato - All the products are sold at the Aun Bang market. - The price is decided depending on the quality of the product. Q1: 800 kyat/viss, Q2: 700 kyat/viss, Q3: 600 kyat/viss, Q4:500 kyat/viss. - Transportation cost is 10 kyat/viss by small track. ➢ Others - There are middlemen coming from all over the country to purchase the vegetables at Aun Bang market. - They would like to produce Chinese cabbage because it was sold at high price this year. - 70 % of the sales of the Chinese cabbage is to the middlemen who purchase by lot (300-400 kyat/crop). Remaining 30 % is sales at Aun Bang market (1,200 kyat/viss).

Table 26 Results of Group Discussions with Female Group on Natural Resource Management

Theme	Discussions
Important Natural Resources	➢ The important natural resources are: bamboo and firewood. ➢ Bamboo - Bamboo is collected from bamboo groves from the village in January and February. It is free to collect for household use if someone does not have own bamboo groves. - It is not allowed to cut the bamboo near the monastery. - They buy bamboo for house construction. - They earn income by selling bamboo basket. One basket could be sold at 5,000 kyats. 1 bamboo tree is needed to make 3 baskets. - In order to plant 1 sac of tomato, around 50 bamboo trees are needed for the material of the farm. - Labor cost for cutting bamboo is 4 kyat/pole. - Men only cut bamboo. ➢ Firewood - They collect firewood from their home yard and farmland in January and February. They collect 4-5 days continuously per year on average. - They are allowed to cut only in their land. - Men cut large branch of the trees while women cut smaller trees.
Important Agricultural Resources	➢ The important agricultural resources are paddy, peanuts and tomato. ➢ Paddy - Paddy is cultivated for own consumption as main food. - Paddy is milled at Aung Ban for free. The rice mill takes broken rice and bran. Transportation cost is 500 kyats/sac for carrying rice to the place of rice mill machine. ➢ Peanuts - Peanuts is cropped for own consumption and used as cooking oil, curry and snacks. ➢ Tomato - Tomato is cropped for earning cash income and also for house consumption.
Marketing of Important Products and Resources	➢ Cabbage/Cauliflower - Cabbage and cauliflower are sold 1) at Aung Ban vegetable market and 2) brokers coming to the village, tribes of Danu, Myanmar and Pa-oh - Unit price of cabbage/cauliflower is 50-100 kyats. In dry season, all the villagers harvest around 100,000 each of cabbage and cauliflower total in the village. In rainy season, the production of cabbage increases up to 50,000 pcs. Brokers come everyday to the village during the harvest season. - The production of cabbage is around 50 – 100 pcs/HH. - Transportation cost of cabbage is 20,000 kyats for the use of power trailer plus 5,000 kyats to brokers for the rent of the power trailer. 1 trailer can carry 700 pcs of cabbage. ➢ Ginger - Main market for the ginger is the brokers in Aung Ban.

Theme	Discussions
	- Annual harvest volume is 150,000 viss in the village. - The price of ginger is 500 kyats/viss in 2018 and 2,200 kyat/viss in 2019. - Transportation cost is 1,200 kyat/viss ➢ Tomato - The production of tomato is around 150,000 viss in the dry season and 100,000 in the rainy season in the village. - Unit price of tomato is 700 kyat/viss in 2018 and 1,100 kyat/viss in 2019. - Transportation cost is 1,200 kyat/100 viss.
Use of fertilizer	➢ They buy the fertilizer from brokers with the higher price than normal with loan and pay back with income when they get income from selling cash crops, such as tomato and sesame oil.

Table 27 Results of Group Discussions with Male Group on Natural Resource Management and Agriculture products at Pha Yar Phyu village

Natural Resources	
Theme	**Discussions**
Important natural resources	➢ The important natural resources are: 1st. Water, 2nd land d, 3rd Forest and trees, 4th Bamboo ➢ Its reasons for importance are summarized below. ➢ 1st Water : drinking water, water for domestic use and irrigation ・For drinking and water for domestic use, they can get from the water storage tanks connected from the springs by pipes. ・In summer, a household only allowed to carry with shoulder-pole per day for drinking water. ・There is no rules and restriction on using the stream for the agricultural purposes. ➢ 2nd Land: important for farming around the village ・They are allowed to cultivate only in their own land ➢ 3rd Forest and Trees: important to collect firewood, to construct the house and to create a good climate and to provide spring water ・There is the Reserved Forest near the village. Only cutting trees for household consumption for timber and firewood is permitted. ・They are allowed to collect firewood along the bank of the stream. (There is possibility that the area along the bank is communal. But the male group answered so.) Only shrub could be collected for the use of firewood from the reserved forest. ➢ 4th Bamboo: important for construction of house, weaving of basket and posts for tomatoes ・They are only allowed to cut bamboo from own bamboo groves.
Collection of forest products and NTFPs	➢ Pest control (Men), ploughing (M), watering (M), transplanting (Women), weeding (W) harvest and fire wood collection (M/W) ➢ Women do transplant of paddy, weeding and ploughing. ➢ Both men and women do collection of firewood, carrying of water for household use, and grazing.
Agricultural products	
Theme	**Discussions**
Important Agricultural products	➢ The important agricultural resources and its use are: 1st. Tomato as cash crop 2nd. Chinese cabbage as cash crop 3rd. Cauliflower as cash crop. 4th. Peanuts as cash crop 5th. Garlic as cash crop
Marketing of Important Products and Resources	➢ **Tomatoes** **Market** - 90% of the total production in the village is sold at Aung Bang Market and 10% is sold to brokers who come to the village.

- There are four brokers whom the villagers sell ginger and tomato.

Broker

- The price for the brokers is a little higher than the market.

Transport

- Cost for transport, such as power trailer to Aung Bang market is 20 Kyat for 1 viss.

Price

- The price was 200~300 kyat per viss in 2018 depending on the quality.

Fertilizer and pesticides

- 6 packs of fertilizer (300kg) is used for one acre.
- They used fertilizer very little 10 years ago because it was unnecessary.
- At that time, they planted local variety.
- Local seeds produced limited amount with small size of tomato.

➢ **Chinese cabbage**

Market

- Chinese Cabbage is sold at broker's sale center at Aung Ban and to the brokers who come and buy at the village
- 50% of the production in the village are sold to broker's sale center at Aung Ban and another 50% sold to the brokers who come and buy at the village
- Farmers who need money and unable to wait for the broker coming to the village are mostly selling their products at Aung Ban broker's sales center.

Broker

- The broker pays only some of the total payment of the harvest as an initial payment and pay the remaining after the broker sell all the products. There is some case like broker cannot pay the rest of the payment due to some circumstance such as unstable market price.
- They check the quality and do not purchase if the quality is low
- There was one broker who run away without paying.

Price

- They got 500 kyats per viss when the market was good in 2019.
- They only got 80-100 kyats per viss when there was no demand in the last rainy season. The price of the vegetable crops tend to be down in the rainy season since there are many farmers grow them.

Transport

- Transportation cost to Aung Ban broker's sales center is 20 kyats/1 viss.
- If they hired the whole power trailer, they need to pay 20,000 kyats.
- Some farmers sell their products at brokers who come and buy at village.
- They sell the products by plot to the brokers who only come to buy when there is high demand.
- They get 2 million to 2.5 million kyats/plot per HH.

- There is no need to pay for transportation.

Fertilizer and pesticides

- For one acre of Chinese cabbage, they used 8 pack (400kg) of fertilizer.

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➢ **Cauliflower**

Market

- 100% of the total production is sold at Aung Bang Market.

Transport

- Cost for transport to Aung Bang market is 20,000 Kyat per 800-900 pieces.
- When they return from the market by the same truck and carry something like fertilizer, they do not need to pay additional cost.

Price

- The price of one piece is 100-300 kyat.

Fertilizer

- Villagers buy the fertilizer and pesticides from the shop which is not the same one who buy their agricultural products.
- They use 2 bottles of herbicides which is 1 liter in total for one acre.

➢ **Ginger**

Market

- 100% of the total production in the village is sold at Aung Bang Market.
- From 300 viss of ginger seed per acre, 1,200 vis can be produced.

Transport

- It cost 20,000 kyat to Aung Bang Market by small truck.

Price

- The price is 2,000 kyat per viss this year. It was 200-300 kyat/viss before.

Fertilizer and pesticides

- Three bags of fertilizer are used.
- No herbicide is used.

➢ **Garlic**

Market

- 100% of the production in the village is sold at Aung Bang Market.
- 300 - 500 viss of garlics can be produced at one acre.

Transport

- Transportation cost is 20 Kyats per viss with a trailers
- One trailer can carry 800 viss of garlic

	Price - The price is 300 - 700 kyat/viss depending on the quality. **Fertilizer and pesticides** - Three bags of fertilizer are used. - 2 liters/bottles of herbicide is used in total. The cost is 24,000 Kyat for 2 bottles. ➢ **Green pepper** **Market** - 100% of the total production in the village is sold at Aung Bang Market. - 15 HH out of 52 HH produce green pepper. - 1 pack of seeds is 7500 kyat. - From 5 packs of seeds of green pepper, 1000 viss per acre are produced. **Transport** - Transportation cost is 20 kyat/viss. **Price** - The price is 800-1000 kyat/vis and is fluctuating even in one day. - **Fertilizer and pesticides** - The cost for fungicides is 20,000 kyat/viss.

Table 28 Results of Group Discussions with Female Group on Natural Resource Management

Theme	Discussions
Important Natural Resources	➢ The important natural resources are 1st. Water, 2nd Firewood and 3rd Land. The reasons of their importance are as follows: 1st Water : drinking water, domestic use (cooking, washing of clothes, bathing, etc.), and irrigation ➢ For drinking and domestic use, can get the water from the water pipes which connect water source and water storage. ➢ Rules : For drinking water, a household only allowed to carry with shoulder-pole per day in summer. ➢ For grazing and irrigation, they use water from streams. ➢ It is advised not to leave the livestock around the water sources ➢ There is no rules and restrictions for the use of stream water. ➢ Stream is common property. Stream bank is private area which limit access by others to collect firewood. 2nd Firewood is use for cooking and warming in the cold season ➢ Collect mostly from the Reserved Forest ➢ Collect the dry trees from gullies ➢ Use more firewood for warming in November, December, January and February ➢ Rules: the stream bank is a private land they are not allowed to collect. ➢ Gully area also has a private owner but can collect dry trees from there. ➢ Reserved Forest communal land which is open for all the villagers to collect the firewood. 3rd Land : important for agriculture and settlements ➢ There is no encroachment to others' farms.
Role by Gender	➢ Water: carrying water (Men/Women), pumping water (M/W), ➢ Agriculture: plowing (M), trenching (M/W), soil covering (M/W), soil mounding (M/W), paddy transplanting (M/W), other vegetables transplanting (M/W), rope arranging for tomato farm (M/W), pole installing for tomato farm (M/W), application of pesticide, fertilizer and herbicide (M/W), harvesting (M/W), carrying harvest (M/W) ➢ Others: selling at Aung Ban (M), keeping money (W), firewood collection (M/W),
Important Agricultural Resources	➢ The important agricultural resources are: 1st paddy, 2nd ginger, 3rd tomato and Chinese cabbage. 1st. Paddy : Self-consumption, staple crop 2nd Ginger : Cash crop. It can be kept for one year in the storage to choose the timing for a good price as well as sold whenever they need income. 3rd. Tomato: Cash crop: It can be harvested and sold for 4 to 5 times in two month per season. 3rd Chinese cabbage: Cash crop. The villagers could earn money in short period as it could be harvested 4 times per year.

Theme	Discussions
Marketing of Important Products and Resources	Ginger ➢ There are 33 HHs growing ginger, selling only in 2 brokers at Aung Ban Township ➢ There is limitation of growing ginger due to soil type, money and land availability. ➢ There are two brokers for ginger in Aung Ban township. One of them is based in Tun Tauk sales center. ➢ The villagers ask the price from the brokers by calling to select the broker who offers better price. ➢ The production amount of the ginger in the village is 10,000 viss per village. 70 % is sold to the broker based in Tun Taul sales center and 30% to the other. ➢ Price of ginger is 380-400 kyats per viss in 2018 and 800-2200 kyat per viss in 2019. The price of ginger varies by size. ➢ To transport ginger to the market, they use power trailer or small track. Transportation cost is 20 kyat/viss. The power trailer can carry up to 1,000 viss. ➢ They need to pay the labor fee, 200 kyat/basket (50 pcs/basket) for the workers who work for carrying products for the brokers. ➢ 50% of HHs buy the fertilizer with debt from the shop. They pay back to the shop after selling the products. ➢ Transportation cost of fertilizer is 500 kyat/sac. Tomato (rainy season) ➢ They sell tomato to 2 brokers (Brokers A & B) in brokers' sales center at Aung Ban which offer more or less the same price to the villagers. ➢ There are also two brokers that they sell ➢ Broker A provides seeds of tomatoes to 20 HHs with credit and they buy all the tomatoes products from these 20 HHs farmers. ➢ Broker B provides seeds of tomatoes to 10 HH with credit and buy all the tomatoes products from these 10 HHs farmers ➢ There are remaining 10 HHs who do not take any seed or credit from the brokers, but they sell they products to Brokers A & B. ➢ Price of tomato is 100 – 800/900 kyats/viss in 2018 and 400 – 800 kyats/viss in 2019. The price varies depending on the size. ➢ They use power trails and small trucks for transporting products. Transportation cost is 20 kyats/viss. ➢ Both power trailer and light truck can carry 30 sac. (around 900 viss) ➢ Payment for the labor cost to carry the product to the broker is 100 kyats per sac. ➢ Cost of fertilizer is 500 kyat/bag. Amount of application of fertilizer and pesticide is decided by themselves referring to the description at the package. Chinese Cabbage ➢ Chinese Cabbage is sold to the i) middlemen/women who come to the village and ii)

Theme	Discussions
	broker at Aung Ban township. ➢ The middlemen/women come to the village from January to June. - They usually buy the products by plot. - 1 plot where one sac of seed is applied can be sold from 250,000 Kyats to 350,0000 kyats in 2019. - In 2018, they only got from 30,000 kyats to 50,000 kyats for one plot planted with one sac of seeds.One sac of seed may harvest 2,300 unit of Chinese cabbage. - There is no transportation and labor cost. ➢ They usually sell the products at Aung Ban township in from July to December - In Aung Ban, they sell by viss. - They sold 150 Kyats – 200 kyats/viss in 2018 and 700 kyats in 2019. - Transportation cost is 20 kyats/viss - If they hire the whole power trailer or light truck, it costs 20,000 kyats and it can carry 700 viss to 800 viss. ➢ They buy the fertilizer from Aung Ban township. Transportation cost of fertilizer is 500 kyat/bag. ➢ As for the application amount of the fertilizer, they decide the amount by themselves referring to the description at the package.

Table 29 Results of Group Discussions with Male Group on Natural Resource Management and Agriculture products at Ein Yar village

Natural Resources	
Theme	**Discussions**
Important natural resources	➢ 1st. Forest, 2nd Stream, 3rd Bamboo, 4th Honey bee/ Honey and 5th Turmeric ➢ 1st Forest : A dense forest provides better soil fertility, normal rainfall, normal weather and less temperature. ➢ 2nd Stream is important for drinking and providing water for domestic use irrigation ➢ 3rd Bamboo is used for construction of houses, baskets, bridges and houses ➢ 4th Honey bee/Honey uses as a medicine and household consumption ➢ 5th Turmeric for own consumption
Collection of forest products and NTFPs	➢ Villagers collect honey in the bush along the river. But not all people collect honey because it is dangerous. ➢ The pest control (Men), soil mounding (M), harvest and fire wood collection (M/F), selection of the crops for the next year (M&Women)
Agricultural products	
Theme	**Discussions**
Important Agricultural products	➢ The important agricultural resources and its use are: 1st. Ginger as cash crop 2nd Tomato as cash crop 3rd. Cabbage as cash crop. 50% of HHs grow cabbage. 4th. Peanuts as cash crop and own consumption for cooking oil. 5th. Rice: for self-consumption. 30% of HHs sell paddy. One household consumes 15 pack (510kg) of paddy for one year with 6 family members on average.
Marketing of Important Products and Resources	➢ Ginger **Market** - 90% of the total production is sold at Aung Bang Market and 10% to the broker. - There are 4 brokers who come to the village and they also go to sell to these 4 brokers in Aung Ban Brokers' Sales Center. **Broker** - They pay 10% of the sale to the broker. - The broker buys by acre in the field. **Transport** - 65 HHs out of 80 HHs have a truck. - Cost for transportation to Aung Bang market is 15,000 kyat to carry 1 ton of ginger. To transport one viss of ginger is 10 Kyat. - When they return from the market by the same truck and carry fertilizer, they do not need to pay additional cost for transportation. **Price** - The price of one vis (1.6kg) of ginger is 2,000 kyat at Aung Bang Sales Center while 2,100 kyat could be the price per vis to sell to the broker. In 2018, the price was 400 kyat/viss. It is said that the reason of high price this year is high demand by other

countries.

- This year, the price per viss varies from 1850, 2050, 2100 and 2300 kyat depending on the quality and size.

Fertilizer

- Villagers buy fertilizer and pesticide from the shop which is different from the one buying their agricultural products.
- They use 1 litter of herbicides for 500 viss of ginger seed.

➢ **Tomatoes**

Market

- 100% of the total production in the village is sold at Aung Bang Market.
- There are 4 merchants whom they sell their ginger and tomatoes.

Broker

- All ginger is brought to the market by villagers.

Transport

- Cost for transportation of power trailer to Aung Bang market is 15,000 Kyat which carries around 1250 vis (≒2000 kg).
- To transport of one vis of tomatoes is 10 kyat in case the villagers share the transportation with other villagers.

Price

- The price varies from 700, 800, 1,000 or 1,200 depending on the quality and size.
- Even the price is low from October to December, the villagers sell it to obtain cash for necessary items for paddy cropping.

Fertilizer and pesticides

- Villagers use 1 liter of pesticides per acre, which costs 30000 kyat because 0.5 litter of pesticides is 15000 kyat.
- Villagers use 4 viss of fungicides, which costs 24,000 kyat because 1 vis is 6000 kyat.
- They buy the fertilizer and pesticides from the different shop from the one buying their agricultural products.

➢ **Cabbage**

Market

- 90% of the total production in the village is sold for the brokers and 10% of the production is sold at Aung Bang Market.
- Cabbage grows especially in the rainy season.

Broker

- 10,000 pcs of the cabbages are produced from 1 acre.
- Broker buy by acre. 10% of the products were not sold to the brokers because its size is small.

Transport

- There is no transportation cost of selling of Cabbage as the brokers come and buy at the farmland.

Price

- The price varies from 300, 400, 500, or 700 depending on the quality.
-

Fertilizer and pesticides

- They use 250 kg of fertilizer. They use five pack of fertilizer.

➢ **Peanuts**

Market

- 80% of the total production in the village is sold for brokers and 20% is at Aung Bang Market.
- From 1 acre, 480 kg of peanuts can be produced.
- All households produce the peanuts.

Broker

- When the production is low, it is sold at Aung Bang market.

Price

- Five gallons of peanut oil is sold at 65,000 kyat. Sometimes the price decrease to 45,000 Kyat when they sell at the peanut mill for extracting oil.

➢ **Paddy**

Market

- When there is surplus left, rice is sold at Aung ban market.

Transport

- They bring to Aung Bang Market. 31.35 kg of rice packet cost 500 kyats by power trailer

Price

- 31.35 kg rice is sold at 15,000 kya
-
- **Fertilizer and pesticides**
- Fertilizer for 3,000 kyat is applied for an acre and Urea for 24,000 kyat.
- About 200 kg of salt is applied for an acre as herbicide.
- They use 100 kg of fertilizer per acre.

Table 30 Results of Group Discussions with Female Group on Natural Resource Management

Theme	Discussions
Important Natural Resources	➢ The important natural resources are: 1st. Water, 2nd Land, 3rd Firewood and 4th Bamboo. The reasons for its importance are as follows. 1st Water : drinking, domestic use (cooking, washing of clothes, bathing and etc.), and irrigation - They get the water for drinking and domestic use from deep tube well by pipelines to their house. - Rules : Before the installation of water meter, they only get once in two days from 8 am to 9 am. Currently , there seems to be no rules, but they do not know yet as the water meter installed 5 days ago. - For irrigation, they use Thar Hmong Kham stream. - They block the stream in rainy season to divert water for cropping lowland paddy. - There is no rules and restriction on the use of the stream. 2nd Land : important for agriculture - They only use their own land without encroaching other's area. 3rd Firewood : cooking since they are still using firewood even they have electricity - They collect firewood in January along the bank of the stream and their own farmland and home yards. - There is no rules and restriction on the use of firewood - One household collect one cow cart of firewood to use during 1 year 4th Bamboo : construction of house, fence, construction of hut in their farms, weaving of basket - They collect bamboo from own bamboo groves. - Newly marriage couple gets bamboo for free to construct their house. - Small bamboo is sold at 1,500 MMK while large bamboo 3,000 MMK - Villager from Pin Hme village come and waves the basket. - Bamboo basket could be sold at 4,000 MMK and large bamboo could produce 4 units of baskets.
Role by Gender	➢ No gender differentiation on using of Water. ➢ Plowing (Men), digging (M/W), soil preparation (M/W), and soil covering (M/W), application of fertilizer (M/W), application of pesticide (M/W), harvesting (M/W) ➢ House construction (M) ➢ No gender differentiation on collecting of firewood. ➢ Only men cut bamboo and weave the basket.
Marketing of Important Products and Resources	Ginger ➢ Total harvest of ginger of the village is around 80,000 viss (130,400kg) per year ➢ Selling at brokers' sale center at Aung Ban township (5 brokers) with total sales volume of 75,000 viss and to the brokers who come to the village with total sales amount of 5,000 viss. ➢ Price of Ginger is 250-450 kyats per viss (153 kyats – 276 kyats per kg) in 2018.

Theme	Discussions
	➢ Currently the price of ginger is 1500 - 2300 kyats per viss (920 - 1411 kyats per kg) ➢ Transportation cost is 10 kyat/viss ➢ 50 HHs has the power trailers to carry the product. ➢ They need to pay the cost of the labor at the market for carrying the products: 8,000 kyats/every sales of 100,000 Kyats ➢ Buyers come to the village to buy seedlings for the next cropping season. They are from Lae Kyar, Naung San Phu and Nan Tine villages ➢ 6% of Ginger from the village are sold as seed. The price is 250-450 kyat/viss in 2018 and 1,500-2,300 kyat/viss. ➢ When the demand is so high they come to the village to buy ginger. They do not come every year. Only 1-2 HHs are selling to them. ➢ They buy the fertilizer at Aung Ban market with the price of 500 kyat/bag. They can buy it with debt from the shop with the interest of 5,000 kyat/100,000 kyat. 50% of HHs buy cow-dung/fertilizer with debt. After harvesting, they pay back to the shop. ➢ Every month they can sell the ginger, which could be stored for 2 years. ➢ Tomato (rain crop) ➢ They sell only at brokers' sale center at Aung Ban (same broker with ginger). They prefer the broker than middlemen in Aung Ban market since their transaction volume is higher. ➢ Price of tomato is 50 kyats per viss (31 kyats per Kg) in 2017. ➢ 20 HHs is growing tomato. They sell tomato in July & August. ➢ In the last 2 years, they have had difficulty in selling tomato because there have been many producers. Even their brokers did not buy tomatoes. ➢ Transportation cost is 10 kyats/viss ➢ Labor cost to carry the products at the market is 8,000 kyat/sales of 100,000 kyat. ➢ When the price of tomato got low, they just lost the workload and transportation cost for carrying tomato at the market. ➢ They use fertilizer mixed by Theesone and Armo. The quantity of application of the fertilizer is 1-1.5 bag/2,000 viss of the tomato production per year.

