COVAMS

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Economic Impact of the Project for COVAMS

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Masahiro Abe

Ph. D student, Graduate school of Economics and Management

Tohoku University

The project for Community Vitalization and Afforestation in Middle Shire

(COVAMS)

Forestry department / Japan International Cooperation Agency

1. Introduction

The purpose of this survey is to estimate the economic impact of COVAMS project in the project area in monetary form. We organized workshops at 9 villages in the project area and conducted questionnaire surveys to collect data about maize increased due to contour ridging and about tree planting. In addition, we set some questions about the farmers' recognition of the value of COVAMS and estimated the willingness to pay (WTP) by contingent valuation method (CVM).

To analyze the economic impact or benefit and cost of a project is general especially in the field of infrastructure and projects involving degradation of environmental quality in a developed country. The result of monetary form cost benefit estimation could be understood easily by decision makers and voters--they can compare the cost and benefit directly. In other words, cost and benefit in monetary form can help a politician make decision and make it easier for citizen to show their intention to a policy. Therefore the social meaning of this research is significant.

"COVAMS" is abbreviation of "The Project for Community Vitalization and Afforestation in Middle Shire", the main purposes for this project are improve local farmers' living condition and mitigate local soil erosion. Because of the increasing demand of firewood and timber by the increasing population since 1990's, people living in Middle Shire region cut down a lot of trees. As a result, huge soil erosion happens and the soil runs off to Shire River, which causes soil siltation at dams on the river. The soil siltation is an obstacle of hydroelectricity generation at the dams, thus changing current situation is an ultimate purpose of COVAMS. However, electricity generated at the dams is consumed by urban people living in Blantyre and Lilongwe while farmers living at countryside don't benefit from it. So no matter how hard we claim that COVAMS is good for electricity, farmers won't take steps on soil erosion positively. Thus, COVAMS makes a point that contour ridging will increase the amount of maize yield and tree planting will generate new earning. Under this background, it is mandatory to prove the benefit of COVAMS and feed back to the farmers. And then, we can expect that more farmers newly practice contour ridging and tree planting if we announce this survey result to the farmers extensively.

2. Economic Impact Survey

2.1. Outline

This survey was composed of group survey and individual survey. In the group survey, we separated the farmers into 4~6 groups based on gender and whether they practiced contour ridging or not. Then we handed out cards on which number and their group attribution were written. After that, a researcher, a COVAMS extension staff or an employed student, asked his/her group members in a sweep and wrote down their answers one by one in a blank whose number corresponded to the number of each farmer's card. We asked about the area of their maize garden and the amount of their maize yield (See Appendix.1).

We conducted individual survey after the group survey. When we started individual survey, we had farmers show us cards we had handed out and we wrote down information on the cards to be able to check their answers in the group survey. After the confirmation, we asked questions about their WTP to COVAMS which we will discuss later. Then we asked about their age, yearly income, academic background, meal, and tree planting. Since some survey questions are about very private information, we conducted it one by one and away from other farmers (See Appendix.2).

First, a trial survey had been done at Kateya on July 31st to check for problems such as whether there was any trouble in management of the workshop and contents of the survey questionnaire, or some points in the survey sheet farmers couldn't understand easily which should be revised and added some new questions. In addition, after the trial, as we found the participation of COVAMS extension staff will not be enough for subsequent surveys, COVAMS employed 6 students studying at Technical College near COVAMS office at 1000MK (Malawi Kwacha) a day per student.

Initially, we assumed the workshops after Mizenje were not trial but real part. However, there were a lot of mistakes caused by the students' inexperience and a trouble in grouping (although some farmers answered they didn't practice contour ridging at first, actually they did.), which resulted in a lot of invalid answers. Therefore we revised the survey sheet and improved problems in grouping method again. For your information, we added new questions about their meal and collection of firewood after Mizenje, so for Kateya and Mizenje's data those numbers don't exist. After the survey in Mizenje, we organized 7 workshops in a row from 13th August to 22nd August at Gomani, Mdala, Kampaka, Rafu Maunde, Temani, Zimba, Chinseu Sawa. We show the number of whole households,

participants of group surveys, participants of individual surveys of each village in Table.1. We called one participant from one household, so the number of participants is equal to the number of participated households. The difference of number between group survey and individual survey is because some farmers broke away from them in the middle to cook lunch of which we gave the materials and some farmers took part in the surveys in the middle.