Table 31 Results of Group Discussions with Male Group on Natural Resource Management and Agriculture products at Nang Thon village

Natural Resources	
Theme	**Discussions**
Important natural resources	- The important natural resources are 1. forest and 2. Bamboo - Forest is also important because if the forest exists, the rain comes on time. - Also, forest is necessary as source of firewood and timber - Bamboos are important because they are used for baskets and bridges and houses
Collection of forest products and NTFPs	- Villagers collect honey in the bush along the river. But not all people collect honey because it is dangerous. - Villagers go to other areas outside of the village to collect honey. - No rules for the collection of honey.
Agricultural products	
Theme	**Discussions**
Important Agricultural products	➢ The important agricultural resources and its use are: 1st. Chayote as cash crop 2nd Ginger as cash crop 3rd. Cauliflower as cash crop
Marketing of Important Products and Resources	➢ **Chayote** **Market** - 90% of the total production in the village is sold at Aung Bang Market. - Villagers do not know the place which the chayote will be transport from Aung Bang Township. - There is only one merchant whom they sell their Chayote. - This merchant buys even when there are plenty of Chayote in the market, while other merchants do not buy. **Broker** - 10% sold is given for a broker. - The broker buys by acre in the field. **Transport** - Cost for transport to Aung Bang market is 15,000 Kyat to carry around 7,500 pieces of chayote. - There are 7 big trucks (small trucks like 3 ton truck) and 4 small trucks (smaller than 3 ton truck) in the village. - When they return from the market by the above truck and carry something like fertilizer, they do not need to pay additional cost. **Price** - The price of one piece of chayote is 150 Kyat - 200 Kyat in 2019. **Fertilizer** - Villagers buy fertilizer and pesticides from the shop. The shop is different from one which buy their agricultural products.

➢ **Ginger**

Market

- 100% of the total production in the village is sold at Aung Bang Market.
- There are several merchants whom they sell their Ginger.

Broker

- All gingers are brought to the market by villagers.

Transport

- Cost for transport to Aung Bang market is 20,000 Kyat to carry around 1200 viss (≒ 1.6 kg).

Price

- The price becomes low in October and November and high in May and June.
- Even the price is low from October to December, the villagers sell it to obtain cash for necessary items to crop paddy.

Fertilizer and pesticides

- Villagers buy fertilizer and pesticides from the shop which is different from the one buying their agricultural products.

➢ **Cauliflower**

Market

- 80% of the total production in the village is sold at Aung Bang Market.
- There are around 5 merchants to whom Nang Thon villagers sold at Aung Bang Market. (There are more than 5 merchants for cauliflower at Aung Bang Market but villagers always sell their cauliflower to these 5 merchants).

Broker

- They pay 20% of sales to the broker.
- The broker buys by acre in the field.
- The price of the broker is lower than the price at Aung Bang Market.
- The broker does not sell fertilizer.

Transport

- Cost for transportation to Aung Bang market is 20,000 kyat to carry between 600 to 1200 pieces. Also, the cost for transportation depends on the size of the product.
- To transport one piece is 20 Kyat.

Price

- The price varies from 100 to 500 kyat per piece.

Fertilizer and pesticides

- Villagers buy fertilizer and pesticides from the shop from the one buying their agricultural products.

Table 32 Results of Group Discussions with Female Group on Natural Resource Management and Agriculture products at Nang Thon village

Natural Resources	
Theme	**Discussions**
Important natural resources	- The important natural resources in the village are 1. Firewood, and 2. Bamboo - Firewood is essential for daily cooking. - Bamboo is used as materials for house construction and repairing of houses.
Collection of forest products and NTFPs	- They collect firewood along the bank of stream, while most of bamboo from they own yard. If household does not have bamboo grave, they need to buy. The price varies from 1500 to 3000 kyats depending of type and size of bamboo.
Access to resources	- There is no gender difference to access to natural resources.
Agricultural products	
Theme	**Discussions**
Important Agricultural products	➢ The important agricultural resources and its use are: 1st. Chayote as cash crop 2nd Ginger as cash crop 3rd. Cauliflowers as cash crop
Marketing of Important Products and Resources	➢ **Chayote** **Market** - 79% of farmers in the village sell the chayote to a broker in Thar Hmong Kham village. (The broker from Aung Ban Township open a buying station in Thar Hmong Kham village) - Another market's channel is brokers in Aung Ban Township. Only 3% of farmers sell chayote at the market of Aung Ban Township. (Market of Aung Ban township is a place where the farmers go directly to sell their vegetable to the brokers) **Broker** - Some brokers also come and buy chayote in the village when the prices arise. Only 10 HHs (18% of farmers) sell to them. **Transport** - For transportation, villagers use power trailers. - Transportation cost from the village to Aung Bang Township is 1000 MMK per basket (around 250 pcs in one basket and 30 baskets for one trailer). - Transportation cost from village to Thar Hmong Khan Village is 7000 MMK for one trailer. (around 3,000 pcs. in one power trailer) - Transportation cost for fertilizer from Aung Ban Township to the village is 500 MMK for one bag. **Price** - The current price of one piece of Chayote is 150 MMK/pcs. The price is highest in July and August. - The price is low in September and October. **Fertilizer** - Villagers buy fertilizer and pesticides from the agriculture shop in Aung Ban Township.

➢ **Ginger**

Market

- 99% of the total production is sold at Aung Bang's Market.
- There are many brokers in Aung Ban Township who buy gingers.

Broker

- Some brokers also come and buy gingers in the village when the price is getting high.

Transport

- Transportation cost from the village to Aung Ban's market is 1000 kyats per one basket
- Transportation cost for fertilizer from Aung Ban Township to the village is 500 MMK for one bag.

Price

- The price becomes low in October and November and high in May and June.
- The current price is 2,300 Kyats for one viss (1411 MMK for one kg).

Fertilizer and pesticides

- Villagers buy fertilizer and pesticides from the shops in Aung Ban Township. However, the shops are not the same as the one buying their products.

➢ **Cauliflower**

Market

- 100% of the total production in the village is sold at Aung Bang's Market.

Broker

- Some Brokers also come and buy chayote in the village when the prices goes up. Only 10 HHs (18% of farmers) sell to them.

Transport

- Transportation cost from the village to Aung Bang's market is 20,000 MMK using power trailer.
- Transportation cost of fertilizer from Aung Ban Township to the village is 500 MMK for one bag for the people who do not have a power trailer.

Price

- The price range was between from 250 –– 270 MMK/viss Kyat in last year.

Fertilizer and pesticides

- Villagers buy fertilizer and pesticides from the shop at Aung Ban Township.

Figures

Figure 1 Resource Map of Kone Ni Village

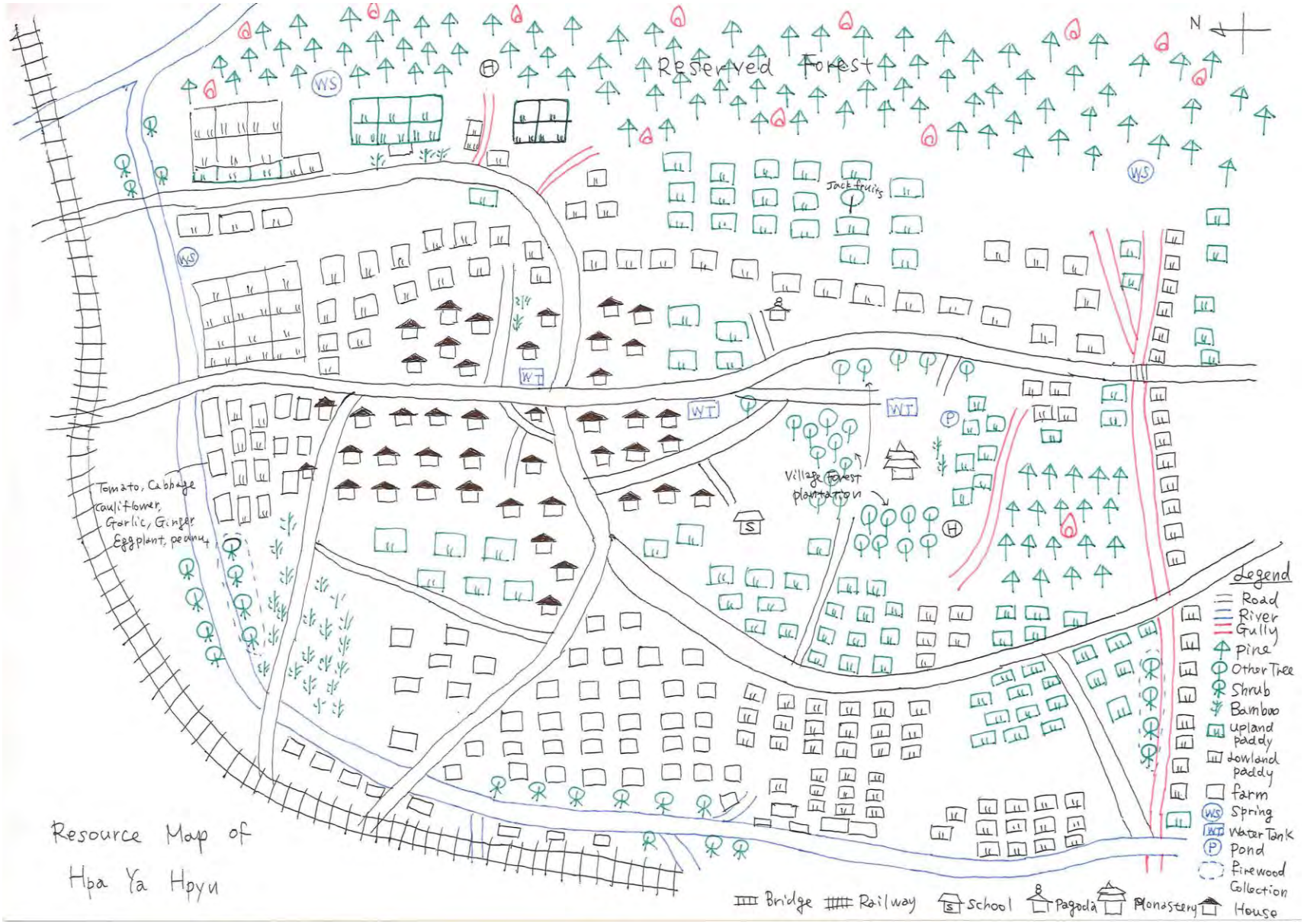


Figure 2 Resource Map of Pha Yar Phyu Village

Figure 3 Resource Map of Ein Yar Village

Figure 4 Resource Map of Nang Thon Village

Appendix-1

Guidelines on the Conducts of PRA Sessions

Guidelines on the Conducts of PRA Sessions

Activity	Target group	Aspects to be clarified or Key questions	Steps to be taken	Attentions to be paid	Necessary materials
Resource mapping/ Hazard mapping	Group of people (20 -30 pax) - village leaders - land owners - female - others	• Distribution of forest, and land uses, e.g., shifting farm, permanent farm, orchards, grazing land, and others • Major landmarks in the village (roads, paths, rivers/streams, village boundaries, etc.) • Land ownership, e.g., Government land, Communal land (land owned by village) and Private land (land owned by individuals) • Distribution of households/hamlets in the village • Distribution of important NTFP (such as bamboo, honey, others) • Distribution of major water resources with their use • Sacred places • Protected area (if any) • Areas for firewood collection • Location of natural hazards, e.g., forest fires and gully erosion • Extent of damages caused by above events	• Select a proper place for making a map in consultation with local people • Explain the purpose and time schedule of the exercise • Ask them to show the major resources and landmarks using locally available materials in a creative way and to make the map as representative as possible • Do not interfere. Allow them to do it on their own. In case they get stuck, help them out. • Listen carefully to the discussions they have while preparing the map. Note down the relevant points. • In case the participants do not represent the aspects that we intend, we could ask them un-intrusive questions without disturbing the process, like “What about …..?”, or “Can you show us ……..in the map?” • Ask them to explain the map including the various symbols, visuals and colours used. • At the end, ask them whether anybody would like to make any modifications or additions. • Copy the map onto a large sheet of paper with all details including legends. Also make a small-sized copy for reporting.	• Take note any comments by people who are not directly involved in drawing the map. • Classify the farmlands into upland farm (fixed), shifting farm, orchards, and others). • Classify forests by major species and density of forests, such as dense, medium and sparse. • Demarcate Community Forest and/or reserved forest and other protected forest (if any) • Identify the location of gully erosion/land slides/forest fires • Draw the map prepared by villagers soon after it being depicted. • Check seasonal changes in land use	<u>In case you use the ground for a matrix.</u> • Chalk or rope for boundaries • Piece of papers • Stones • Symbols • Other materials <u>In case you use the composite paper for a matrix.</u> • Large plywood • Composite paper • Pen ---------- • Flipcharts
Trend Analysis	Group of people (20 -30 pax) - People from different ages and different strata - Elders	• Historical changes in the situations of natural resource • Major items to be surveyed are: 1) income, 2) water 3) paddy (major-crops 1), 4) tomato (major-crops 2), 5) potato (major-crops 3), 6) other major farm products, 7) major NTFPs, 8) volume of firewood collection, 9) livestock, 10) land availability, 11) population, 12) forest, 13) landslide/gully erosion, 14) forest fires	• Explain the objective and time schedule of the exercise. • Ask them to make a grid with chalk or other materials on the ground or with a bold pen in a large composite paper. • Put the land mark years in the left column from top to bottom and aspects of natural resource, e.g., forests, land, production of major crops, • Take up one of the aspects and ask the participants to depict the situation today in the corresponding cell using symbols, visuals, seeds, sticks, stones, etc. Move to next time landmark so	• Landmark years should be used namely i) After 2011, ii) 2003/4 - 2011, iii) 1988 – 2003/4, iv) 1962 – 1988 and v) before 1962 • Take notes all the discussions made by the participants, not only the answers but also comments or suggestions made during the discussions.	<u>In case you use the ground for a matrix</u> • Chalk or rope for boundaries • Stone/seeds/other local materials

Activity	Target group	Aspects to be clarified or Key questions	Steps to be taken	Attentions to be paid	Necessary materials
			on. After the completion of one aspect, move to the next aspect and follow the same process till all the cells are filled in. • Once the diagram is ready, ask them whether they would like to make any changes. • Check if there are any aspects to be added to the matrix. • Ask the participants to explain the diagram. Encourage the participants to discuss their findings and reflect on them.		
Seasonal Calendar	Group of people (20-30 pax) - People from different ages and different strata	• Rainfall pattern • Farming practices of shifting cultivation • Farming practices of upland crops, and vegetables • Harvest seasons of major crops • Harvest seasons of industrial plants, NTFPs, Firewood and other products • Any events (Droughts, Fires, Slides) • Seasonal change in availability of water (river water and springs)	• Explain the objective and time schedule of the exercise. • Ask them to make a grid with chalk or other materials on the ground or with a bold pen in a large composite paper. • The grid has at least 13 columns and as many rows as the items that we like to study. The items to be studied shall be decided in consultation with the Team before the session. • Put the numbers of months or symbols of months in the top boxes in the grid in order, horizontally. • Put the symbols or drawings or letters of the aspects of which seasonal variations to be clarified. Ask the participants to show the months when the aspect or activity is on. Ask them to represent the magnitude of the activity using seeds or sticks of different size or writing the x-marks or any other symbols. • After completing one aspect or activity move to another, until all of them are similarly covered. • Ask the participants if any modifications are necessary. • Ask questions about aspects which you are not clear. • Facilitate discussions and analyses among the participants. • Copy the diagram on a piece of paper with legends and details of the participants, facilitators,	• Make and use a matrix of months and topics/resources • Use symbols (such as cross or tick mark) or local materials (such as stones) to express seasonal trends of the topics to be clarified	<u>In case you use composite papers for matrix.</u> • Plywood • Composite papers <u>In case you use the ground for a matrix.</u> • Chalk or rope for boundaries • Symbols or local materials showing the frequency/seasonal trend

Activity	Target group	Aspects to be clarified or Key questions	Steps to be taken	Attentions to be paid	Necessary materials
			location and date. •		
Separate group discussion on Current Status of Community Forest and Forest Resource Management	Separated group of people (10~20 pax/group) including the members of Community Forest User Groups (if any) - 10~20 women from different ages and different strata - 10~20 men from different ages and different strata	【For the village which already has been practicing CF】 • General Information of CF • Condition of forest in CF area • Main objectives of CF registration • Criteria of granting membership of CFUG • Land tenure of CF area • Basic rules relating to forest and land management in CF area • Process of establishment of CF • Afforestation/Reforestation made in CF area • Any forest management practices and activities conducted by CFUG • Major forest & NTFP products collected from CF • Mechanism of benefit sharing among CFUG members • Past and current support for CF activities from government, donors, NGOs, etc. • Future use of CF area • Incentive to participate in CUFG activities • Any changes in forest conditions in CF area • Any problems and concerns about management of CF area • Perception of improvement of ecosystem services 【For the village which has yet to introduce CF】 • Interest in participation in CF • Existing forest in the village • Perception of CF • Expectation from CF • Obstacles for apply to CF 【Forest Management in the Village (private land) and Status for Forests】 • Current status of forests • Forest fires	• Explain the objective and time schedule of the exercise. • Ask the questions according to the checklist prepared. • Once you get the answers from the participants, ask the reasons for the answers given. Facilitate the discussions among the participants. • Take notes all the discussions made by the participants, not only the answers but also comments or suggestions made during the discussions.	• Use a checklist (see Checklist 1) specifically for this meeting. • Take note any statements of the participants	• Checklist for semi-structured interview • Flipcharts

Activity	Target group	Aspects to be clarified or Key questions	Steps to be taken	Attentions to be paid	Necessary materials
		• Firewood collection • Conversion of forests • Importance of forest • Existing forest management practices • Protected areas or communal forests			
Separate group discussion on Farming practices and agricultural resources	Separated group of people (10~20 pax/group) - 10~20 women from different ages and different strata - 10~20 men from different ages and different strata	【Practice on Shifting cultivation】 • Number of plots owned by household for shifting cultivation • Practices of shifting cultivation • Intention to continue shifting cultivation 【Practice on Permanent Farming】 • Farming practices in permanent farms • Crop production • Soil conservation measures and agroforestry • Any concerns	• Explain the objective and time schedule of the exercise. • Ask the questions according to the checklist prepared. • Once you get the answers from the participants, ask the reasons for the answers given. Facilitate the discussions among the participants. • Take notes all the discussions made by the participants, not only the answers but also comments or suggestions made during the discussions.	• Use a checklist (see Checklist 2) specifically for this meeting. • Take note any statements of the participants	• Checklist for semi-structured interview • Flipcharts
Separate group discussion on Natural Resource Management	Separated group of people (10~20 pax/group) - 10~20 women from different ages and different strata - 10~20 men from different ages and different strata	• Important Natural Resources and Access to the Resources • Important Agricultural Products • Important Marketing Products	• Explain the objective and time schedule of the exercise. • Ask the questions according to the checklist prepared. • Once you get the answers from the participants, ask the reasons for the answers given. Facilitate the discussions among the participants. • Take notes all the discussions made by the participants, not only the answers but also comments or suggestions made during the discussions.	• Use a checklist (see Checklist 3) specifically for this meeting. • Take note any statements of the participants	• Checklist for semi-structured interview • Flipcharts

Checklist 1: Separate Group Discussion on Community Forest and Forest Resource Management

1. Current Status of Community Forest

1-1: For the village which already has been practicing CF

Points	Key Suggested Questions
1) General Information of CF	■No. of CFUG members, Area of CF, Year of registration, Composition of CFUG management
2) Condition of forest in CF area	■Dense or closed canopy, moderately closed canopy, sparse forest, or woodlot when it was registered?
3) Main objectives of CF registration	■What are the main objectives of CF registration?
4) Criteria of granting membership of CFUG	■What kinds of attributes/qualifications are required for being a member of CFUG?
5) Land tenure of CF area	■Was CF area the state land or private land? ■Why was CF area selected for CF?
6) Basic rules relating to forest and land management in CF area	■What are the basic rules on the use and management of CF area?
7) Process of establishment of CF	■What steps and activities were taken for establishment of CF from identification of the proposed site to registration of CF? ■How many meetings were organized during above process? ■How many villagers were involved in the process of establishment of CF?
8) CF management plan	■Did the community prepare CF management plan? ■If so, what steps were taken during preparation of CF management plan? ■If so, have CF management plan been implemented?
9) Afforestation/ Reforestation made in CF area	■Species planted, Area or No. of seedlings planed, Year of afforestation/reforestation
10) Any forest management practices and activities conducted by CFUG	■Have CFUG members engaged in any forest management activities? ■If so, what kinds of forest management activities have they conducted in CF area?
11) Major forest & NTFP products collected from CF area	■Have CFUG members collected any forest and non-timber forest products from CF area? ■If so, what kinds of products have they collected and what purpose have they collected such products for?
12) Mechanism of benefit sharing among CFUG members	■If the members can collect any commercial products from CF area, how does CFUG share the benefit from the products among its members? ■Please specify the rules on benefit sharing?
13) Past and current support for CF activities from government, donors, NGOs, etc.	■Year, Type of activities, Area/Size of support, and Organization
14) Future use of CF area	■Does CFUG like to change the condition of CF area? ■How does CFUG think CF area should be in future?

Points	Key Suggested Questions
	■What purpose does CFUG like to use CF area for? ■What kinds of trees or crops does CFUG like to plant in CF area?
15) Incentive to participate in CFUG activities	■What are the main incentives for CFUG members to participate in CF activities?
16) Any change in forest conditions in CF area	■Has the forest condition in CF area been changed? ■If yes, how has the conditions been changed (degraded or improved)?
17) Any problems and concerns about management of CF area	■Are there any problems or concerns about management of CF area (such as deforestation, encroachment, forest fire, gully erosion, etc.)? ■If there are any problems/concerns, what are the main causes of such problems/concerns? ■What kinds of interventions/supports are required for solving such problems/ concerns?
18) Perception of improvement of ecosystem services	■How far do CFUG members understand about ecosystem services provided by forests, particularly CF area, e.g., water availability, stability of slope?

1-2: For the village which has yet to introduce CF

Points	Key Suggested Questions
1) Interest in participation in CF	■Do communities know about CF? ■Do communities in the village like to allocate existing forest for CF? ■Do communities in the village like to bear responsibility for rehabilitation, management, and protection of degraded forest reserve adjacent to the village? ■If so, why do they like to introduce CF in the village? ■What kinds of benefits do they expect from CF?
2) Existing Forest in the Village	■Are there any natural forests which could be allocated for CF?
3) Perception of CF	■What do they think about CF? ■What are their understandings about CF? (less incentive but more obligations, etc.)
4) Expectation from CF	■What are the expectations of communities from CF? (any improvement of livelihood, protection of environment, no expectation)
5) Obstacles for apply to CF	■What kinds of negative aspects do communities foresee from the introduction of CF?

2. Forest Management in the Village (Private Land) and Status of Forests

Points	Key Suggested Questions
1) Current status of forests	■Have forest areas in the village been changed? ■If so, how have forest areas in the village been changed, decrease or increase? and what are the main reasons for the change? ■What are the main species of trees planted in private land and naturally grown in the village?

Points	Key Suggested Questions
2) Forest fires	■How often do forest fires occur in the dry season? ■Which parts of village do forest fires frequently occur (by using a resource map prepared by local communities)? ■When (or Which months) do forest fires occur usually? ■What do communities think the main causes of forest fires are? ■What do communities think frequent forest fires would cause in future?
3) Firewood collection	■How often does one household collect firewood in a week? ■Are there any specific areas used for collection of firewood? If so, please specify the area in the resource map prepared by local communities. ■How much of firewood does a household collect for one time collection? ■Which species or types of trees are used for firewood in general?
4) Conversion of forests	■Are forests in the village still converted into other forms of land use? ■If so, what kinds of land use are forests converted, vegetable farms, upland farms, and others?
5) Importance of forest	■Do communities consider forest as an important resource? ■If so, why or what points do they consider forest to be important? (e.g., a source of firewood, potential area for new farms, place for animal grazing, etc.)
6) Protected Areas or communal forests	■Is there any protected area or communal forest within the boundaries of the village? ■If so, what kind of rules or practices do communities follow to manage and protect the protected area / communal forest? ■If there are any rules on management, please specify the rules. ■Who will be responsible for management and protection of the protected area or communal forests?

Checklist 2: Separate Group Discussion on Farming Practices and Agricultural Resources

1. Practice on Shifting Cultivation

Points	Key Suggested Questions
1) Number of plots owned by household for shifting cultivation	■How many plots did communities used to use for shifting cultivation before? ■How many plots do communities use for shifting cultivation at present? ■If there is no shifting cultivation practice existing in the village, what made them change their practices?
2) Practices of shifting cultivation	■If shifting cultivation still exists, how large is the average size of the plot used by one household? ■How many years do communities use the same area for production of annual crops on average? ■What kinds of crops are produced in the plot of shifting cultivation? ■After production of annual crops, what do communities do in such an area? ■How many years do communities fallow the area after stopping the production of annual crops? ■What are the major good points in production of crops under shifting cultivation as compared to the production in permanent farms? ■What are the major difficulties (or bad points) in production of crops under shifting cultivation as compared to the production in permanent farms?
3) Intention to continue shifting cultivation	■Do communities like to continue shifting cultivation? ■If so, why do they like to continue such a practice? ■If no, why do they like to stop and what kinds of support are required for them to stop the practice?

2. Practice on Permanent Farming

Points	Key Suggested Questions
1) Farming practices in permanent farms	■What kind of crops does one household grow in their permanent farms? ■Do communities apply farm inputs for production of the respective crops grown in the permanent farms? ■Have communities grown the same crops since before?
2) Crop production	■Are there any change in production or productivity of crops? ■If the production/ productivity declines, what do they think the main causes of decrease of crop production? ■If the production/ productivity increases, what do they think the main reason for increase of crop production?
3) Soil conservation measures and agroforestry	■Have communities applied any soil conservation measures to their permanent farms? ■If so, how many percent of communities on average have applied soil conservation measures? and what kinds of soil conservation measures have they applied (such as bench

Points	Key Suggested Questions
	terracing, contour bunds, or putting crop residues along contours, etc.)? ■In general, which types of farms do they apply the soil conservation measures (vegetable farms, upland farms, or no difference among types of farms)? ■Have communities applied agroforestry practices to their own farms? ■If so, how many percent of communities on average have applied agroforestry practices? and what kinds of agroforestry practices have they applied (such as taungya, Silvopastoral, etc.)? ■How many plots does one household own such a type of farm (agroforestry farm) on average? (or how large is the agroforestry farm hold by one household on average?)
4) Any concerns	■What are the major concerns about production of crops? ■What kind of supports or intervention are needed to address such concerns and issues?

Checklist 3: Separate Group Discussion on Natural Resource Management

1. Important Natural Resources and Access to the Resources

Points	Key Suggested Questions
1) Important natural resources	■Please specify three most important natural resources including forest and non-timber forest products for their livelihoods. ■Please also specify the reasons why such products are selected as important resources. ■Please also classify them into resources to be marketed for cash income and those used/ consumed by household.
2) Practices of collection of important forest products and NTFPs	■Where, when, and how often do communities collect such resources (using a resource map for identification of the locations)? ■Are there any rules on collection of such resources in the village? ■If so, please specify the rules.
3) Access to resources	■Is there any difference in accessing to natural resources, particularly important natural resources among community members, such as between the sexes? ■If so, what kinds of resources that women or men have limitation to access to?

2. Important Agricultural Products

Points	Key Suggested Questions
1) Important agricultural products	■Please specify three most important agricultural products for their livelihoods. ■Please also specify the reasons why such products are selected as important products. ■Please also classify them into products to be marketed for cash income and those consumed by household.

3. Important Agricultural Products

Points	Key Suggested Questions
1) Marketing of important products and resources	■Where (in the village, market outside the village, nearby town, etc.) and to whom (company, groups of people, etc.) do communities sell the marketable important resources and products? ■Are there any difficulties in accessing to the market or buyers? ■If so, please specify what kinds of difficulties that they face in marketing the resources and products. ■Please specify how do communities market the respective resources and products, such as i) locations, ii) means of transportation, iii) cost for transportation, iv) volume of product per transaction. ■Please also draw market channels/flows of the respective resources and products with identification of key stakeholders/ players involved in the market flows.

Appendix -2

Photos of PRA Sessions in the Target Villages

Appendix-2 Photos of the PRA sessions in the Target Villages

Resource Mapping at Kone Ni Village

Resource Map of Kone Ni Village

Trend Analysis at Pha Yar Phyu Village

Seasonal Calendar at Pha Yar Phyu Village

Trend Analysis at Ein Yar Village

Seasonal Calendar at Ein Yar Village

Resource Mapping at Nang Thon Village

Group Discussions with Female Group on Natural Resource Management and Agriculture products at Nang Thon village

Attachment 15
Report on the Results of the Market Survey of the Agricultural Products

Report on the Market Survey

1. Objective

The JICA Project Expert Team carried out the Market Survey from May to July 2019, and November to December 2019 in order to grasp the market and livelihood development potentials for livelihood improvement options which can be introduced in the watershed.

Surveys for Identification of Potential Livelihood Improvement Options

Survey	Survey Items
Market Survey with Value-chain Analysis	■ Market Needs and Supply ■ Agricultural products in demand ■ Market trends and current value-chain of agricultural products

Source: JICA Project Expert Team for the Design Phase of Component 2 (2019)

2. Survey Methodology

2.1. Target

The Government data were collected from Department of Agriculture (DOA), Ministry of Agriculture, Livestock and Irrigation (MOALI) at Kalaw, Pinlaung, Yuwangan, Nyaug Shwe and Pindaya Township in Taunggyi District.

The market data were collected from villagers at Kon Ni, Pha Yar Pyu, Ain Ya, Nang Ton Villages in Kalaw Township which were selected as the target areas of Participatory Rural Appraisal (PRA) in the Project. Moreover, merchants, middle men and wholesalers, at the six main markets around Inle Lake, such as Aung Ban, Heho, Mine Thaunt, Nyaung Shwe, Shwe Nyaung, Than Daung were also targeted for market survey.

2.2. Timeline

May–August and November -December, 2019

2.3. Data Collection

The following data were collected as shown in the Table below.

Table 2-1 Collected data from the Government and six markets

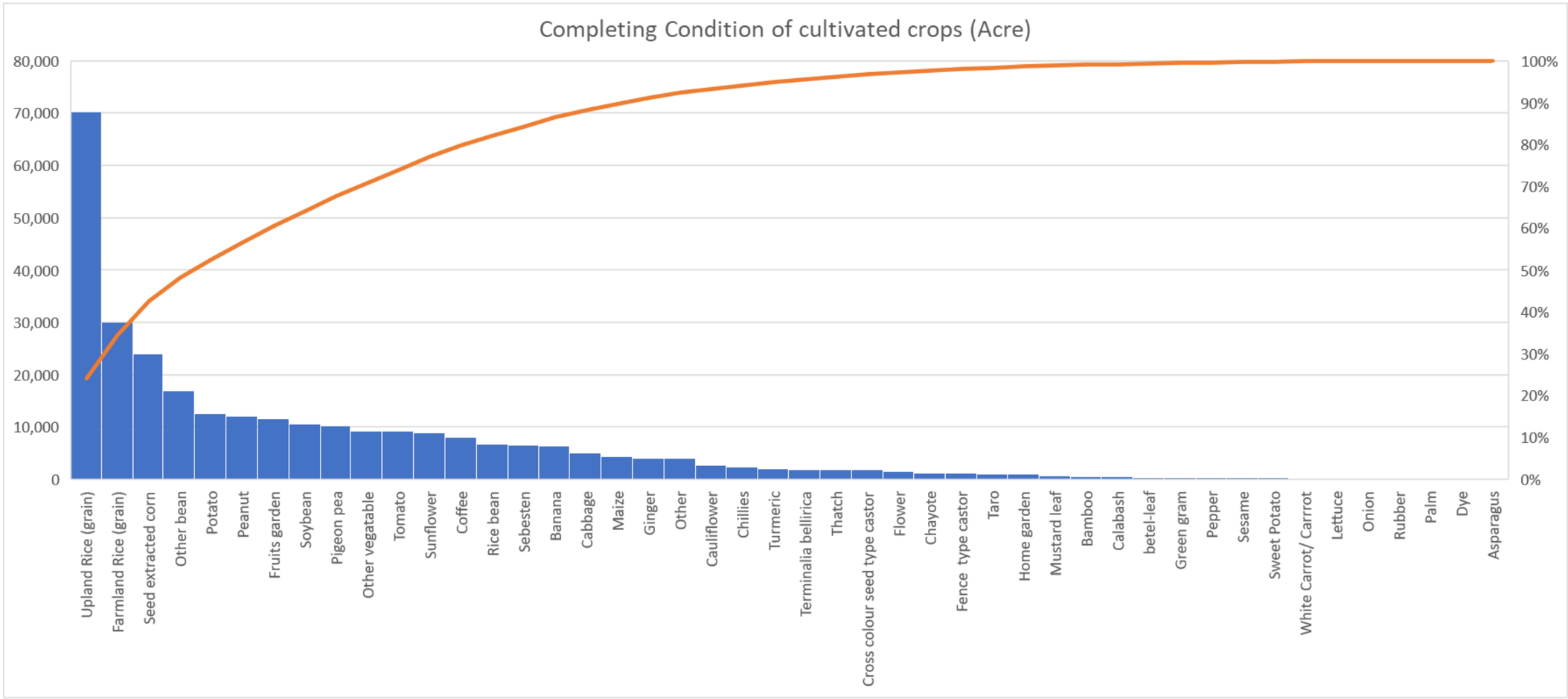
Item	Means of Data Collection	Contents
Secondary data collection	Collection of Government statistics	Unit price and original production location of staple food, meat, fruit, vegetables, wood, flower, trend of products.
Parimary data collection	Interview with agricultural producers and CF User Group	Main crops, income and expenditure for farming, market flow (relationships with middle men, wholesalers, and market merchants), technical assistance in farming practice, obstacle and needs etc.
	Interview with middle men	Main productions to deal in, market trend, income and expenditure for the intermediate, market flow, obstacle and needs etc.
	Interview with merchants at market	Main productions to deal in, market trend, income and expenditure, market flow, obstacle and needs etc.

Item	Means of Data Collection	Contents
	Interview with Government (DOA)	Main crops, market trend, market flow, technical assistance to villagers, corporation with others, obstacle and needs etc

2.4. Results of Market Survey

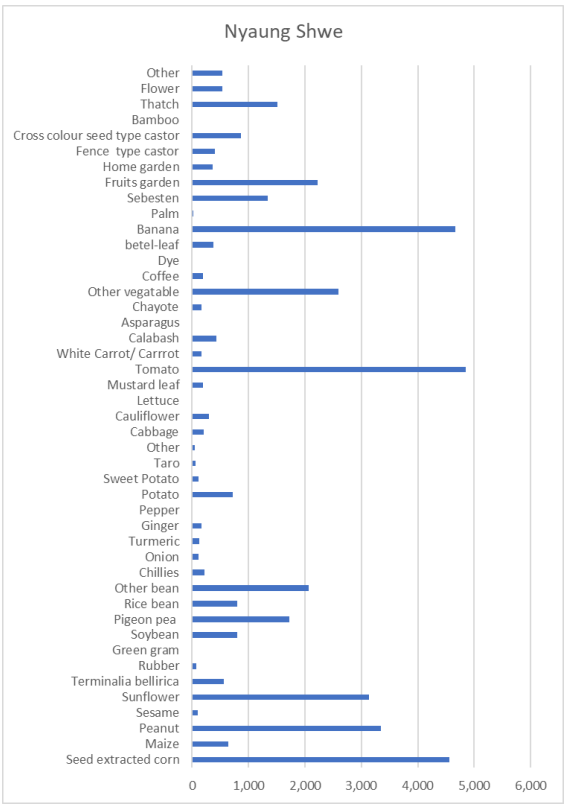
(1). Government Statistics

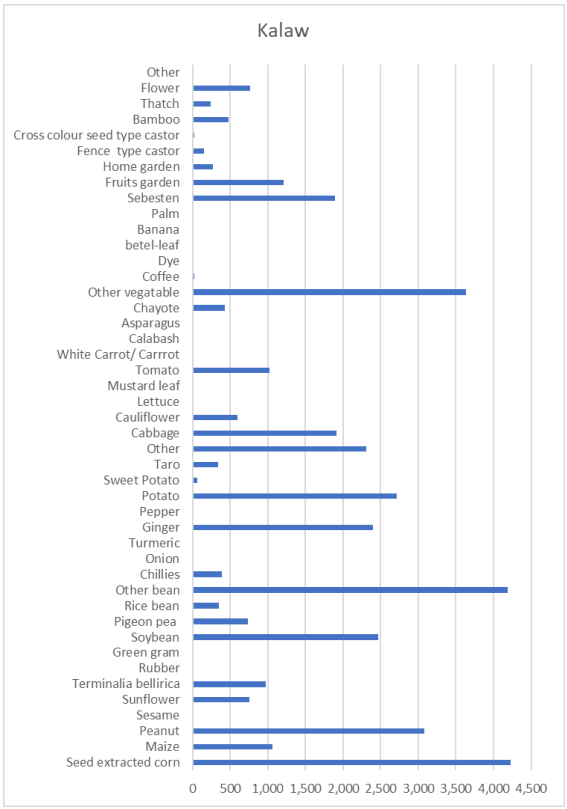
Statistic data for cultivated rainfed crops (cultivated acre) in Kalaw, Pinlaung and Yuwangan in 2017–2018 season and at Nyaug Shwe and Pindaya in 2018–2019 season were collected from DOA in MOALI. Please see Figure2-1, 2-2, 2-3 for the result. The largest areas are used for upland (non-irrigated) and farmland (irrigated) rice, followed by corns (maize), other beans, potatoes, fruits etc. There was the information gap between the result of interview and of statistics. While villagers and merchants cited that producing tomatoes and cabbages have been increased in the las a few years, the statistics data does not show it as market trend. Main results are presented as the following.

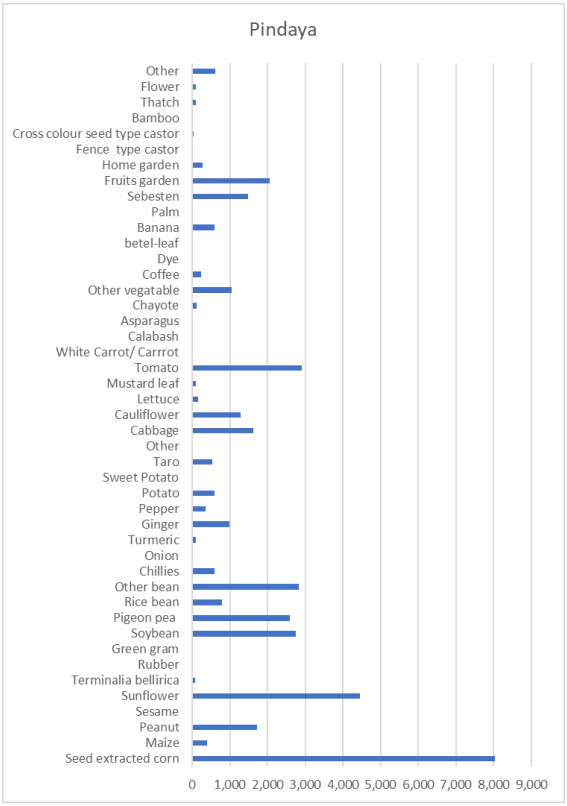


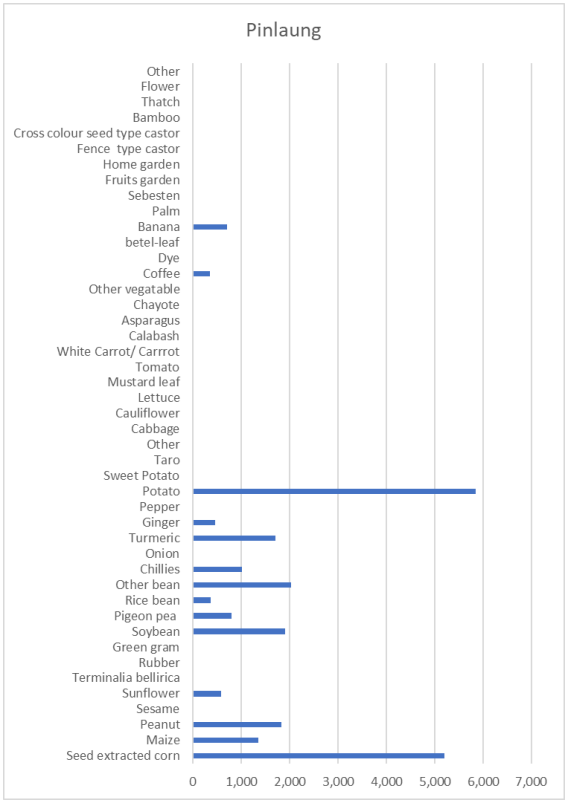
Source: Department of Agriculture, Ministry of Agriculture, Livestock, and Irrigation (MOALI) at Shan State

Figure 2-1 Area of cultivated Rainfed Crops (Cultivated Acre)

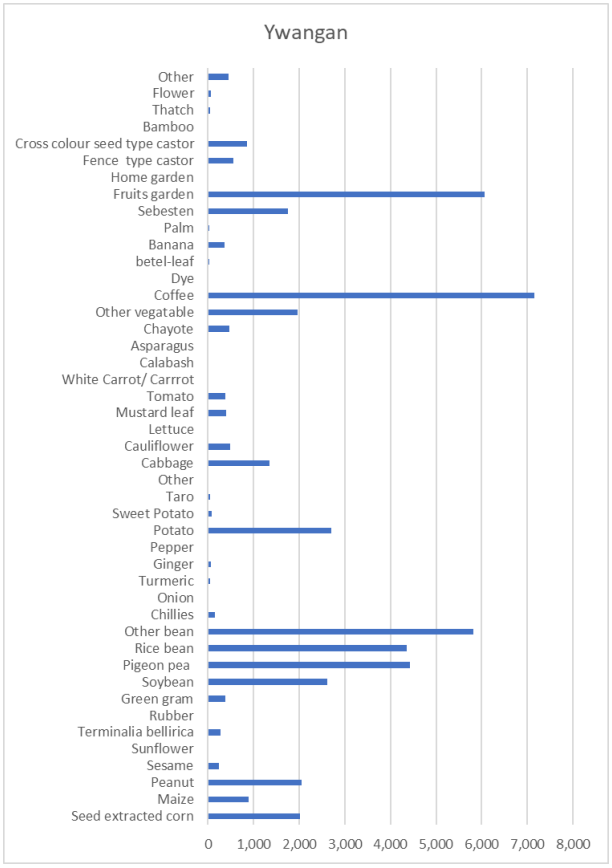








Source: Department of Agriculture, Ministry of Agriculture, Livestock, and Irrigation (MOALI) at Shan State



Source: Department of Agriculture, Ministry of Agriculture, Livestock, and Irrigation (MOALI) at Shan State

Figure 2-3 Area of Completing Condition of cultivated Rainfed Crops (Cultivated Acre)

(2). Market Price

Market survey was conducted at the main six (6) markets around Inle Lake, which are Aung Ban, Heho, Mine Thaunt, Nyaung Shwe, Shwe Nyaung, Than Daung.

Table 2-1 Market Price of Vegetables

Group: Vegetable

Market			Name																													
			Aspragus		Bamboo shoot		Basil leave		Bitter grout		Bitter Guar		Broccoli		Butter Bean		Cabbage		Carrot		Charyote leave		Chayote		Chayote leave		Chayote leaves		Chick Pea		Chilly pepper (hot)		Chinese Cabbage	
			bunch	Total	viss	Total	bunch	Total	viss	Total	viss	Total	no.	Total	can	Total	no.	Total	bunch	Total	bunch	Total	no.	Total	bunch	Total	bunch	Total	can	Total	viss	Total	viss	Total
Aung Ban	Mean	Unit price (MMK)	1,000	1,000	1,500	1,500			1,000	1,000					500	500	1,300	1,300	200	200									400	400	2,800	2,800		
	Minimum	Unit price (MMK)	1,000	1,000	1,500	1,500			1,000	1,000					500	500	1,300	1,300	200	200									400	400	2,800	2,800		
	Maximum	Unit price (MMK)	1,000	1,000	1,500	1,500			1,000	1,000					500	500	1,300	1,300	200	200									400	400	2,800	2,800		
	N	Unit price (MMK)	1	1	1	1			1	1					1	1	1	1	1	1									1	1	1	1		
Heho	Mean	Unit price (MMK)															1,200	1,200	300	300					350	350			400	400	3,000	3,000		
	Minimum	Unit price (MMK)															1,200	1,200	300	300					350	350			400	400	3,000	3,000		
	Maximum	Unit price (MMK)															1,200	1,200	300	300					350	350			400	400	3,000	3,000		
	N	Unit price (MMK)															1	1	1	1					1	1			1	1	1	1		
Mine Thaunt	Mean	Unit price (MMK)			2,000	2,000					1,200	1,200					500	500	300	300	300	300									2,000	2,000		
	Minimum	Unit price (MMK)			2,000	2,000					1,200	1,200					500	500	300	300	300	300									2,000	2,000		
	Maximum	Unit price (MMK)			2,000	2,000					1,200	1,200					500	500	300	300	300	300									2,000	2,000		
	N	Unit price (MMK)			1	1					1	1					1	1	1	1	1	1									1	1		
Nyaung Shwe	Mean	Unit price (MMK)			200	200	100	100	1,000	1,000					500	500	800	800	300	300									400	400	2,000	2,000	1,000	1,000
	Minimum	Unit price (MMK)			200	200	100	100	1,000	1,000					500	500	800	800	300	300									400	400	2,000	2,000	1,000	1,000
	Maximum	Unit price (MMK)			200	200	100	100	1,000	1,000					500	500	800	800	300	300									400	400	2,000	2,000	1,000	1,000
	N	Unit price (MMK)			1	1	1	1	1	1					1	1	1	1	1	1									1	1	1	1	1	1
Shwe Nyaung	Mean	Unit price (MMK)			2,000	2,000							200	200			1,200	1,200	300	300			200	200			300	300			3,000	3,000	800	800
	Minimum	Unit price (MMK)			2,000	2,000							200	200			1,200	1,200	300	300			200	200			300	300			3,000	3,000	800	800
	Maximum	Unit price (MMK)			2,000	2,000							200	200			1,200	1,200	300	300			200	200			300	300			3,000	3,000	800	800
	N	Unit price (MMK)			1	1							1	1			1	1	1	1			1	1			1	1			1	1	1	1
Than Daung	Mean	Unit price (MMK)			200	200			1,200	1,200							400	400	300	300											2,000	2,000		
	Minimum	Unit price (MMK)			200	200			1,200	1,200							400	400	300	300											2,000	2,000		
	Maximum	Unit price (MMK)			200	200			1,200	1,200							400	400	300	300											2,000	2,000		
	N	Unit price (MMK)			1	1			1	1							1	1	1	1											1	1		
Total	Mean	Unit price (MMK)	1,000	1,000	1,180	1,180	100	100	1,067	1,067	1,200	1,200	200	200	500	500	900	900	283	283	300	300	200	200	350	350	300	300	400	400	2,467	2,467	900	900
	Minimum	Unit price (MMK)	1,000	1,000	200	200	100	100	1,000	1,000	1,200	1,200	200	200	500	500	400	400	200	200	300	300	200	200	350	350	300	300	400	400	2,000	2,000	800	800
	Maximum	Unit price (MMK)	1,000	1,000	2,000	2,000	100	100	1,200	1,200	1,200	1,200	200	200	500	500	1,300	1,300	300	300	300	300	200	200	350	350	300	300	400	400	3,000	3,000	1,000	1,000
	N	Unit price (MMK)	1	1	5	5	1	1	3	3	1	1	1	1	2	2	6	6	6	6	1	1	1	1	1	1	1	1	3	3	6	6	2	2