Table.1. Number of whole households and participants

	Kateya	Mizenje	Gomani	Mdala	Kampaka	Rafu Maunde	Temani	Zimba	Chinseu Sawa	Total
Whole households	61	110	115	123	88	179	96	102	88	962
Participants(Group)	39	87	76	54	72	100	60	75	42	605
Participants(Individual)	36	80	77	54	72	102	61	74	38	594

2.2. Contingent Valuation Method (CVM)

In this section a simple explanation about contingent valuation method (CVM) would be given. CVM is one of Stated Preference (SP) methods to evaluate the economic value of public goods such as a dam or a freeway. This method is especially developed in the field of environmental economics as a method to estimate the economic value of environment. In particular, we ask beneficiaries their willingness to pay (WTP), directly or indirectly, to practice (or prevent) improvement policy (or degradation policy) of an environment and influencing factors to their WTP such as social attribution, knowledge, and experience, and then, estimate average WTP or median WTP by an econometrical method. Sum of the estimated average WTP or median WTP of all beneficiaries can be seen as value of an environment factor or a development project, and that is a benefit side material of Cost-Benefit Analysis in project valuation. Theoretically CVM can be applied to estimation of any kind of projects and goods. What we should be careful about is that we can't ask questions like "How much will you pay for the environment?", but we should make respondents imagine "hypothetical situation" like improvement (or degradation) of an environment or beginning (or stopping) of a project, and ask about their WTP to realize (or prevent) the hypothetical situation. That is, we should suggest the situations before and after something change to respondents, and ask them their WTP for that change.

There are some methods to derive WTP. In "Open-ended" format, the respondent is

asked “How much are you willing to pay” and is free to state any amount. In “Payment card” format, the respondent is shown some options of amount and chooses his/her preferable one. “Dichotomous choice” format, where the respondent is shown an amount to pay and answers “agree to pay (YES)” or “disagree to pay (NO)”, is a more general method to estimate WTP nowadays. This survey adopted “Double bound dichotomous choice”, which is shown to the respondent twice and the 2 amounts are different. If the respondent answers “YES” in the first question, the second amount is bigger than the first amount while if the respondent answers “NO” in the first question, the second amount is smaller than the first amount. One of the advantages of this method is that we could make a reliable estimation even if the number of the sample is small.

Before the group survey, COVAMS extension staff explained about the soil erosion and agricultural damages in Middle Shire area, and also explained about contour ridging, tree planting and countermeasure for gully which COVAMS is disseminating to remove bias of information between the farmers. Furthermore, before the individual survey, the survey researcher explained them again to each farmer with some pictures (Appendix.3).

Then, we told a hypothetical situation that “discontinuation of COVAMS is now discussed and contour ridging, tree planting and everything the farmers practice in COVAMS is lost and the situation before COVAMS comes back if COVAMS doesn’t continue”. That means a contour ridged maize garden turns back to not contour ridged one and loses the effect of contour ridging to keep rainwater and soil in a maize garden and to increase the maize yields. Also, the planted trees and countermeasures for gullies the farmers set will disappear. However, we told them also “COVAMS will be continued if they pay some amount of money we show them after, and contour ridging, tree planting and countermeasure for gullies would be kept although their disposable money for other purpose decrease by the payment.” Then we asked next question.

Q.1		
Q.(1)Will you pay (_____)MK in a year to have COVAMS continued?	YES(Go on to (2))	NO(Go on to (3))
Caution! Don't ask both (2) and (3). Just one of the two.		
Q.(2)Will you pay "double of the first amount" in a year to have COVAMS continued?	YES	NO
Q.(3)Will you pay "half of the first amount" in a year to have COVAMS continued?	YES	NO

Figure.1 CVM survey design

We have 5 patterns of amount, 50MK, 100MK, 200MK, 400MK, and 800MK in Q.(1), and these are shown to the respondents in a random manner.