Source: JICA Project Expert Team for the Design Phase of Component 2 (2019)

Group:	Vegetable																																
			Name																														
			Chive roots		Cow Pea		Cucumber		Culiflower		Cyhaote leaves		Egg plant		Garlic		Ginger		Gourd		Green bean		green cauliflower		Green pepper		Lady finger			Lentil		Lettuce	
Market			bunch	Total	can	Total	no.	Total	no.	Total	bunch	Total	viss	Total	viss	Total	viss	Total	no.	Total	viss	Total	no.	Total	viss	Total	bunch	viss	Total	viss	Total	bunch	Total
Aung Ban	Mean	Unit price (MMK)	250	250			350	350	300	300			800	800	1,600	1,600	2,300	2,300	500	500	1,000	1,000			3,000	3,000	200		200	3,500	3,500		
	Minimum	Unit price (MMK)	250	250			200	200	300	300			800	800	1,600	1,600	2,300	2,300	500	500	1,000	1,000			3,000	3,000	200		200	3,500	3,500		
	Maximum	Unit price (MMK)	250	250			500	500	300	300			800	800	1,600	1,600	2,300	2,300	500	500	1,000	1,000			3,000	3,000	200		200	3,500	3,500		
	N	Unit price (MMK)	1	1			2	2	1	1			1	1	1	1	1	1	1	1	1	1			1	1	1		1	1	1		
Heho	Mean	Unit price (MMK)	200	200			300	300	700	700			1,000	1,000	2,200	2,200	2,200	2,200	400	400	2,000	2,000			1,300	1,300	1,600		1,600				
	Minimum	Unit price (MMK)	200	200			300	300	700	700			1,000	1,000	2,200	2,200	2,200	2,200	400	400	2,000	2,000			1,300	1,300	1,600		1,600				
	Maximum	Unit price (MMK)	200	200			300	300	700	700			1,000	1,000	2,200	2,200	2,200	2,200	400	400	2,000	2,000			1,300	1,300	1,600		1,600				
	N	Unit price (MMK)	1	1			1	1	1	1			1	1	1	1	1	1	1	1	1	1			1	1	1		1				
Mine Thaunt	Mean	Unit price (MMK)					300	300	500	500			800	800	2,000	2,000	1,500	1,500	500	500					1,500	1,500		1,600	1,600				
	Minimum	Unit price (MMK)					300	300	500	500			800	800	2,000	2,000	1,500	1,500	500	500					1,500	1,500		1,600	1,600				
	Maximum	Unit price (MMK)					300	300	500	500			800	800	2,000	2,000	1,500	1,500	500	500					1,500	1,500		1,600	1,600				
	N	Unit price (MMK)					1	1	1	1			1	1	1	1	1	1	1	1					1	1		1	1				
Nyaung Shwe	Mean	Unit price (MMK)	800	800	300	300	200	200	1,000	1,000			800	800	4,000	4,000	2,000	2,000	500	500	1,600	1,600	700	700	2,000	2,000	200		200				
	Minimum	Unit price (MMK)	800	800	300	300	200	200	1,000	1,000			800	800	4,000	4,000	2,000	2,000	500	500	1,600	1,600	700	700	2,000	2,000	200		200				
	Maximum	Unit price (MMK)	800	800	300	300	200	200	1,000	1,000			800	800	4,000	4,000	2,000	2,000	500	500	1,600	1,600	700	700	2,000	2,000	200		200				
	N	Unit price (MMK)	1	1	1	1	1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1				
Shwe Nyaung	Mean	Unit price (MMK)					300	300	800	800			500	500	500	500	2,500	2,500	700	700	2,200	2,200			1,400	1,400	100		100			200	200
	Minimum	Unit price (MMK)					300	300	800	800			500	500	500	500	2,500	2,500	700	700	2,200	2,200			1,400	1,400	100		100			200	200
	Maximum	Unit price (MMK)					300	300	800	800			500	500	500	500	2,500	2,500	700	700	2,200	2,200			1,400	1,400	100		100			200	200
	N	Unit price (MMK)					1	1	1	1			1	1	1	1	1	1	1	1	1	1			1	1	1		1			1	1
Than Daung	Mean	Unit price (MMK)	1,000	1,000			100	100	300	300	300	300	1,200	1,200	1,500	1,500	2,500	2,500	400	400					1,200	1,200	200		200				
	Minimum	Unit price (MMK)	1,000	1,000			100	100	300	300	300	300	1,200	1,200	1,500	1,500	2,500	2,500	400	400					1,200	1,200	200		200				
	Maximum	Unit price (MMK)	1,000	1,000			100	100	300	300	300	300	1,200	1,200	1,500	1,500	2,500	2,500	400	400					1,200	1,200	200		200				
	N	Unit price (MMK)	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1					1	1	1		1				
Total	Mean	Unit price (MMK)	563	563	300	300	271	271	600	600	300	300	850	850	1,967	1,967	2,167	2,167	500	500	1,700	1,700	700	700	1,733	1,733	460	1,600	650	3,500	3,500	200	200
	Minimum	Unit price (MMK)	200	200	300	300	100	100	300	300	300	300	500	500	500	500	1,500	1,500	400	400	1,000	1,000	700	700	1,200	1,200	100	1,600	100	3,500	3,500	200	200
	Maximum	Unit price (MMK)	1,000	1,000	300	300	500	500	1,000	1,000	300	300	1,200	1,200	4,000	4,000	2,500	2,500	700	700	2,200	2,200	700	700	3,000	3,000	1,600	1,600	1,600	3,500	3,500	200	200
	N	Unit price (MMK)	4	4	1	1	7	7	6	6	1	1	6	6	6	6	6	6	6	6	4	4	1	1	6	6	5	1	6	1	1	1	1

Source: JICA Project Expert Team for the Design Phase of Component 2 (2019)

Group: Vegetable

Market			Name																																			
			Long bean			Luffa		Mustard leaf			Onion		Potato		Pumpkin		Red pepper		roselle		Snow pea		Sweet Potato		Tamrined Leaf		Taro		Tomato		Water Cress		Total						
			bunch	viss	Total	no.	Total	bunch	no.	Total	viss	Total	viss	Total	no.	Total	viss	Total	bunch	Total	viss	Total	viss	Total	can	Total	viss	Total	viss	Total	bunch	Total	bunch	can	no.	viss	Total
Aung Ban	Mean	Unit price (MMK)		1,500	1,500	200	200	250		250	800	800	1,000	1,000	1,000	1,000	2,800	2,800			2,500	2,500			100	100	600	600	1,600	1,600	100	100	333	333	625	1,724	1,097
	Minimum	Unit price (MMK)		1,500	1,500	200	200	250		250	800	800	800	800	800	800	2,800	2,800			2,500	2,500			100	100	600	600	1,600	1,600	100	100	100	100	200	600	100
	Maximum	Unit price (MMK)		1,500	1,500	200	200	250		250	800	800	1,200	1,200	1,200	1,200	2,800	2,800			2,500	2,500			100	100	600	600	1,600	1,600	100	100	1,000	500	1,300	3,500	3,500
	N	Unit price (MMK)		1	1	1	1	1		1	1	1	2	2	2	2	1	1			1	1			1	1	1	1	1	1	1	1	6	3	8	17	34
Heho	Mean	Unit price (MMK)		1,600	1,600	200	200				800	800	800	800	1,000	1,000													2,000	2,000	200	200	530	400	633	1,690	1,080
	Minimum	Unit price (MMK)		1,600	1,600	200	200				800	800	800	800	1,000	1,000													2,000	2,000	200	200	200	400	200	800	200
	Maximum	Unit price (MMK)		1,600	1,600	200	200				800	800	800	800	1,000	1,000													2,000	2,000	200	200	1,600	400	1,200	3,000	3,000
	N	Unit price (MMK)		1	1	1	1				1	1	1	1	1	1													1	1	1	1	5	1	6	10	22
Mine Thaunt	Mean	Unit price (MMK)		200	200						800	800	800	800	500	500													1,500	1,500	50	50	217		460	1,325	943
	Minimum	Unit price (MMK)		200	200						800	800	800	800	500	500													1,500	1,500	50	50	50		300	200	50
	Maximum	Unit price (MMK)		200	200						800	800	800	800	500	500													1,500	1,500	50	50	300		500	2,000	2,000
	N	Unit price (MMK)		1	1						1	1	1	1	1	1													1	1	1	1	3		5	12	20
Nyaung Shwe	Mean	Unit price (MMK)				150	150		300	300	3,200	3,200	2,800	2,800	300	300	1,200	1,200	100	100	4,000	4,000	1,200	1,200					1,000	1,000	100	100	267	400	494	1,867	1,086
	Minimum	Unit price (MMK)				150	150		300	300	3,200	3,200	2,800	2,800	300	300	1,200	1,200	100	100	4,000	4,000	1,200	1,200					1,000	1,000	100	100	100	300	150	200	100
	Maximum	Unit price (MMK)				150	150		300	300	3,200	3,200	2,800	2,800	300	300	1,200	1,200	100	100	4,000	4,000	1,200	1,200					1,000	1,000	100	100	800	500	1,000	4,000	4,000
	N	Unit price (MMK)				1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					1	1	1	1	6	3	8	15	32
Shwe Nyaung	Mean	Unit price (MMK)	300		300	200	200				800	800	1,000	1,000	1,000	1,000	2,000	2,000									600	600	1,500	1,500			240		575	1,446	946
	Minimum	Unit price (MMK)	300		300	200	200				800	800	1,000	1,000	1,000	1,000	2,000	2,000									600	600	1,500	1,500			100		200	500	100
	Maximum	Unit price (MMK)	300		300	200	200				800	800	1,000	1,000	1,000	1,000	2,000	2,000									600	600	1,500	1,500			300		1,200	3,000	3,000
	N	Unit price (MMK)	1		1	1	1				1	1	1	1	1	1	1	1									1	1	1	1			5		8	13	26
Than Daung	Mean	Unit price (MMK)	200		200	200	200	300		300	800	800	800	800									1,200	1,200					1,600	1,600			383		280	1,291	814
	Minimum	Unit price (MMK)	200		200	200	200	300		300	800	800	800	800									1,200	1,200					1,600	1,600			200		100	200	100
	Maximum	Unit price (MMK)	200		200	200	200	300		300	800	800	800	800									1,200	1,200					1,600	1,600			1,000		400	2,500	2,500
	N	Unit price (MMK)	1		1	1	1	1		1	1	1	1	1									1	1					1	1			6		5	11	22
Total	Mean	Unit price (MMK)	250	1,100	760	190	190	275	300	283	1,200	1,200	1,171	1,171	800	800	2,000	2,000	100	100	3,250	3,250	1,200	1,200	100	100	600	600	1,533	1,533	113	113	335	371	526	1,578	1,007
	Minimum	Unit price (MMK)	200	200	200	150	150	250	300	250	800	800	800	800	300	300	1,200	1,200	100	100	2,500	2,500	1,200	1,200	100	100	600	600	1,000	1,000	50	50	50	100	100	200	50
	Maximum	Unit price (MMK)	300	1,600	1,600	200	200	300	300	300	3,200	3,200	2,800	2,800	1,200	1,200	2,800	2,800	100	100	4,000	4,000	1,200	1,200	100	100	600	600	2,000	2,000	200	200	1,600	500	1,300	4,000	4,000
	N	Unit price (MMK)	2	3	5	5	5	2	1	3	6	6	7	7	6	6	3	3	1	1	2	2	2	2	1	1	2	2	6	6	4	4	31	7	40	78	156

Source: JICA Project Expert Team for the Design Phase of Component 2 (2019)

Table 2-2 Market Price of Fruit

Group: Fruit

Market			Name																									
			Apple		Asian Pear		Avocado		Banana		Coffee		Dragon fruit		Grape		grapes		Jackfruit		Juck Fruit		Lime		lychee		Mango		melon		Orange	
			Unit		Unit		Unit		Unit		Unit		Unit		Unit		Unit		Unit		Unit		Unit		Unit		Unit		Unit		Unit	
			no.	Total	no.	Total	no.	Total	bunch	Total	Pack	Total	no.	Total	viss	Total	viss	Total	no.	Total	no.	Total	no.	Total	Pack	Total	no.	Total	no.	Total	no.	Total
Aung Ban	Mean	Unit price (MMK)	675.000	675.000			500.000	500.000	1666.667	1666.667	3500.000	3500.000											100.000	100.000			666.667	666.667				
	Minimum	Unit price (MMK)	350.0	350.0			500.0	500.0	800.0	800.0	3500.0	3500.0											100.0	100.0			200.0	200.0				
	Maximum	Unit price (MMK)	1000.0	1000.0			500.0	500.0	3500.0	3500.0	3500.0	3500.0											100.0	100.0			1500.0	1500.0				
	N	Unit price (MMK)	2	2			1	1	6	6	1	1											1	1			3	3				
Heho	Mean	Unit price (MMK)							1650.000	1650.000	2700.000	2700.000											200.000	200.000			205.000	205.000				
	Minimum	Unit price (MMK)							800.0	800.0	2700.0	2700.0											200.0	200.0			160.0	160.0				
	Maximum	Unit price (MMK)							2500.0	2500.0	2700.0	2700.0											200.0	200.0			250.0	250.0				
	N	Unit price (MMK)							2	2	1	1											1	1			2	2				
Mine Thaunt	Mean	Unit price (MMK)	300.000	300.000			600.000	600.000													4000.000	4000.000	100.000	100.000			200.000	200.000				
	Minimum	Unit price (MMK)	300.0	300.0			600.0	600.0													4000.0	4000.0	100.0	100.0			200.0	200.0				
	Maximum	Unit price (MMK)	300.0	300.0			600.0	600.0													4000.0	4000.0	100.0	100.0			200.0	200.0				
	N	Unit price (MMK)	1	1			1	1													1	1	1	1			1	1				
Nyaung Shwe	Mean	Unit price (MMK)	833.333	833.333			750.000	750.000	750.000	750.000	2700.000	2700.000	2500.000	2500.000			5000.000	5000.000	500.000	500.000			150.000	150.000	300.000	300.000	500.000	500.000	800.000	800.000	300.000	300.000
	Minimum	Unit price (MMK)	500.0	500.0			500.0	500.0	500.0	500.0	2700.0	2700.0	2500.0	2500.0			4000.0	4000.0	500.0	500.0			150.0	150.0	300.0	300.0	400.0	400.0	800.0	800.0	300.0	300.0
	Maximum	Unit price (MMK)	1200.0	1200.0			1000.0	1000.0	1000.0	1000.0	2700.0	2700.0	2500.0	2500.0			6000.0	6000.0	500.0	500.0			150.0	150.0	300.0	300.0	600.0	600.0	800.0	800.0	300.0	300.0
	N	Unit price (MMK)	3	3			2	2	2	2	1	1	1	1			2	2	1	1			1	1	1	1	3	3	1	1	1	1
Shwe Nyaung	Mean	Unit price (MMK)	750.000	750.000	600.000	600.000	800.000	800.000	650.000	650.000					4000.000	4000.000							200.000	200.000			250.000	250.000			600.000	600.000
	Minimum	Unit price (MMK)	500.0	500.0	600.0	600.0	800.0	800.0	600.0	600.0					4000.0	4000.0							200.0	200.0			250.0	250.0			600.0	600.0
	Maximum	Unit price (MMK)	1000.0	1000.0	600.0	600.0	800.0	800.0	700.0	700.0					4000.0	4000.0							200.0	200.0			250.0	250.0			600.0	600.0
	N	Unit price (MMK)	2	2	1	1	1	1	2	2					1	1							1	1			2	2			1	1
Than Daung	Mean	Unit price (MMK)															6000.000	6000.000	2500.000	2500.000			100.000	100.000			300.000	300.000				
	Minimum	Unit price (MMK)															6000.0	6000.0	2500.0	2500.0			100.0	100.0			300.0	300.0				
	Maximum	Unit price (MMK)															6000.0	6000.0	2500.0	2500.0			100.0	100.0			300.0	300.0				
	N	Unit price (MMK)															1	1	1	1			1	1			1	1				
Total	Mean	Unit price (MMK)	706.250	706.250	600.000	600.000	680.000	680.000	1341.667	1341.667	2966.667	2966.667	2500.000	2500.000	4000.000	4000.000	5333.333	5333.333	1500.000	1500.000	4000.000	4000.000	141.667	141.667	300.000	300.000	409.167	409.167	800.000	800.000	450.000	450.000
	Minimum	Unit price (MMK)	300.0	300.0	600.0	600.0	500.0	500.0	500.0	500.0	2700.0	2700.0	2500.0	2500.0	4000.0	4000.0	4000.0	4000.0	500.0	500.0	4000.0	4000.0	100.0	100.0	300.0	300.0	160.0	160.0	800.0	800.0	300.0	300.0
	Maximum	Unit price (MMK)	1200.0	1200.0	600.0	600.0	1000.0	1000.0	3500.0	3500.0	3500.0	3500.0	2500.0	2500.0	4000.0	4000.0	6000.0	6000.0	2500.0	2500.0	4000.0	4000.0	200.0	200.0	300.0	300.0	1500.0	1500.0	800.0	800.0	600.0	600.0
	N	Unit price (MMK)	8	8	1	1	5	5	12	12	3	3	1	1	1	1	3	3	2	2	1	1	6	6	1	1	12	12	1	1	2	2

Source: JICA Project Expert Team for the Design Phase of Component 2 (2019)

Group:	Fruit																																			
			Name																																		
			Papaya		Pear		Pears (Chinese Pear)		Pineapple		Pulm		Rambutan		Sapodilla plum		Strawberry		Sunkist		Tea			Unshu mikan		Water mellon		Total									
			Unit		Unit		Unit		Unit		Unit		Unit		Unit		Unit		Unit		Unit			Unit		Unit		Unit									
	Market		no.	Total	no.	Total	no.	Total	no.	Total	no.	Total	no.	Total	no.	Total	Busket	Total	no.	Total	Pack	viss	Total	no.	Total	no.	Total	bunch	Busket	no.	Pack	viss	Total				
Aung Ban	Mean	Unit price (MMK)							1150.000	1150.000			150.000	150.000			2500.000	2500.000				5250.000	5250.000			3000.000	3000.000	1666.667	2500.000	854.545	3500.000	5250.000	2017.391				
	Minimum	Unit price (MMK)							800.0	800.0			150.0	150.0			2500.0	2500.0				2500.0	2500.0			3000.0	3000.0	800.0	2500.0	100.0	3500.0	2500.0	100.0				
	Maximum	Unit price (MMK)							1500.0	1500.0			150.0	150.0			2500.0	2500.0				8000.0	8000.0			3000.0	3000.0	3500.0	2500.0	3000.0	3500.0	8000.0	8000.0				
	N	Unit price (MMK)							2	2			1	1			1	1				4	4			1	1	6	1	11	1	4	23				
Heho	Mean	Unit price (MMK)							800.000	800.000			120.000	120.000			2000.000	2000.000				7000.000	7000.000					1650.000	2000.000	306.000	2700.000	7000.000	2544.167				
	Minimum	Unit price (MMK)							800.0	800.0			120.0	120.0			2000.0	2000.0				6000.0	6000.0					800.0	2000.0	120.0	2700.0	6000.0	120.0				
	Maximum	Unit price (MMK)							800.0	800.0			120.0	120.0			2000.0	2000.0				7500.0	7500.0					2500.0	2000.0	800.0	2700.0	7500.0	7500.0				
	N	Unit price (MMK)							1	1			1	1			1	1				3	3					2	1	5	1	3	12				
Mine Thaunt	Mean	Unit price (MMK)											200.000	200.000			2300.000	2300.000				4250.000	4250.000			1000.000	1000.000		2300.000	914.286		4250.000	1720.000				
	Minimum	Unit price (MMK)											200.0	200.0			2300.0	2300.0				2500.0	2500.0			1000.0	1000.0		2300.0	100.0		2500.0	100.0				
	Maximum	Unit price (MMK)											200.0	200.0			2300.0	2300.0				6000.0	6000.0			1000.0	1000.0		2300.0	4000.0		6000.0	6000.0				
	N	Unit price (MMK)											1	1			1	1				2	2			1	1		1	7		2	10				
Nyaung Shwe	Mean	Unit price (MMK)	900.000	900.000			1500.000	1500.000	1500.000	1500.000	50.000	50.000	120.000	120.000	20.000	20.000	2000.000	2000.000	8000.000	8000.000	700.000	6500.000	5050.000	120.000	120.000	1250.000	1250.000	750.000	2000.000	1056.667	1233.333	5900.000	1773.143				
	Minimum	Unit price (MMK)	800.0	800.0			1500.0	1500.0	1500.0	1500.0	50.0	50.0	120.0	120.0	20.0	20.0	2000.0	2000.0	8000.0	8000.0	700.0	5500.0	700.0	120.0	120.0	1000.0	1000.0	500.0	2000.0	20.0	300.0	4000.0	20.0				
	Maximum	Unit price (MMK)	1000.0	1000.0			1500.0	1500.0	1500.0	1500.0	50.0	50.0	120.0	120.0	20.0	20.0	2000.0	2000.0	8000.0	8000.0	700.0	7500.0	7500.0	120.0	120.0	1500.0	1500.0	1000.0	2000.0	8000.0	2700.0	7500.0	8000.0				
	N	Unit price (MMK)	2	2			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	4	1	1	2	2	2	1	24	3	5	35				
Shwe Nyaung	Mean	Unit price (MMK)			1500.000	1500.000			1000.000	1000.000												6250.000	6250.000			2500.000	2500.000	650.000		836.364		5800.000	2194.444				
	Minimum	Unit price (MMK)			1500.0	1500.0			1000.0	1000.0												4000.0	4000.0			2500.0	2500.0	600.0		200.0		4000.0	200.0				
	Maximum	Unit price (MMK)			1500.0	1500.0			1000.0	1000.0												8000.0	8000.0			2500.0	2500.0	700.0		2500.0		8000.0	8000.0				
	N	Unit price (MMK)			1	1			1	1												4	4			1	1	2		11		5	18				
Than Daung	Mean	Unit price (MMK)															2500.000	2500.000				4250.000	4250.000			500.000	500.000		2500.000	850.000		4833.333	2550.000				
	Minimum	Unit price (MMK)															2500.0	2500.0				2500.0	2500.0			500.0	500.0		2500.0	100.0		2500.0	100.0				
	Maximum	Unit price (MMK)															2500.0	2500.0				6000.0	6000.0			500.0	500.0		2500.0	2500.0		6000.0	6000.0				
	N	Unit price (MMK)															1	1				2	2			1	1		1	4		3	8				
Total	Mean	Unit price (MMK)	900.000	900.000	1500.000	1500.000	1500.000	1500.000	1120.000	1120.000	50.000	50.000	147.500	147.500	20.000	20.000	2260.000	2260.000	8000.000	8000.000	700.000	5750.000	5484.211	120.000	120.000	1583.333	1583.333	1341.667	2260.000	891.774	1980.000	5613.636	2038.585				
	Minimum	Unit price (MMK)	800.0	800.0	1500.0	1500.0	1500.0	1500.0	800.0	800.0	50.0	50.0	120.0	120.0	20.0	20.0	2000.0	2000.0	8000.0	8000.0	700.0	2500.0	700.0	120.0	120.0	500.0	500.0	500.0	2000.0	20.0	300.0	2500.0	20.0				
	Maximum	Unit price (MMK)	1000.0	1000.0	1500.0	1500.0	1500.0	1500.0	1500.0	1500.0	50.0	50.0	200.0	200.0	20.0	20.0	2500.0	2500.0	8000.0	8000.0	700.0	8000.0	8000.0	120.0	120.0	3000.0	3000.0	3500.0	2500.0	8000.0	3500.0	8000.0	8000.0				
	N	Unit price (MMK)	2	2	1	1	1	1	5	5	1	1	4	4	1	1	5	5	1	1	1	18	19	1	1	6	6	12	5	62	5	22	106				

Source: JICA Project Expert Team for the Design Phase of Component 2 (2019)

Table 2-3 Market Price of Fish

Group: Fish

Market			Name																													
			Barbus		Carp		Catfish		Eel		featherback		Prawn		Promfert		red-eye gudgeon		River cash fist		river catfish		Sardine fish		Seabass		smoked sccobranch catfish		Snakehead fish		Synanceia		Tilapia		Total	
			viss	Total	viss	Total	viss	Total	viss	Total	viss	Total	viss	Total	viss	Total	viss	Total	viss	Total	viss	Total	viss	Total	viss	Total	viss	Total	viss	Total	viss	Total	viss	Total
Aung Ban	Unit price (MMK)	Mean					8,000	8,000	6,000	6,000			15,000	15,000											8,000	8,000	7,000	7,000	8,000	8,000			2,500	2,500	7,786	7,786
		Minimum					8,000	8,000	6,000	6,000			15,000	15,000											8,000	8,000	7,000	7,000	8,000	8,000			2,500	2,500	2,500	2,500
		Maximum					8,000	8,000	6,000	6,000			15,000	15,000											8,000	8,000	7,000	7,000	8,000	8,000			2,500	2,500	15,000	15,000
		N					1	1	1	1			1	1											1	1	1	1	1	1			1	1	7	7
Heho	Unit price (MMK)	Mean							12,000	12,000	7,000	7,000															6,500	6,500	10,000	10,000					8,875	8,875
		Minimum							12,000	12,000	7,000	7,000															6,500	6,500	10,000	10,000					6,500	6,500
		Maximum							12,000	12,000	7,000	7,000															6,500	6,500	10,000	10,000					12,000	12,000
		N							1	1	1	1															1	1	1	1					4	4
Mine Thaunt	Unit price (MMK)	Mean			9,000	9,000			6,000	6,000	5,000	5,000																	9,000	9,000	3,000	3,000			6,400	6,400
		Minimum			9,000	9,000			6,000	6,000	5,000	5,000																	9,000	9,000	3,000	3,000			3,000	3,000
		Maximum			9,000	9,000			6,000	6,000	5,000	5,000																	9,000	9,000	3,000	3,000			9,000	9,000
		N			1	1			1	1	1	1																	1	1	1	1			5	5
Nyaung Shwe	Unit price (MMK)	Mean	4,000	4,000	12,000	12,000			8,000	8,000	6,000	6,000			3,500	3,500					6,000	6,000	6,000	6,000			6,000	6,000	10,000	10,000	2,500	2,500			6,400	6,400
		Minimum	4,000	4,000	12,000	12,000			8,000	8,000	6,000	6,000			3,500	3,500					6,000	6,000	6,000	6,000			6,000	6,000	10,000	10,000	2,500	2,500			2,500	2,500
		Maximum	4,000	4,000	12,000	12,000			8,000	8,000	6,000	6,000			3,500	3,500					6,000	6,000	6,000	6,000			6,000	6,000	10,000	10,000	2,500	2,500			12,000	12,000
		N	1	1	1	1			1	1	1	1			1	1					1	1	1	1			1	1	1	1	1	1			10	10
Shwe Nyaung	Unit price (MMK)	Mean					6,000	6,000											7,000	7,000					13,000	13,000	6,500	6,500	7,000	7,000					7,900	7,900
		Minimum					6,000	6,000											7,000	7,000					13,000	13,000	6,500	6,500	7,000	7,000					6,000	6,000
		Maximum					6,000	6,000											7,000	7,000					13,000	13,000	6,500	6,500	7,000	7,000					13,000	13,000
		N					1	1											1	1					1	1	1	1	1	1					5	5
Than Daung	Unit price (MMK)	Mean			5,000	5,000					8,000	8,000					8,000	8,000																	7,000	7,000
		Minimum			5,000	5,000					8,000	8,000					8,000	8,000																	5,000	5,000
		Maximum			5,000	5,000					8,000	8,000					8,000	8,000																	8,000	8,000
		N			1	1					1	1					1	1																	3	3
Total	Unit price (MMK)	Mean	4,000	4,000	8,667	8,667	7,000	7,000	8,000	8,000	6,500	6,500	15,000	15,000	3,500	3,500	8,000	8,000	7,000	7,000	6,000	6,000	6,000	6,000	10,500	10,500	6,500	6,500	8,800	8,800	2,750	2,750	2,500	2,500	7,250	7,250
		Minimum	4,000	4,000	5,000	5,000	6,000	6,000	6,000	6,000	5,000	5,000	15,000	15,000	3,500	3,500	8,000	8,000	7,000	7,000	6,000	6,000	6,000	6,000	8,000	8,000	6,000	6,000	7,000	7,000	2,500	2,500	2,500	2,500	2,500	2,500
		Maximum	4,000	4,000	12,000	12,000	8,000	8,000	12,000	12,000	8,000	8,000	15,000	15,000	3,500	3,500	8,000	8,000	7,000	7,000	6,000	6,000	6,000	6,000	13,000	13,000	7,000	7,000	10,000	10,000	3,000	3,000	2,500	2,500	15,000	15,000
		N	1	1	3	3	2	2	4	4	4	4	1	1	1	1	1	1	1	1	1	1	1	1	2	2	4	4	5	5	2	2	1	1	34	34

Source: JICA Project Expert Team for the Design Phase of Component 2 (2019)

Table 2-4 Market Price of Non Timber Forest Product (TNFP)

Group: NTFP

Market			Name											
			Honey		Mushroom		orchid				Total					
			bottle	Total	viss	Total	bunch	plant	pot	Total	bottle	bunch	plant	pot	viss	Total
Aung Ban	Unit price (MMK)	Mean	5,000	5,000	6,000	6,000	1,000		8,500	4,750	5,000	1,000		8,500	6,000	5,125
		Minimum	5,000	5,000	6,000	6,000	1,000		8,500	1,000	5,000	1,000		8,500	6,000	1,000
		Maximum	5,000	5,000	6,000	6,000	1,000		8,500	8,500	5,000	1,000		8,500	6,000	8,500
		N	1	1	1	1	1		1	2	1	1		1	1	4
Heho	Unit price (MMK)	Mean						1,000		1,000			1,000			1,000
		Minimum						1,000		1,000			1,000			1,000
		Maximum						1,000		1,000			1,000			1,000
		N						1		1			1			1
Mine Thaunt	Unit price (MMK)	Mean					1,000			1,000		1,000				1,000
		Minimum					1,000			1,000		1,000				1,000
		Maximum					1,000			1,000		1,000				1,000
		N					1			1		1				1
Nyaung Shwe	Unit price (MMK)	Mean	3,333	3,333			1,433			1,433	3,333	1,433				2,383
		Minimum	1,000	1,000			1,100			1,100	1,000	1,100				1,000
		Maximum	7,000	7,000			2,000			2,000	7,000	2,000				7,000
		N	3	3			3			3	3	3				6
Total	Unit price (MMK)	Mean	3,750	3,750	6,000	6,000	1,260	1,000	8,500	2,257	3,750	1,260	1,000	8,500	6,000	3,067
		Minimum	1,000	1,000	6,000	6,000	1,000	1,000	8,500	1,000	1,000	1,000	1,000	8,500	6,000	1,000
		Maximum	7,000	7,000	6,000	6,000	2,000	1,000	8,500	8,500	7,000	2,000	1,000	8,500	6,000	8,500
		N	4	4	1	1	5	1	1	7	4	5	1	1	1	12

Source: JICA Project Expert Team for the Design Phase of Component 2 (2019)

Table 12-5 Market Price of Meat

Group: Meat

Market			Name																			
			Beef		Chicken		Chiken		Duck		Egg		Mutton		Pork		Port		quail egg		Total		
			viss	Total	viss	Total	viss	Total	no.	Total	no.	Total	viss	Total	viss	Total	viss	Total	no.	Total	no.	viss	Total
Aung Ban	Unit price (MMK)	Mean	16,000	16,000	12,000	12,000	8,000	8,000			130	130	36,000	36,000	6,750	6,750	7,000	7,000			130	13,214	11,579
		Minimum	16,000	16,000	12,000	12,000	8,000	8,000			130	130	36,000	36,000	5,500	5,500	7,000	7,000			130	5,500	130
		Maximum	16,000	16,000	12,000	12,000	8,000	8,000			130	130	36,000	36,000	8,000	8,000	7,000	7,000			130	36,000	36,000
		N	1	1	1	1	1	1			1	1	1	1	2	2	1	1			1	7	8
Heho	Unit price (MMK)	Mean	12,000	12,000			7,000	7,000			120	120			7,000	7,000	8,000	8,000			120	8,200	6,853
		Minimum	12,000	12,000			7,000	7,000			120	120			6,000	6,000	8,000	8,000			120	6,000	120
		Maximum	12,000	12,000			7,000	7,000			120	120			8,000	8,000	8,000	8,000			120	12,000	12,000
		N	1	1			1	1			1	1			2	2	1	1			1	5	6
Mine Thaunt	Unit price (MMK)	Mean	16,000	16,000			6,000	6,000			120	120			7,000	7,000					120	9,667	7,280
		Minimum	16,000	16,000			6,000	6,000			120	120			7,000	7,000					120	6,000	120
		Maximum	16,000	16,000			6,000	6,000			120	120			7,000	7,000					120	16,000	16,000
		N	1	1			1	1			1	1			1	1					1	3	4
Nyaung Shwe	Unit price (MMK)	Mean	16,000	16,000	12,000	12,000	6,000	6,000			183	183	26,000	26,000	5,250	5,250	5,750	5,750	40	40	154	10,250	6,367
		Minimum	16,000	16,000	12,000	12,000	6,000	6,000			100	100	26,000	26,000	3,500	3,500	5,500	5,500	40	40	40	3,500	40
		Maximum	16,000	16,000	12,000	12,000	6,000	6,000			400	400	26,000	26,000	7,000	7,000	6,000	6,000	40	40	400	26,000	26,000
		N	1	1	1	1	1	1			4	4	1	1	2	2	2	2	1	1	5	8	13
Shwe Nyaung	Unit price (MMK)	Mean	16,000	16,000			7,500	7,500	3,000	3,000	130	130			6,000	6,000	7,000	7,000			1,565	8,500	6,519
		Minimum	16,000	16,000			7,500	7,500	3,000	3,000	130	130			5,000	5,000	7,000	7,000			130	5,000	130
		Maximum	16,000	16,000			7,500	7,500	3,000	3,000	130	130			7,000	7,000	7,000	7,000			3,000	16,000	16,000
		N	1	1			1	1	1	1	1	1			2	2	1	1			2	5	7
Than Daung	Unit price (MMK)	Mean	16,000	16,000			6,000	6,000			105	105			7,000	7,000					105	9,667	5,842
		Minimum	16,000	16,000			6,000	6,000			100	100			7,000	7,000					100	6,000	100
		Maximum	16,000	16,000			6,000	6,000			110	110			7,000	7,000					110	16,000	16,000
		N	1	1			1	1			2	2			1	1					2	3	5
Total	Unit price (MMK)	Mean	15,333	15,333	12,000	12,000	6,750	6,750	3,000	3,000	144	144	31,000	31,000	6,400	6,400	6,700	6,700	40	40	373	10,194	7,453
		Minimum	12,000	12,000	12,000	12,000	6,000	6,000	3,000	3,000	100	100	26,000	26,000	3,500	3,500	5,500	5,500	40	40	40	3,500	40
		Maximum	16,000	16,000	12,000	12,000	8,000	8,000	3,000	3,000	400	400	36,000	36,000	8,000	8,000	8,000	8,000	40	40	3,000	36,000	36,000
		N	6	6	2	2	6	6	1	1	10	10	2	2	10	10	5	5	1	1	12	31	43

Source: JICA Project Expert Team for the Design Phase of Component 2 (2019)

Table 2-6 Market Price of Basket

Group: Basket

Market			Name					
			Basket		Basket (Paline)		Total	
			no.	Total	no.	Total	no.	Total
Aung Ban	Unit price (MMK)	Mean	2,167	2,167	5,800	5,800	4,438	4,438
		Minimum	1,500	1,500	2,000	2,000	1,500	1,500
		Maximum	3,000	3,000	12,000	12,000	12,000	12,000
		N	3	3	5	5	8	8
Heho	Unit price (MMK)	Mean	3,550	3,550	6,875	6,875	5,767	5,767
		Minimum	1,600	1,600	2,000	2,000	1,600	1,600
		Maximum	5,500	5,500	12,500	12,500	12,500	12,500
		N	2	2	4	4	6	6
Nyaung Shwe	Unit price (MMK)	Mean	2,333	2,333	5,000	5,000	3,667	3,667
		Minimum	1,500	1,500	3,000	3,000	1,500	1,500
		Maximum	3,000	3,000	7,000	7,000	7,000	7,000
		N	3	3	3	3	6	6
Total	Unit price (MMK)	Mean	2,575	2,575	5,958	5,958	4,605	4,605
		Minimum	1,500	1,500	2,000	2,000	1,500	1,500
		Maximum	5,500	5,500	12,500	12,500	12,500	12,500
		N	8	8	12	12	20	20

Source: JICA Project Expert Team for the Design Phase of Component 2 (2019)

Table 2-7 Market Price of Flower

Group: Flower

Market			Name													
			Chrysanthemum			Galdiolus		Rose			Total					
			10 flowers	bunch	Total	bunch	Total	10 flowers	bunch	Total	10 flowers	bunch	Total			
Aung Ban	Unit price (MMK)	Mean		1,000	1,000				500	500		750	750			
		Minimum		1,000	1,000				500	500		500	500			
		Maximum		1,000	1,000				500	500		1,000	1,000			
		N		1	1				1	1		2	2			
Heho	Unit price (MMK)	Mean		350	350	1,200	1,200		500	500		683	683			
		Minimum		350	350	1,200	1,200		500	500		350	350			
		Maximum		350	350	1,200	1,200		500	500		1,200	1,200			
		N		1	1	1	1		1	1		3	3			
Mine Thaunt	Unit price (MMK)	Mean		500	500				800	800		650	650			
		Minimum		500	500				800	800		500	500			
		Maximum		500	500				800	800		800	800			
		N		1	1				1	1		2	2			
Nyaung Shwe	Unit price (MMK)	Mean	750		750			900		900	825		825			
		Minimum	500		500			800		800	500		500			
		Maximum	1,000		1,000			1,000		1,000	1,000		1,000			
		N	2		2			2		2	4		4			
Shwe Nyaung	Unit price (MMK)	Mean		500	500				300	300		433	433			
		Minimum		500	500				300	300		300	300			
		Maximum		500	500				300	300		500	500			
		N		2	2				1	1		3	3			
Than Daung	Unit price (MMK)	Mean		400	400				500	500		450	450			
		Minimum		400	400				500	500		400	400			
		Maximum		400	400				500	500		500	500			
		N		1	1				1	1		2	2			
Total	Unit price (MMK)	Mean	750	542	594	1,200	1,200	900	520	629	825	588	647			
		Minimum	500	350	350	1,200	1,200	800	300	300	500	300	300			
		Maximum	1,000	1,000	1,000	1,200	1,200	1,000	800	1,000	1,000	1,200	1,200			
		N	2	6	8	1	1	2	5	7	4	12	16			

Source: JICA Project Expert Team for the Design Phase of Component 2 (2019)

Table 2-8 Market Price of Staple food

Group: Staple food

Market			Name																	
			broken rice		Maize		Rice		Sorghum			Wheat		Total						
			Pyi	Total	bud	Total	Pyi	Total	can	viss	Total	viss	Total	bud	can	Pyi	viss	Total
Aung Ban	Unit price (MMK)	Mean	1,050	1,050	250	250	1,573	1,573		450	450	1,600	1,600	250		1,468	1,217	1,249
		Minimum	1,050	1,050	250	250	1,000	1,000		450	450	1,400	1,400	250		1,000	450	250
		Maximum	1,050	1,050	250	250	2,208	2,208		450	450	1,800	1,800	250		2,208	1,800	2,208
		N	1	1	1	1	4	4		1	1	2	2	1		5	3	9
Heho	Unit price (MMK)	Mean			175	175	1,637	1,637	100		100	1,625	1,625	175	100	1,637	1,625	1,189
		Minimum			150	150	1,000	1,000	100		100	1,500	1,500	150	100	1,000	1,500	100
		Maximum			200	200	2,290	2,290	100		100	1,750	1,750	200	100	2,290	1,750	2,290
		N			2	2	5	5	1		1	2	2	2	1	5	2	10
Mine Thaunt	Unit price (MMK)	Mean					1,588	1,588								1,588		1,588
		Minimum					1,125	1,125								1,125		1,125
		Maximum					2,050	2,050								2,050		2,050
		N					2	2								2		2
Nyaung Shwe	Unit price (MMK)	Mean			500	500	1,820	1,820				1,267	1,267	500		1,820	1,267	1,489
		Minimum			500	500	1,100	1,100				1,000	1,000	500		1,100	1,000	500
		Maximum			500	500	2,300	2,300				1,500	1,500	500		2,300	1,500	2,300
		N			1	1	5	5				3	3	1		5	3	9
Shwe Nyaung	Unit price (MMK)	Mean	1,000	1,000	200	200	1,626	1,626	100		100	1,600	1,600	200	100	1,501	1,600	1,223
		Minimum	1,000	1,000	200	200	1,250	1,250	100		100	1,400	1,400	200	100	1,000	1,400	100
		Maximum	1,000	1,000	200	200	2,290	2,290	100		100	1,800	1,800	200	100	2,290	1,800	2,290
		N	1	1	1	1	4	4	1		1	2	2	1	1	5	2	9
Than Daung	Unit price (MMK)	Mean			70	70								70				70
		Minimum			70	70								70				70
		Maximum			70	70								70				70
		N			1	1								1				1
Total	Unit price (MMK)	Mean	1,025	1,025	228	228	1,663	1,663	100	450	217	1,494	1,494	228	100	1,605	1,390	1,269
		Minimum	1,000	1,000	70	70	1,000	1,000	100	450	100	1,000	1,000	70	100	1,000	450	70
		Maximum	1,050	1,050	500	500	2,300	2,300	100	450	450	1,800	1,800	500	100	2,300	1,800	2,300
		N	2	2	6	6	20	20	2	1	3	9	9	6	2	22	10	40

Source: JICA Project Expert Team for the Design Phase of Component 2 (2019)

Table 2-9 Market Price of Wood

Group: Wood

Market			Name																			
			Bamboo		Chacoal		Firewood		Plywood		Tanaka		Timber		Tumaric Powder		Total						
			no.	Total	Sac	Total	bunch	Total	flat piece	Total	no.	Total	ton	Total	viss	Total	bunch	flat piece	no.	Sac	ton	viss	Total
Aung Ban	Unit price (MMK)	Mean	1,100	1,100	3,500	3,500	1,000	1,000	14,333	14,333			797,500	797,500	5,000	5,000	1,000	14,333	1,100	3,500	797,500	5,000	249,677
		Minimum	500	500	3,500	3,500	1,000	1,000	7,500	7,500			780,000	780,000	5,000	5,000	1,000	7,500	500	3,500	780,000	5,000	500
		Maximum	2,000	2,000	3,500	3,500	1,000	1,000	22,000	22,000			850,000	850,000	5,000	5,000	1,000	22,000	2,000	3,500	850,000	5,000	850,000
		N	3	3	1	1	1	1	3	3			4	4	1	1	1	3	3	1	4	1	13
Heho	Unit price (MMK)	Mean			3,000	3,000			14,900	14,900								14,900		3,000			11,925
		Minimum			3,000	3,000			8,000	8,000								8,000		3,000			3,000
		Maximum			3,000	3,000			22,500	22,500								22,500		3,000			22,500
		N			1	1			3	3								3		1			4
Mine Thaunt	Unit price (MMK)	Mean									3,500	3,500	780,000	780,000					3,500		780,000		521,167
		Minimum									3,500	3,500	780,000	780,000					3,500		780,000		3,500
		Maximum									3,500	3,500	780,000	780,000					3,500		780,000		780,000
		N									1	1	2	2					1		2		3
Nyaung Shwe	Unit price (MMK)	Mean	2,500	2,500	6,500	6,500			13,233	13,233			815,000	815,000				13,233	2,500	6,500	815,000		187,078
		Minimum	1,500	1,500	6,500	6,500			8,500	8,500			780,000	780,000				8,500	1,500	6,500	780,000		1,500
		Maximum	3,500	3,500	6,500	6,500			19,500	19,500			850,000	850,000				19,500	3,500	6,500	850,000		850,000
		N	3	3	1	1			3	3			2	2				3	3	1	2		9
Shwe Nyaung	Unit price (MMK)	Mean	1,833	1,833	3,500	3,500			14,833	14,833								14,833	1,833	3,500			7,643
		Minimum	1,000	1,000	3,500	3,500			7,500	7,500								7,500	1,000	3,500			1,000
		Maximum	3,000	3,000	3,500	3,500			23,000	23,000								23,000	3,000	3,500			23,000
		N	3	3	1	1			3	3								3	3	1			7
Than Daung	Unit price (MMK)	Mean									2,000	2,000							2,000				2,000
		Minimum									2,000	2,000							2,000				2,000
		Maximum									2,000	2,000							2,000				2,000
		N									1	1							1				1
Total	Unit price (MMK)	Mean	1,811	1,811	4,125	4,125	1,000	1,000	14,325	14,325	2,750	2,750	797,500	797,500	5,000	5,000	1,000	14,325	1,982	4,125	797,500	5,000	178,276
		Minimum	500	500	3,000	3,000	1,000	1,000	7,500	7,500	2,000	2,000	780,000	780,000	5,000	5,000	1,000	7,500	500	3,000	780,000	5,000	500
		Maximum	3,500	3,500	6,500	6,500	1,000	1,000	23,000	23,000	3,500	3,500	850,000	850,000	5,000	5,000	1,000	23,000	3,500	6,500	850,000	5,000	850,000
		N	9	9	4	4	1	1	12	12	2	2	8	8	1	1	1	12	11	4	8	1	37

Source: JICA Project Expert Team for the Design Phase of Component 2 (2019)

(3). Market Trend of Main Agricultural Products

Aungban market was targeted for market trend survey, as it is the main market in the Inle lake watershed. The agricultural producers in Kon Ni, Pha Yar Pyu, Ain Yar and Nang Ton villages are interviewed by means of Participatory Rural Appraisal (PRA). In addition, middlemen and the merchants in Aungban market who deal in agricultural products were interviewed in June, November and December 2019 by JICA Project Team. The survey result is stated as below.

1). Overview of Market Chain

According to the interview with targeted merchants, middlemen and villagers, the middlemen from Aungban contact to the villagers when they want to buy agricultural productions. The middlemen have the contact number of the village leaders and agricultural producers who regularly sell the crops in huge amount.

It seems that there are two types of middlemen in Aungban market. The first type of middlemen can be described that they buy ginger one viss 2,000 kyat and sell to other places 2,100 kyat. These types of middlemen only buy small amount in general. Therefore only a few producers tend to go to use the first type of middlemen.

The second type of middlemen can be outlined that they have strong relationship with more significant middlemen in Mandalay and Yangon. They even export to foreign country such as Bangladesh, Thai, and China through middlemen in Yangon and Mandalay. A ginger's middleman in Aungban cited that 200 Ton of ginger from Kalaw, Aungban area including Kone Ni and Ein Yar will be exported to Bangladesh in 2019. The second type of middlemen do not buy and sell the agricultural products in different price. They buy the products from the villagers and sell to the middlemen in Yangon and Mandalay with the same price. When selling with the higher price, the middleman takes service fees 8% from the producers. For instance, they would take 8,000 kyat from the producers when the producers get 100,000 Kyat. Before the middlemen contact to producers to bring their products, they have connection with the middlemen in Yangon and Mandalay. After the producers had brought their product, middlemen in Aungban sent all of the product to Yangon or Mandalay at the same day. They only ask the villagers to bring the amount at the preference of producers. 80% of the villagers rely on the second type of middlemen. Middlemen from Aungban do not need to pay transportation charge. Transportation cost from Aungban Market to Yangon or Mandalay is paid by middlemen from Yangon, Mandalay and around Myanmar.

The market chain of the main agricultural products is summarized as below.

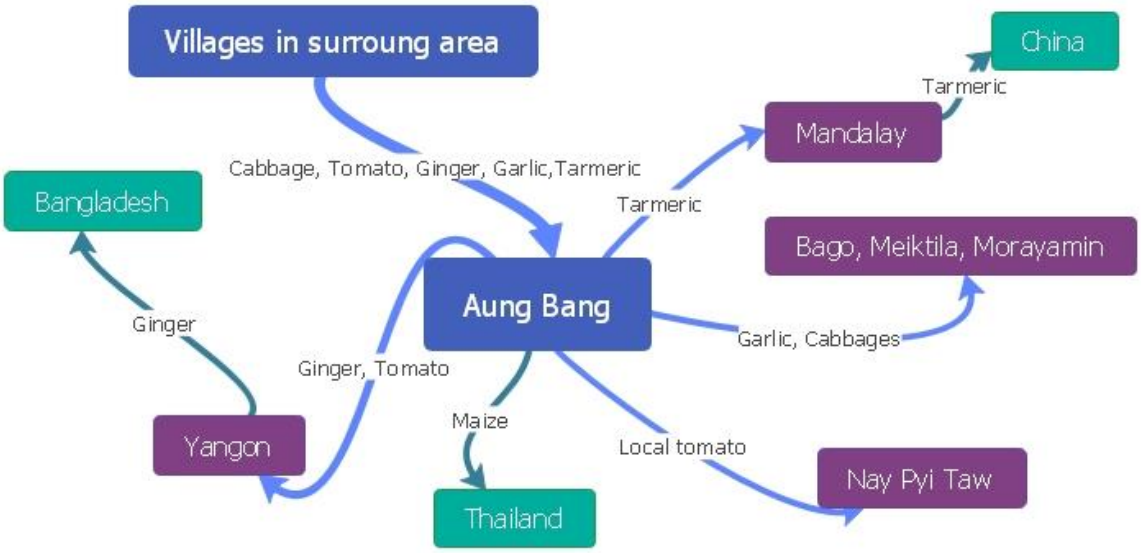


Figure 2-4 Market Chain of Main Agricultural Products

2). Market Flow by Agricultural Products

Cabbage: There are Chinese cabbages and Cabbages sold in the market. They are mainly sold to Meiktila and Bago in the dry zone.

Garlic: They are sold to Bago and Morayamin.

Ginger: According to the shops, gingers are sold mainly to Bangladesh these days. Traders come from Yangon and they sell ginger to Bangladesh. Bangladesh market started three years ago. Amount of ginger exported from southern Shan is 10 million viss per year. Amount of ginger exported from Myanmar to Bangladesh is 30 million viss per year. There are about 50 shops who deal with gingers. There is no connection and meetings between the shops. French people came to promote production of organic ginger. But farmers refused because they felt it was tedious.

Maize: Previously main customers for maize was China. But, because the Chinese market has been recently closed for Myanmar, maize is sold to Thailand. In Thailand they are used for food for CP chicken.

Turmeric: Turmeric is sold to Mandalay's traders who sell them to China. There are a few such traders in Mandalay. At Aung Bang market, there are 4~5 shops who deal with Turmeric.

Tomato (Local) : Traders come to Aung Bang from NPT. There are 4-5 traders. There is enough demand for local tomato and it has been so for a long time. In June, four trucks of 2 tons capacity go to NPT. They grow well in the lowland paddy area (Lae). They are mainly produced in Pin Lang and Pindaya townships near Kalaw.

Tomato (Exotic) : Tomatoes are sold all over the country such as Mandalay, Yangon, Lasho, Morayamin, Mon etc. The shop manager knows 200–300 traders in the country and communicates to sell the products directly. No trading and shop organizations exist.

3). Market Transaction Price

The following table shows the market transaction price of main agricultural products as a result of interview with merchants at Aung Ban market, middlemen and agricultural producers who are in the market chine to Aung Ban market.

Table 2-10 Market Price at Aung Bang Market

Item	Buying price from farmers	Selling price to traders	Selling to:	Re-selling to	Remarks
Chinese cabbage	700 kyat per viss.	800 kyat per viss.	Meiktila, Bago in the dry zone.	Nil	
Cabbage	700 kyat per viss.	800 kyat per viss.	Meiktila, Bago in the dry zone.	Nil	
Ginger	2000 kyat per viss.	2100 kyat per viss.	Yangon	Bangladesh market	· There are about 50 shops who deal with gingers. Most of the shops are small. · There is no connection and meetings between the shops. · Before they were exported to India and China.
Turmeric (Ukon)	1800 kyat per viss. 1900 kyat per viss.	1900 kyat per viss.	Mandalay	China	· There are a few such traders in Mandalay. · There are 4~5 shops who deal with Turmeric. · The amount of Turmeric is 200 ton per month from Aung Bang.
Maize	380 kyat per viss.	400 kyat per viss.		Thailand	· In Thailand they are used for food for CP chicken.
Tomato (exotic)	1300 kyat for the large size and 800-900 for the small size per viss.	1200 and 750 for large and small	Mandalay, Yangon, Lasho, Morayamin, Mon etc.	Nil	· The shop manager knows 200–300 traders in the country. · In June, 10 trucks bring tomatoes form this shop. 30-40 baskets (30–40 m3) are carried by one truck. · There are 4~5 shops in Aung Bang.
Tomato (local)	930 kyat per viss this year.	1,000	Nay Pyi Taw and Minchan.	Nil	· Middle men, wholesalers, in Aungban charges 7%. from the farmer · It was 600-700 kyat in 2018 and 1700 kyat in 2016–2017. · There is enough demand. · They grow well in the lowland paddy area (Lae). · They are mainly produced in Pin Lang and Pindaya.
Garlic	3000 kyat for large size and 900-1000 for small per viss.	3100 to 3200 kyatfor large 1100-1200 for small pervis	Bago and Morayamin.	Nil	· Prices are not stable. · They are not exported. ·

Source: JICA Project Expert Team for the Design Phase of Component 2 (2019)

3. Challenge and Way Forward

Through the survey, some challenges are identified. The challenges and the way forward are presented as below.

(1). Limitation of Data Available

In the Government statistical data, the agricultural lands were mainly used for upland and irrigated rice, corn and beans. But it seems recently tomato and ginger are becoming main products in the area and large lands have been used for those products. Also, as one of the newly introduced fruits, dragon fruit, was not even recorded in the data. In the future, it is important to conduct the field survey to grasp the latest situation. Furthermore, there was limitation in statistical data on the main six markets. It would be essential if those market surveys are conducted in the near future by Government.

(2). Fluctuation of Market Demand

Based on the field interview at Aungban, which is the largest market in Inle watershed, the demand for tomato and cabbage was very high domestically. Ginger, turmeric and maize were traded internationally to Bangladesh, China and Thailand, respectively. Before, ginger was exported to China but now the Chinese market is closed, and they are exported to mainly Bangladesh. As such, the international market demand is too fluctuated for merchants, middlemen and agricultural producers to predict the market trend.

(3). Weak Bargaining Power of Agricultural Producers

One of the main problems for the villagers is the unstable price. There is not famers' associations such as a cooperative and they are negotiating with traders individually. This should be one of the causes of the unstable prices for their crops. The price of mains crops is decided by the middleman coming from Yangon and Mandalay. Even the middleman in Aungban can not decide, as the price of the mains crops totally depends on export market and market in Yangon and Mandalay. In order to strengthen the negotiation and improve the current condition of the prices, one of recommendations would be to establish a farmers' association.

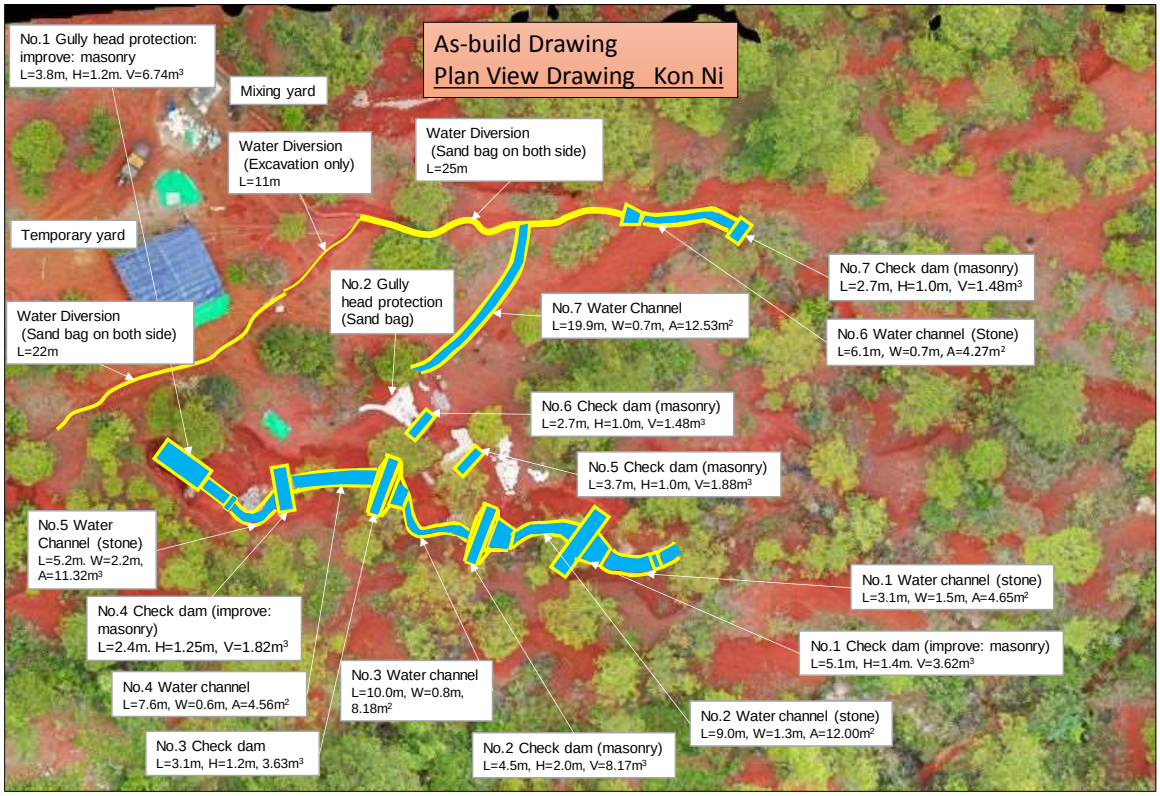
(4). Lack of Standardization of the Products for Selling

The price of the main crops is different by size, shape and weight. Most of the middlemen prefer the farmers to cultivate the foreign seed which can produce much bigger size, better shape and more weight and also last longer. According to the interview with farmers, middlemen and merchants at market, although the farmers mentioned that there are 4 different level (different price by size, shape and weigh), middlemen described that they send to Yangon and Mandalay market only in 2 different levels. The middlemen often mixed the levels and send to Yangon and Mandalay. One middleman mentioned that they even mix the ginger from Aungban and ginger from China, and then send it to Bangladesh, as Bangladesh prefer to buy only Myanmar ginger.

Attachment 16
Reports on the Results of Final Inspection of Soil Erosion Control Work

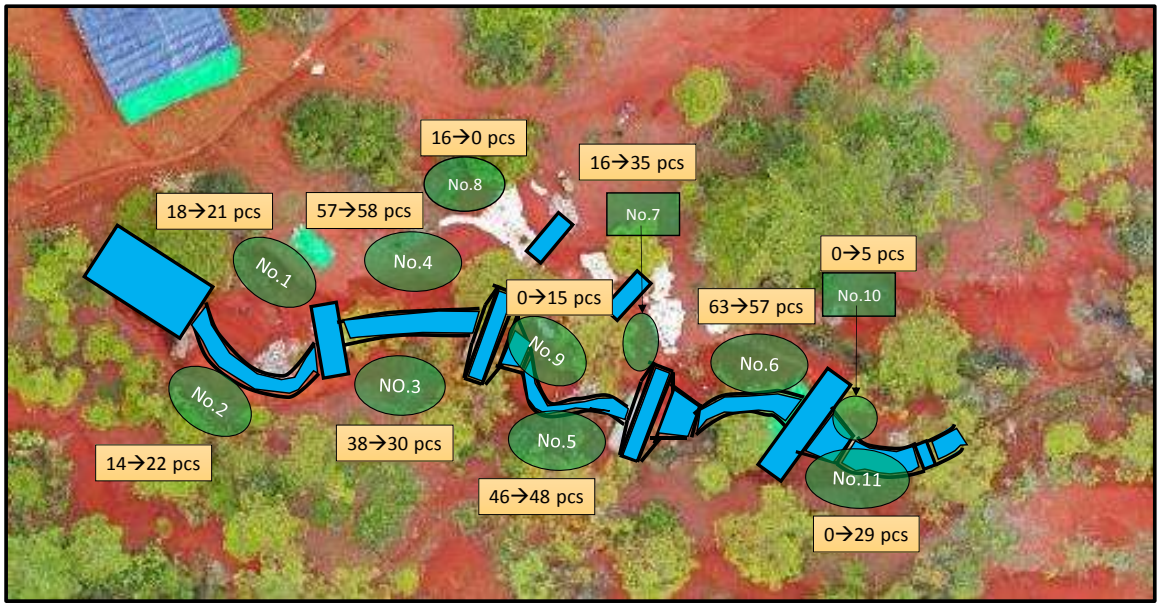
1. Outline of erosion control construction

The pilot activity of countermeasures to control the gully is composed with mechanical and biological countermeasure. The mechanical countermeasure is civil engineering construction of water channel, check dam, gully head protection, and water diversion channel. The biological measure is grass planting on the gully slopes. The distributions of structures of the mechanical and biological countermeasures are shown below.



Source: JICA Expert Team

Figure 1 Plan View Drawing (as-build) of the Erosion Control Construction (Pilot Activity at Kon Ni Village)



Source: JICA Expert Team

Figure 2 Plan View Drawing (as-build) of Grass planting (Pilot Activity at Kon Ni Village)

2. Quantity of construction

The constructed structures are listed below.

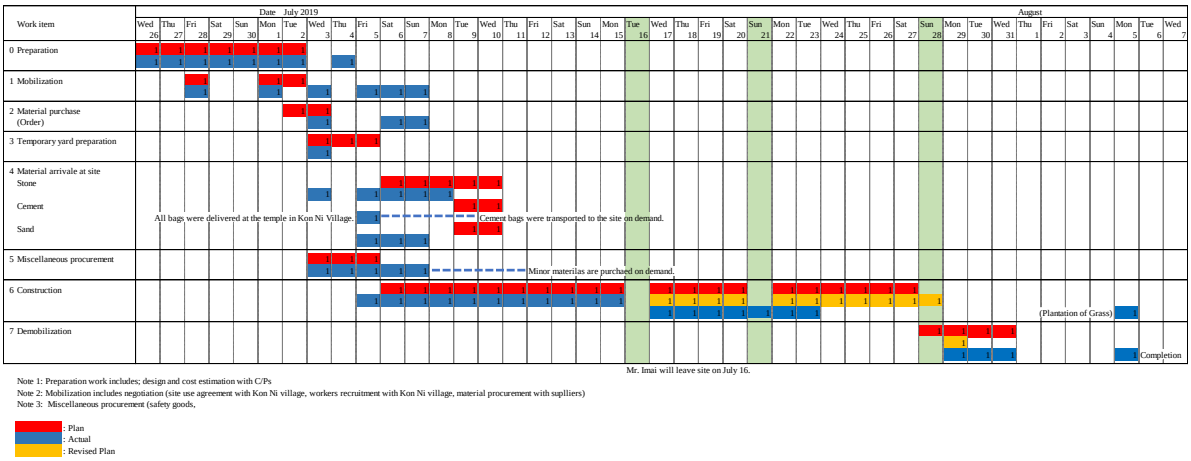
Table 1 List of Structures

Item	L (m)	H (m)	V (m3)	W (m)	A (m2)	Remarks
No.1 Check Dam	5.1	1.4	3.62			Improve, H: average
No.2 Check Dam	4.5	2.0	8.17			
No.3 Check Dam	3.1	1.2	3.63			
No.4 Check Dam	2.4	1.3	1.82			Improve, H: average
No.5 Check Dam	3.7	1.0	1.88			
No.6 Check Dam	2.7	1.0	1.48			
No.7 Check Dam	2.7	1.0	1.48			
No.1 Gully Head Protection			6.74			Include apron and girdle
No.1 Water Channel	3.1	0.2	0.70	1.50	4.65	
No.2 Water Channel	9.0	0.2	1.80	1.3	12.00	
No.3 Water Channel	10.0	0.2	1.23	0.8	8.18	
No.4 Water Channel	7.6	0.2	0.68	0.6	4.56	
No.5 Water Channel	5.2	0.2	1.70	2.2	11.32	
No.6 Water Channel	6.1	0.2	0.64	0.7	4.27	
No.7 Water Channel	17.9	0.2	1.88	0.7	12.53	
Water diversion chanle	25.0					Both side covered by sand bags
Water diversion chanle	22.0					One side covered by sand bags
Water diversion chanle	11.0					No sand bags

Source: JICA Expert Team

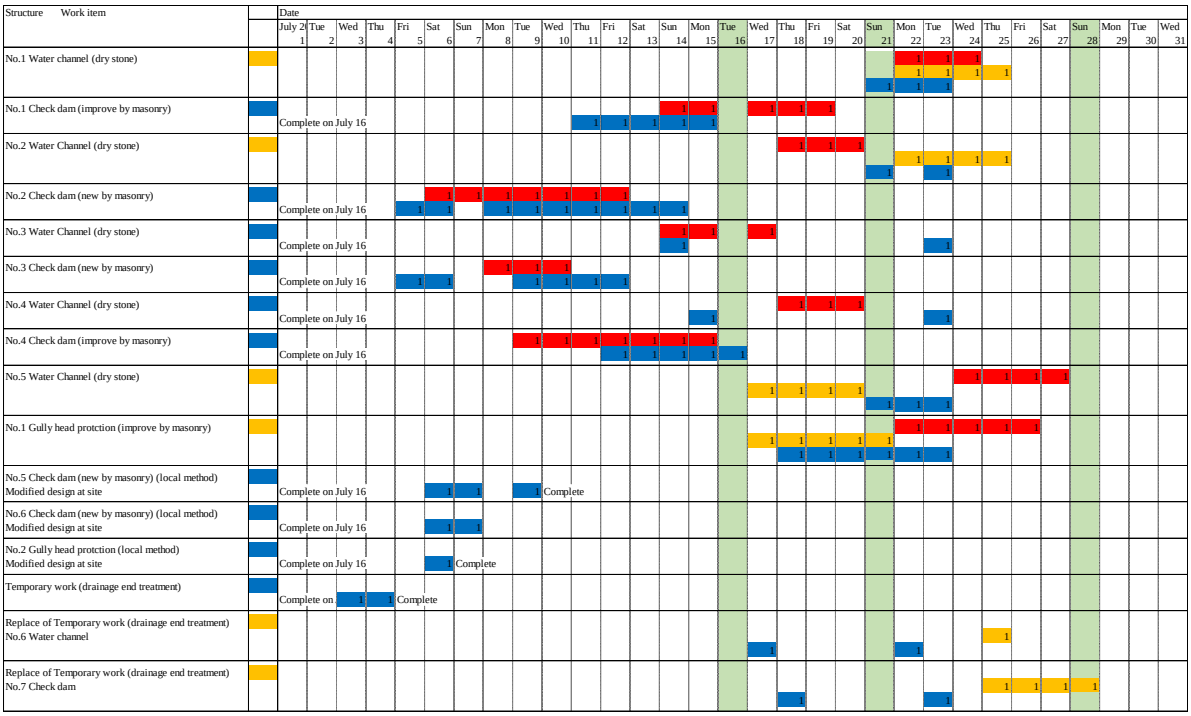
3. Construction schedule

The construction started on 26 June, 2019 and end on 5 August, 2019. The construction schedule is sown below.



Source: JICA Expert Team

Figure 2 Construction Schedule (Pilot Activity)



Source: JICA Expert Team

Figure 3 Structure-wise Construction Schedule (Pilot Activity)

4. Construction cost

The direct construction cost was 5,311,900 MMK totally. It is composed with 1) material cost, 2) labor cost, 3) machine cost, 4) safety cost, and 5) others.

1) Labor cost: Cost for skilled worker and general worker

2) Material cost: cost for i) stone, ii) sand, iii) cement, vi) PVC pipe, and v) grass

3) Machin cost: rental fee of cement mixer, fuel, oil, etc.

4) Safety cost: cost for helmet and grove for workers and helmet supervisor and visitors

5) Others: cost for waterproof sheet, sand bag, and the other miscellaneous material

6) Management fee such supervision/ management is excluded.

The labor cost is about 2.3 million kyat equivalent to about 43% of total direct cost, followed by the material cost, machine cost. The table below shows all direct cost for the construction includes grass planting work.

Table 2 Cost of Construction (Pilot Activity)

Classification	Amount (MMK)	Ratio (%)
Labor	2,301,000	43.3
Material	1,783,700	33.6
Machine	699,500	13.2
Safety	132,000	2.5
Others	395,700	7.4
Total	5,311,900	100.0

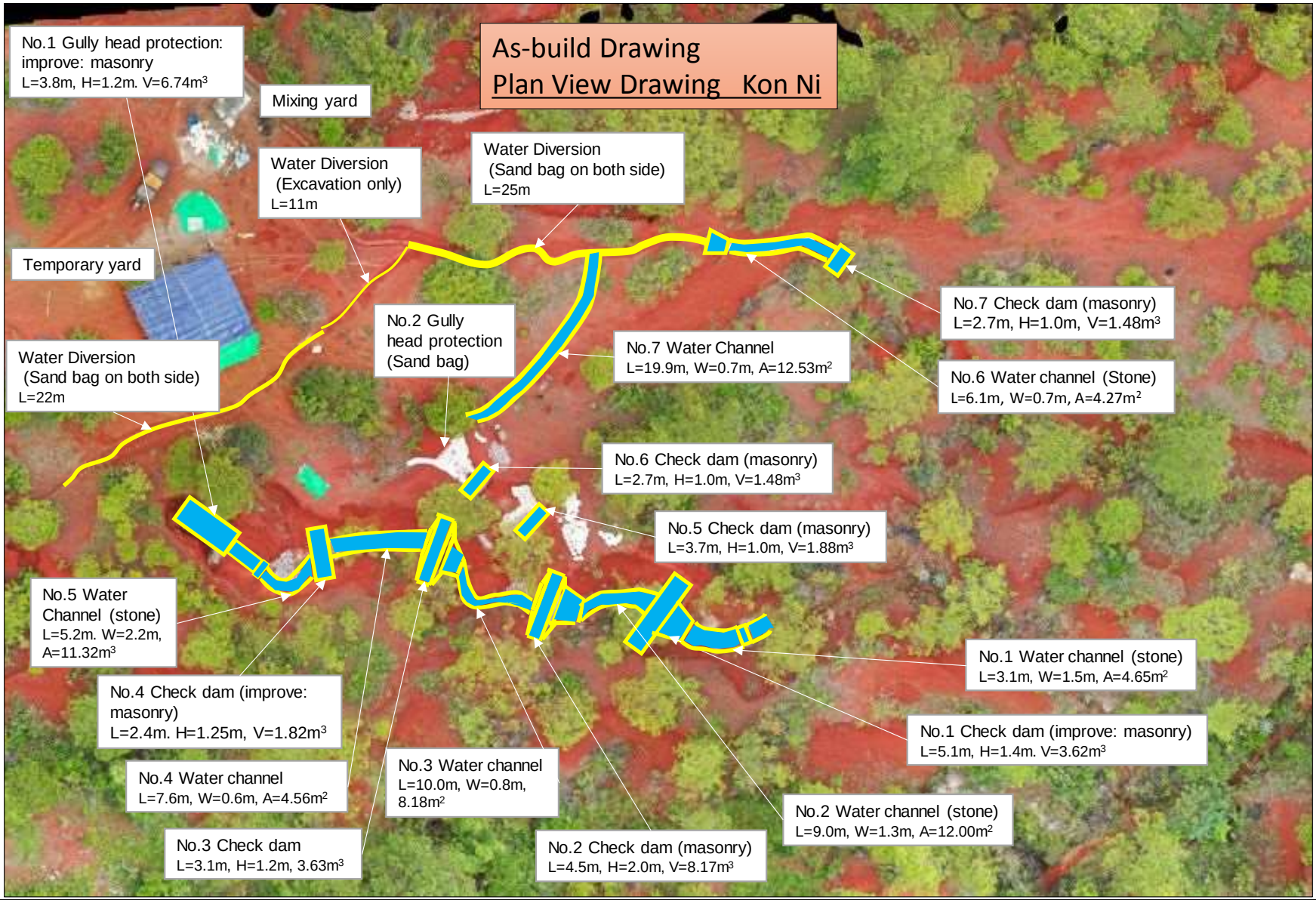
Source: JICA Expert Team

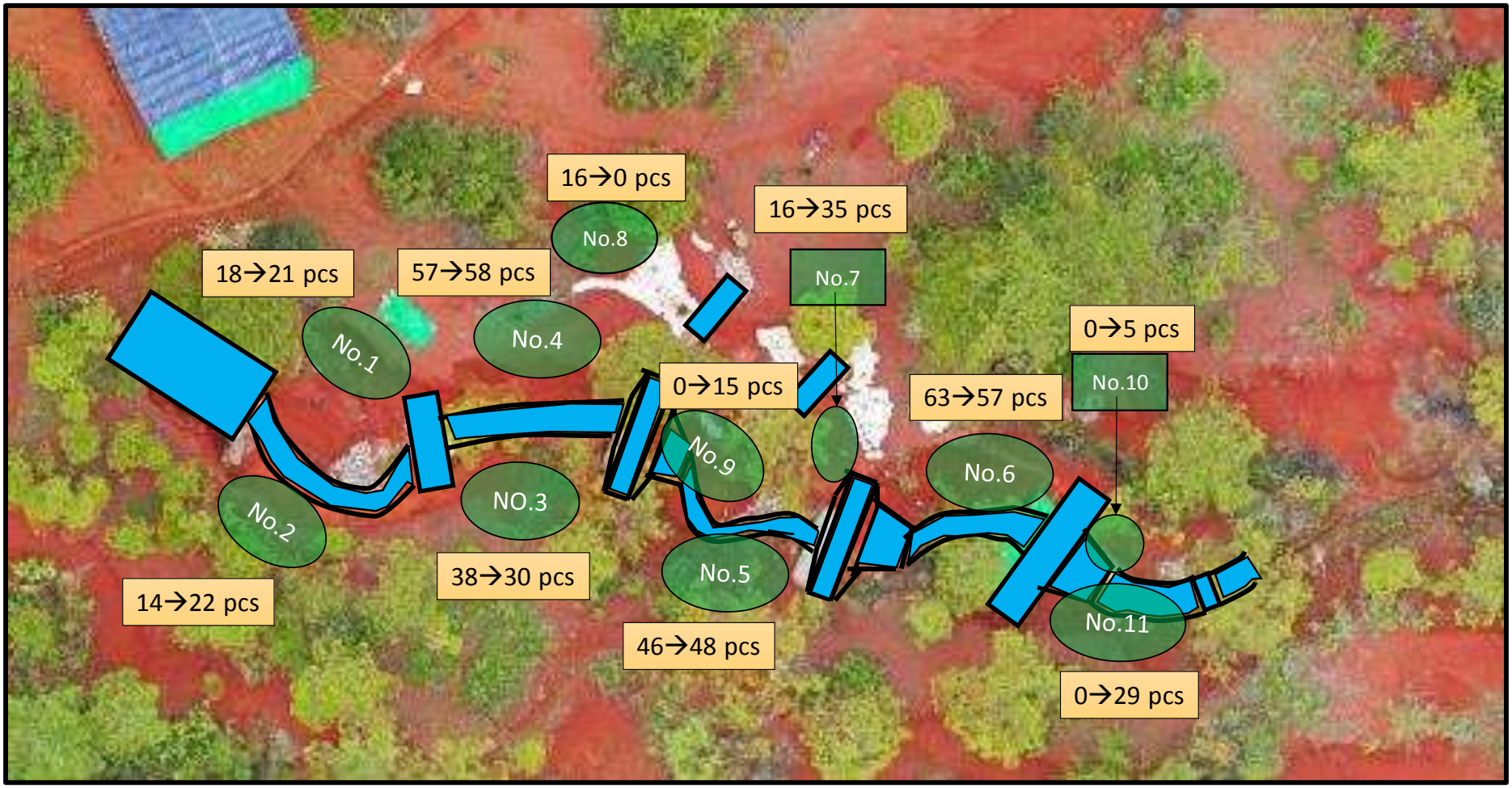
5. As-build drawings and final inspection photos

The as-build drawings and final inspection photos are shown in Attachment-1 and 2.

--End of Document--

Attachment -1 As-Build Drawings

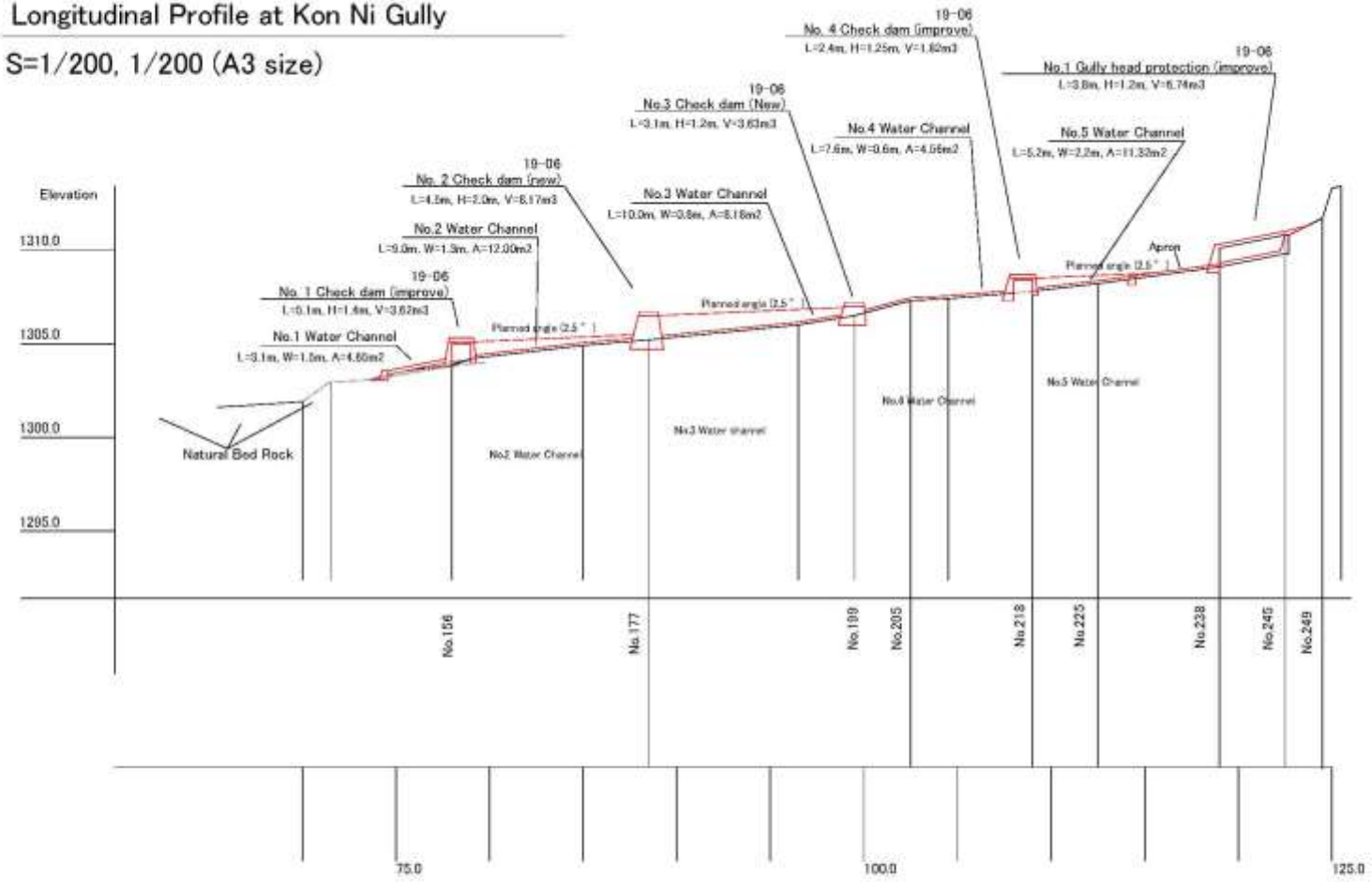

As-build Drawing
Plan View Drawing Kon Ni
No.1 Gully head protection: improve: masonry
L=3.8m, H=1.2m. V=6.74m³
Mixing yard
Water Diversion (Excavation only)
L=11m
Water Diversion (Sand bag on both side)
L=25m
Temporary yard
No.2 Gully head protection (Sand bag)
No.7 Check dam (masonry)
L=2.7m, H=1.0m, V=1.48m³
No.7 Water Channel
L=19.9m, W=0.7m, A=12.53m²
No.6 Water channel (Stone)
L=6.1m, W=0.7m, A=4.27m²
Water Diversion (Sand bag on both side)
L=22m
No.6 Check dam (masonry)
L=2.7m, H=1.0m, V=1.48m³
No.5 Check dam (masonry)
L=3.7m, H=1.0m, V=1.88m³
No.5 Water Channel (stone)
L=5.2m. W=2.2m, A=11.32m³
No.1 Water channel (stone)
L=3.1m, W=1.5m, A=4.65m²
No.4 Check dam (improve: masonry)
L=2.4m. H=1.25m, V=1.82m³
No.1 Check dam (improve: masonry)
L=5.1m, H=1.4m. V=3.62m³
No.4 Water channel
L=7.6m, W=0.6m, A=4.56m²
No.3 Water channel
L=10.0m, W=0.8m, 8.18m²
No.2 Water channel (stone)
L=9.0m, W=1.3m, A=12.00m²
No.3 Check dam
L=3.1m, H=1.2m, 3.63m³
No.2 Check dam (masonry)
L=4.5m, H=2.0m, V=8.17m³

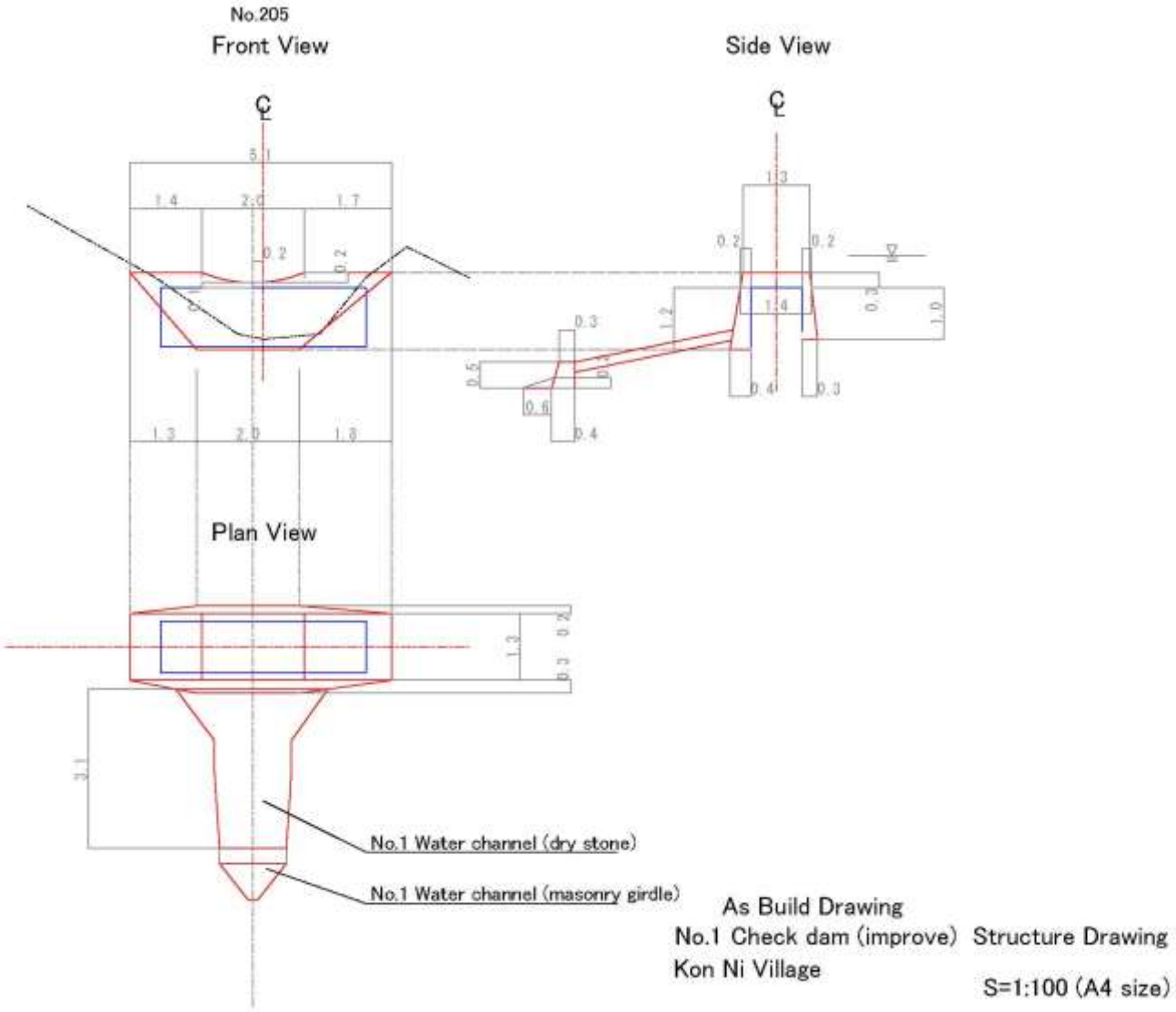


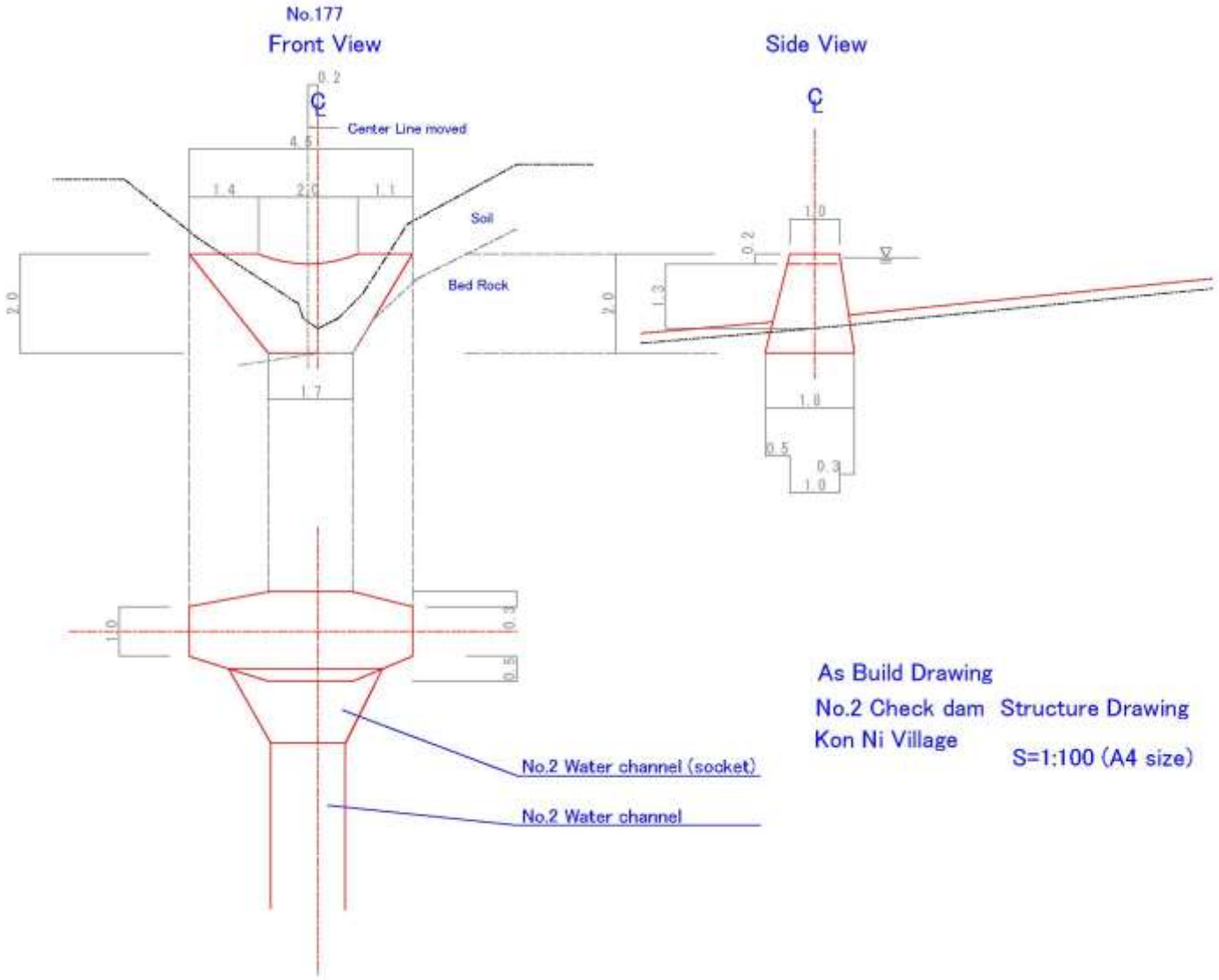
As-Build Drawing of Grass Planting Work

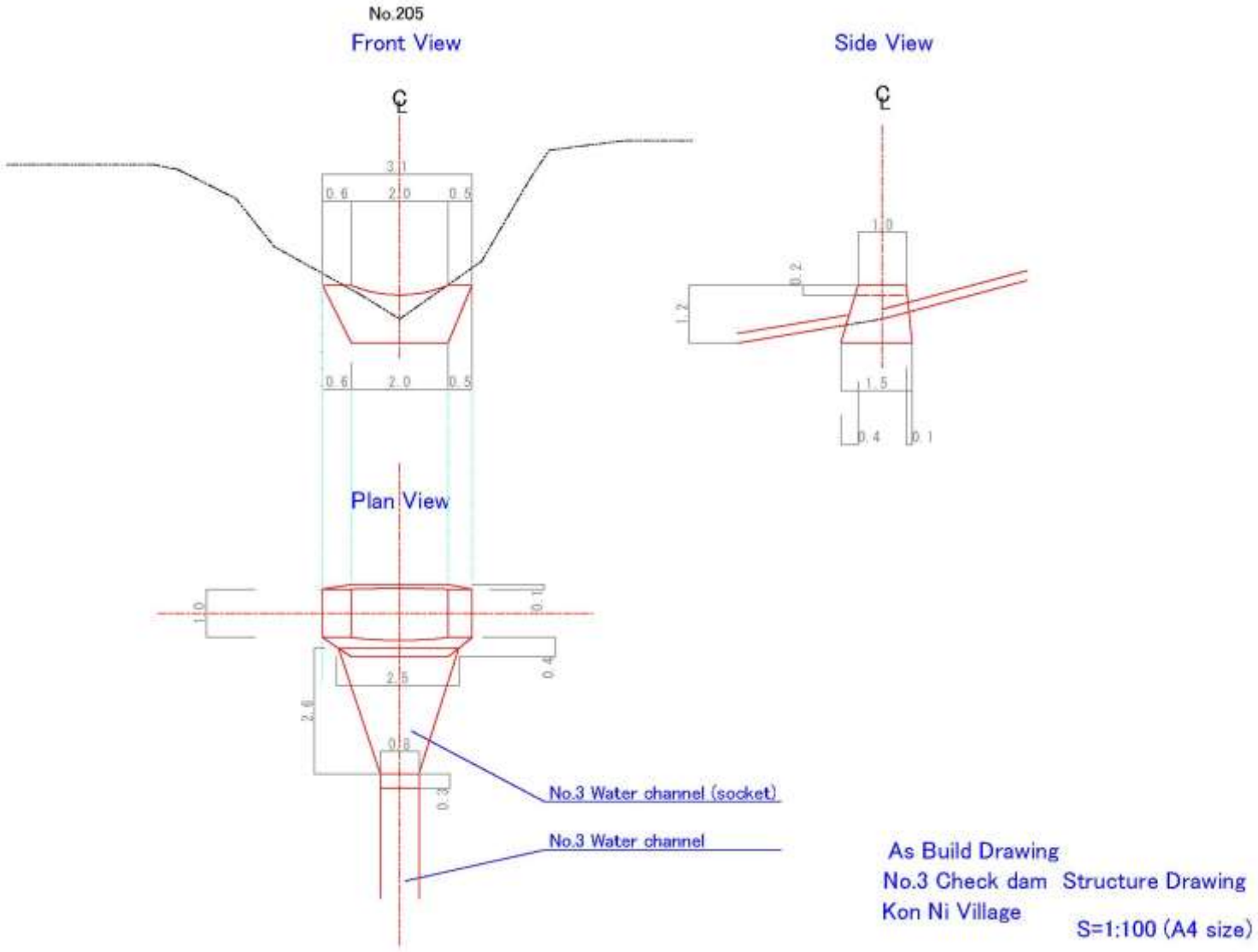
As Build Drawing
Longitudinal Profile at Kon Ni Gully

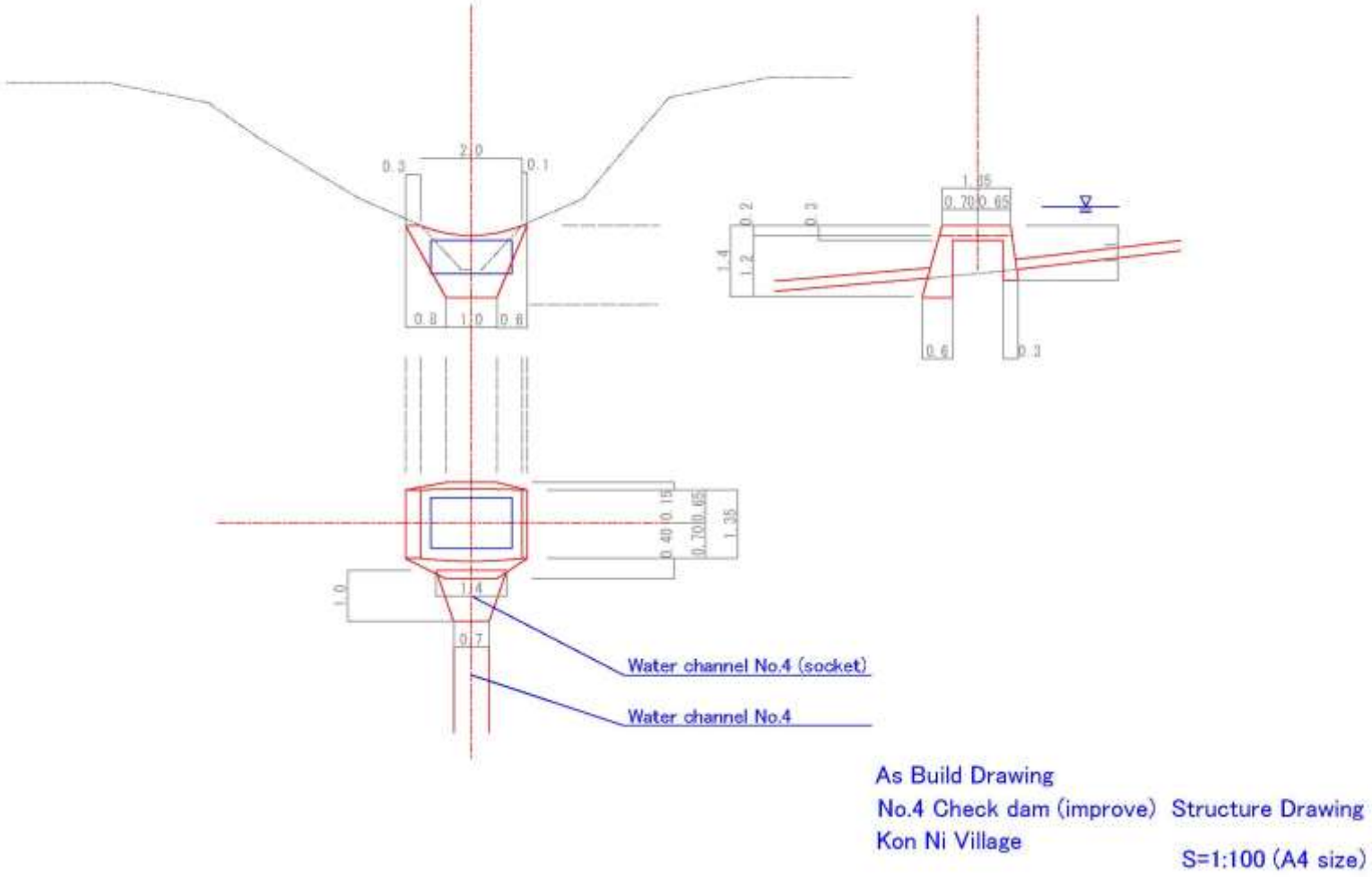
S=1/200, 1/200 (A3 size)

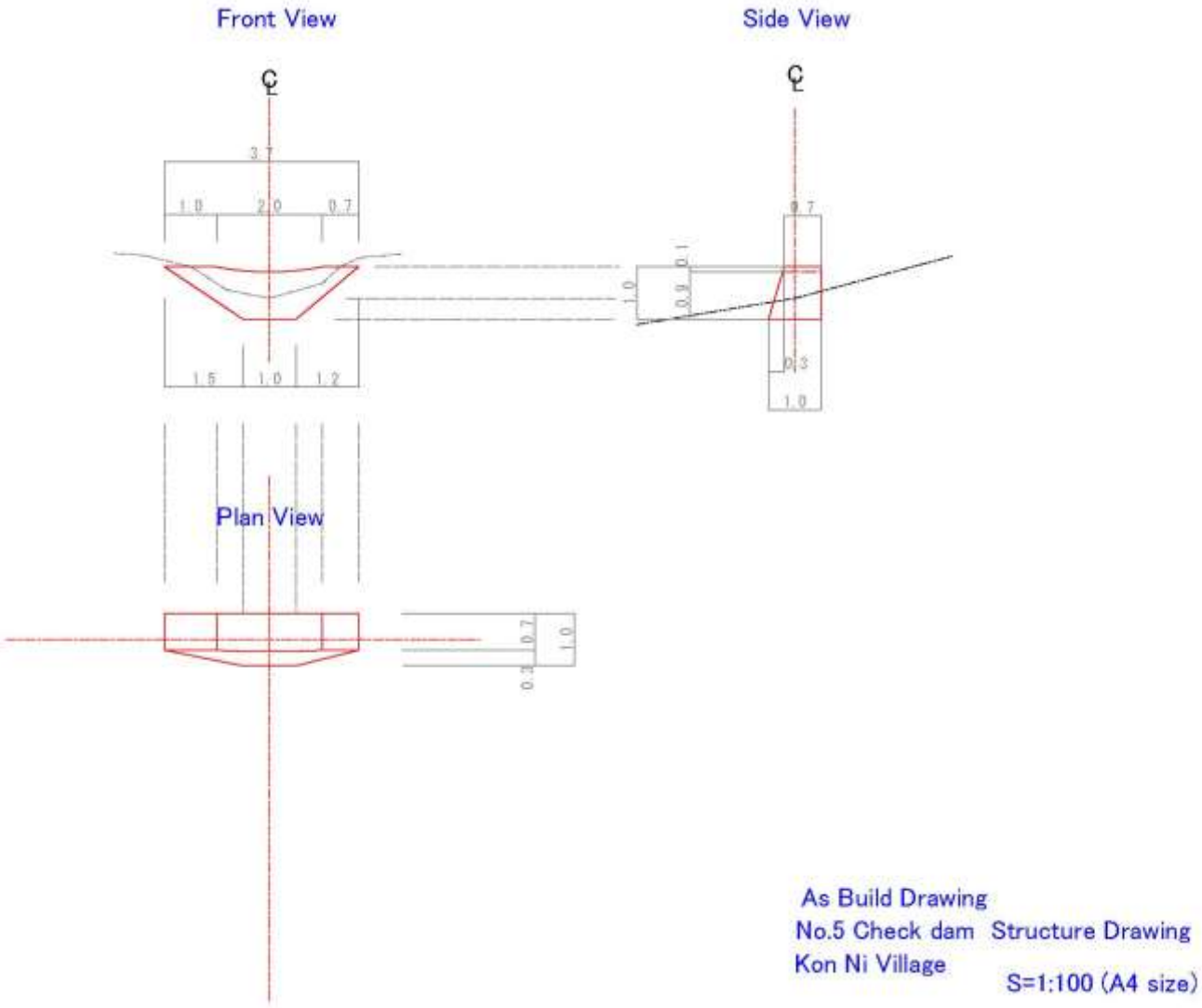


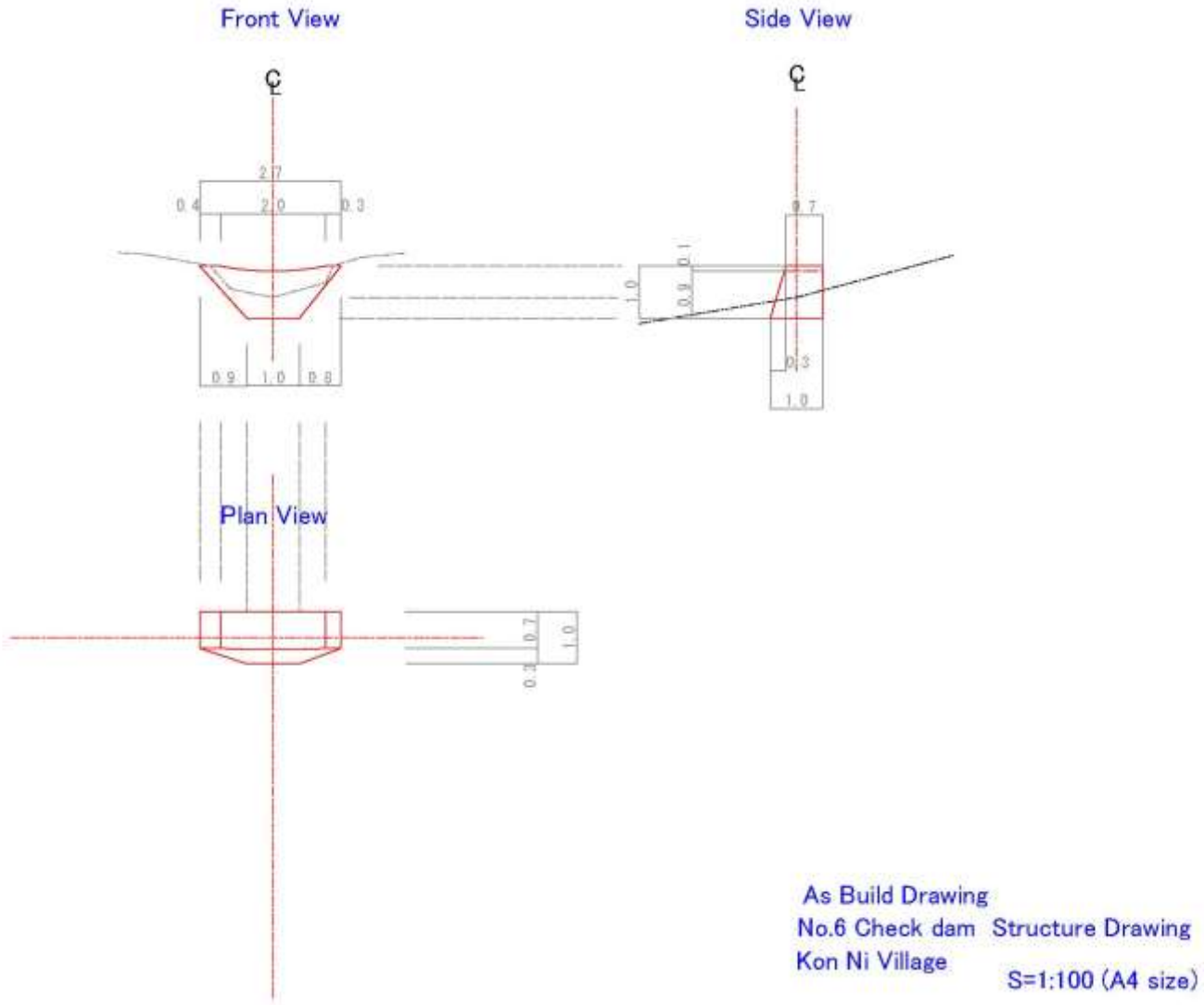

No.205
Front View
Side View
Plan View
No.1 Water channel (dry stone)
No.1 Water channel (masonry girdle)
As Build Drawing
No.1 Check dam (improve) Structure Drawing
Kon Ni Village
S=1:100 (A4 size)

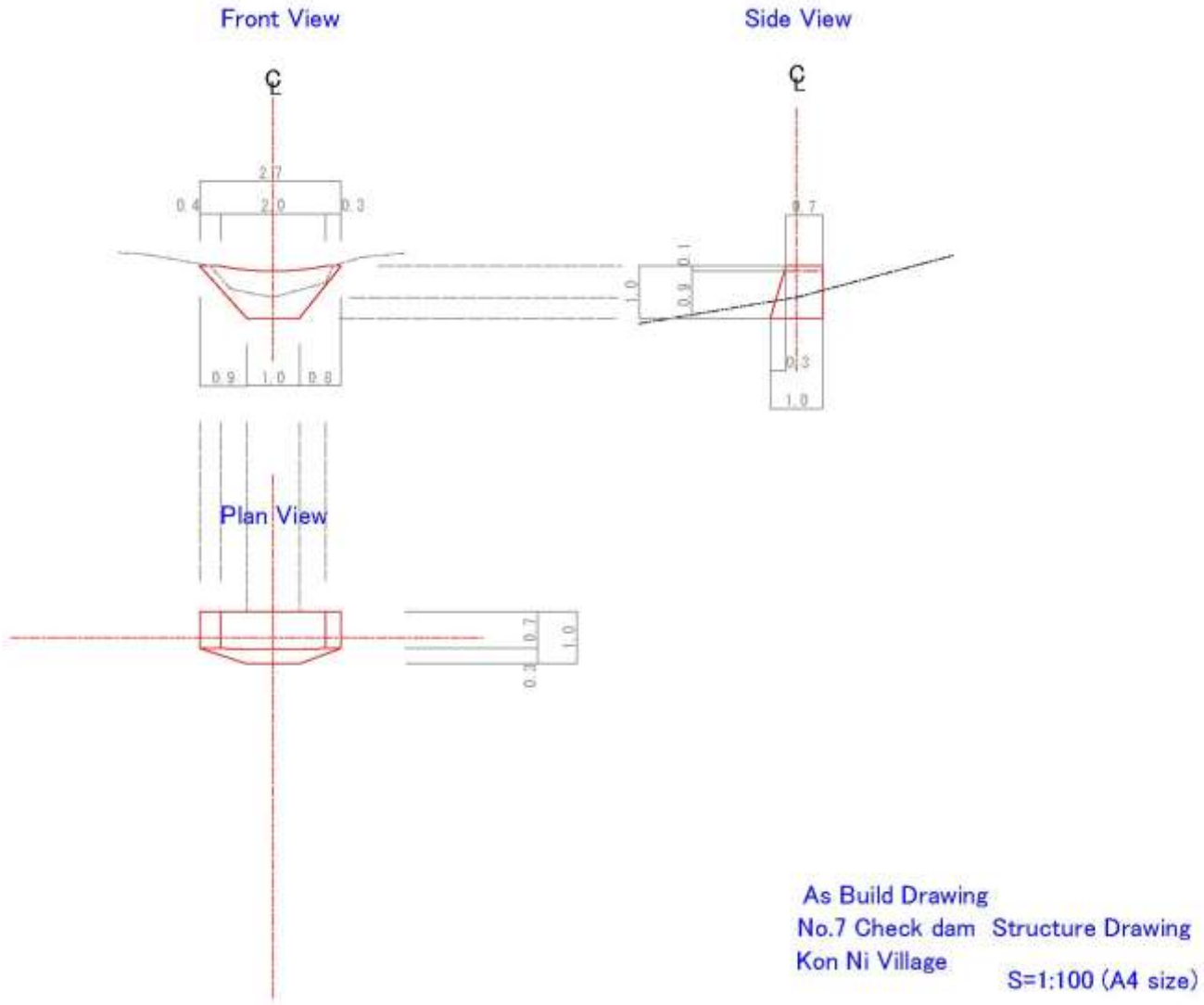

No.177
Front View
Side View
Center Line moved
Soil
Bed Rock
No.2 Water channel (socket)
No.2 Water channel
As Build Drawing
No.2 Check dam Structure Drawing
Kon Ni Village
S=1:100 (A4 size)

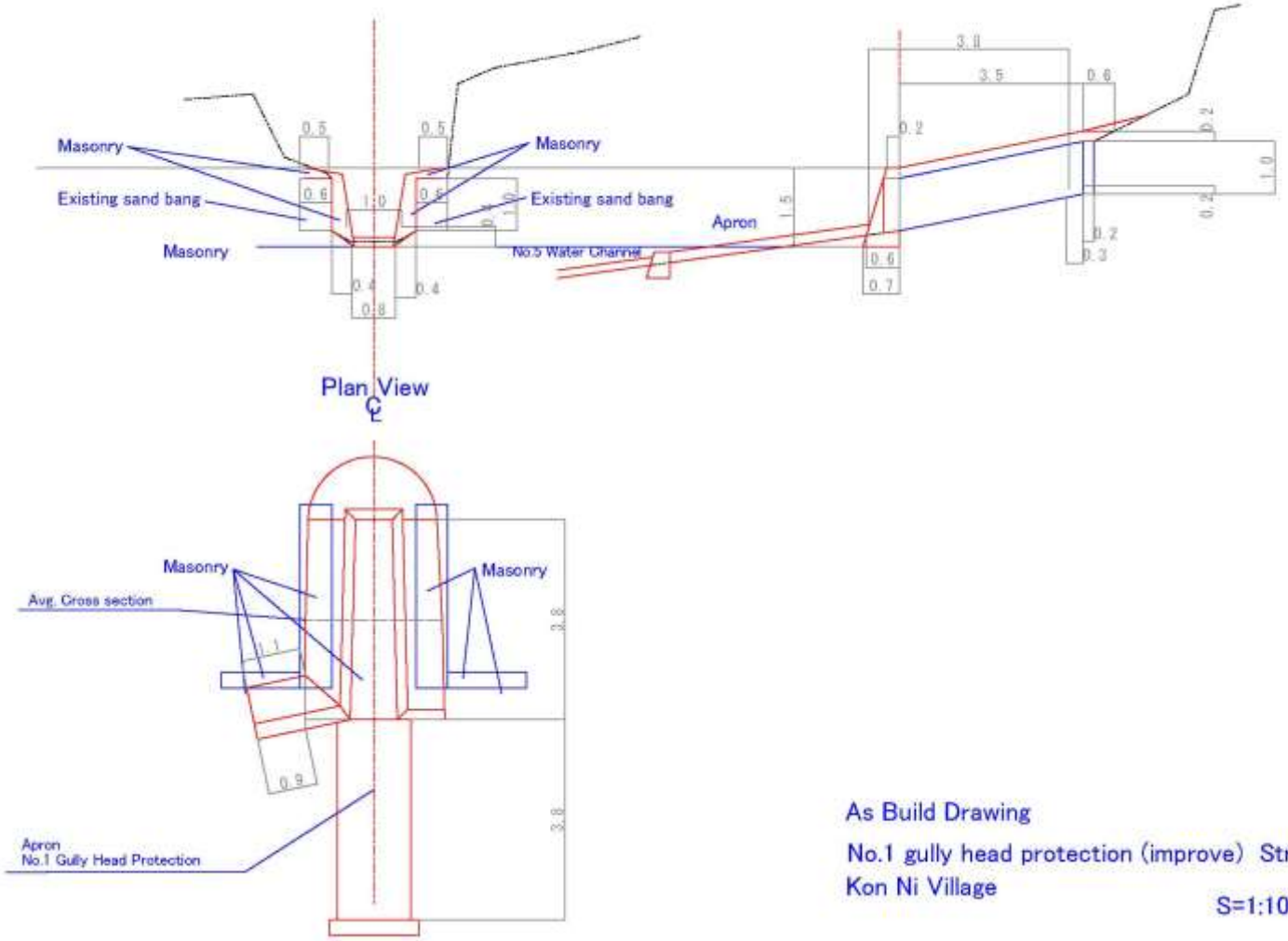

No.205
Front View
Side View
Plan View
3.1
0.6
2.0
0.5
1.0
0.2
1.2
1.5
0.4
0.1
2.5
0.8
0.3
No.3 Water channel (socket)
No.3 Water channel
As Build Drawing
No.3 Check dam Structure Drawing
Kon Ni Village
S=1:100 (A4 size)


Water channel No.4 (socket)
Water channel No.4
As Build Drawing
No.4 Check dam (improve) Structure Drawing
Kon Ni Village
S=1:100 (A4 size)


Front View
Side View
Plan View
3.7
1.0
2.0
0.7
1.5
1.0
1.2
0.7
1.0
0.3
0.1
0.9
1.0
0.3
1.0
As Build Drawing
No.5 Check dam Structure Drawing
Kon Ni Village
S=1:100 (A4 size)


Front View
Side View
Plan View
As Build Drawing
No.6 Check dam Structure Drawing
Kon Ni Village
S=1:100 (A4 size)


Front View
Side View
Plan View
As Build Drawing
No.7 Check dam Structure Drawing
Kon Ni Village
S=1:100 (A4 size)



As Build Drawing

No.1 gully head protection (improve) Structure Drawing

Kon Ni Village

S=1:100 (A4 size)

Attachment-2 Final Inspection Photos

1. Hard Structures

No.1 Water Channel
Dry stone: L=3.1m, W=1.5m (Avg.), A=4.65m^2

Overview from lower side

No.1 Check Dam (existing sand bag dam was improved)
Masonry: L=5.1m, H=2.0m, V=3.62m^3

Front view

Back view

Overview (lower side is covered by natural rock)

No.2 Water Channel
Dry stone: L=9.0m, W=1.3m (Avg.), A=12.0m^2

Front view

From upper side

Connection of No.1 Check dam

No.2 Check Dam (New construction)
Masonry: L=4.5m, H=2.0m, V=8.17m^3

Front view

Back view

Right stream side

From right stream side

No.3 Water Channel
Dry stone: L=10.0m, W=0.8m (Avg.) A=8.18m^2

Over view from left stream side

Masonry stream girdle

Connection to No.3 check dam

No.3 Check Dam (existing sand bag dam was improved)
Masonry: L=3.1m, H=1.2m, V=3.63m^3

Front view

Back view

Left stream side

Right stream side

No.4 Water Channel
Dry stone: L=7.6m, W=0.6m (Avg.), A=4.56m^2

Connection to No.3 Check dam

Connection to No.4 Check dam

No.4 Check Dam (existing sand bag dam was improved)
Masonry: L=2.4m, H=1.25m, V=1.82m^3

Over view

Front view

From left stream side

Back site

No.5 Water Channel Dry stone: L=5.2m, W=2.2m (Avg.), A=11.32m^2


Overview from lower side


Connection to No.4 Check dam


Connection to No.1 Gully Head Protection


Overview from upper side

No.1 Gully head protection (existing sand bag dam was improved)
Masonry: L=3.8m (Avg.), H=1.2m (Avg.), V=6.74m^3


Front view


From upper side


Apron


Main part

No.5 Check Dam (New construction)
Masonry: L=3.7m, H=1.0m, V=1.88m^3

Front view

Back view

No.6 Check Dam (New construction) Masonry: L=2.7m, H=1.0m, V=1.48m^3

Front view

Back view

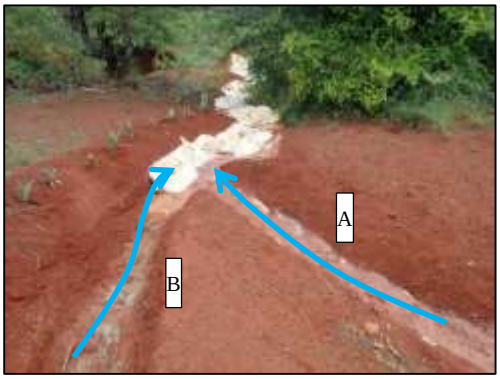
No.2 Gully head protection (Sand bag)

No.7 Check Dam (New construction) Masonry: L=2.7m, H=1.0m, V=1.48m^3

Lower side

Front view

Sand bags behind dam	Connection to No.6 water channel
No.6 Water Channel Dry stone: L=6.1m, W=0.7m (Avg.), A=4.27m^2	
	
No.7 Water Channel Dry stone: L=17.9m, W=0.7m (Avg.), A=12.53m^2	
 Overview	
 From upper side	 From lower side
Water diversion by sand bag: L=25m, W=0.8m (Avg.)	



Sand bags on the water diversion

Surface water runs into the gully before diversion

Water direction after diversion

Temporary yard

Setting of Temporary Yard

After withdrawal of Temporary Yard

2. Grass Plantation

Planted grass:

Vetiver Grass (*Chrysopogon zizanioides*)

320 seedlings were planted.

Plantation Area


No.1 Plantation Area (21 pcs)


No.2 Plantation Area (22pcs)


No.3 Plantation Area (30pcs)


No.4 plantation Area (58 pcs)


No.5 Plantation area (48 pcs)


No.6 Plantation Area (57 pcs)


No.7 Plantation Area (35 pcs)

No.9 Plantation Area (15 pcs)

No.10 Plantation area (5pcs)

No.11 Plantation Area (29 pcs)