If the respondents answer "YES" in Q.(1), they go to Q.(2) and the amount in Q.(2) is double of the amount in Q.(1), also they will skip Q.(3). If the respondents answer "NO" in Q.(1), they skip Q.(2) and go to Q.(3), \the amount in Q.(3) is half of the amount in Q.(1). If the respondents answer "NO" in both Q.(1) and Q.(3), that is, they don't have WTP more than the amount in Q.(3), we asked the respondents that reason in Q.2. If the respondents chose "I don't believe JICA use money appropriately", we saw it as "protest response" and removed it from the estimation samples. Protest response is that the respondent refuses to pay any money because of the payment method such as tax and the opinion that the government or the project contractor should cover the cost, although he/she realize the value.

From Q.3 we asked all respondents their social attribution (Yearly income, Age, Academic background), their impression to JICA/COVAMS, knowledge about Global Warming, knowledge about Ecosystem Services, knowledge about Biodiversity, and whether there was improvement of their lives by COVAMS. We expected the responses of these questions were related to WTP and we analyzed econometrically which factors influence WTP. However, in the analysis, we used not only the responses of the questions above, but also the other data we collected in the group and individual survey such as the amount of maize and the number of planted tree.

3. Result of Economic Impact Survey

3.1. Maize

First, the result of group survey was shown as follow. Table.2 shows the number of practitioners of contour ridging and the practice rate in the participants of the group survey. Table.3 shows data about the area of their maize gardens.

Comparing the result of area survey (Chigwiya and Kanazawa(2012)) and that of this group survey, there are big differences in practice rate in Rafu Maunde and Temani.

Table.2 Number of practitioners of contour ridging and the practice rate

	Kateya	Mizenje	Gomani	Mdala	Kampaka	Rafu Maunde	Temani	Zimba	Chinseu Sawa	Average
(1)Practitioner	35	39(74)*	45	33	41	49	40	48	9	-
(2)Practice rate (%)	89.7	49.4(89.2)*	59.2	61.1	56.9	49.0	66.7	64.0	21.4	50.0
Practice rate in Area survey (%)	98	25	87	39	41	97	104	67	34	28

*The numbers in the case arcs are numbers including farmers who didn't attend the official training but practice contour ridging imperfectly.

Table.3 Data about area of maize garden per household

	Kateya	Mizenje	Gomani	Mdala	Kampaka	Rafu Maunde	Temani	Zimba	Chinseu Sawa	Average
(3)A practitioner's total maize garden area (ha/hh)	0.46	0.61	0.60	0.61	0.39	0.64	0.63	0.56	0.98	0.61
(4) A practitioner's contour ridged maize garden area (ha/hh)	0.33	0.43	0.38	0.26	0.22	0.22	0.27	0.23	0.31	0.29
(5) A practitioner's not contour ridged maize garden area (ha/hh)	0.13	0.18	0.21	0.35	0.17	0.42	0.37	0.34	0.68	0.32
(6) A not practitioner's total maize garden area (ha/hh)	0.53	-	0.37	0.48	0.40	0.35	0.61	0.30	0.51	0.44
(7) Percentage of contour ridged maize garden area (%)	71.3	70.6	64.5	43.0	56.7	34.8	42.2	40.0	31.1	50.1

Followed, we showed the result about the amount of maize yields in Table.4. We asked farmers the number of bags they yielded and the bag size they used in the group survey because they couldn't answer the total amount of maize yield immediately. The most using bag sizes by the farmers use are 50kg, 70kg and 90kg, and the other bag types are few. However, when we measured the actual content in some maize bags after finish of the

group survey, we found there were huge difference between the amount of maize in bags which farmers answered and the actual amount. Therefore we used the average of the actual amounts we measured in calculation of the total maize yield. That is, if the bag size the farmer answered was 50kg, we used 59.3kg in calculation. In a similar fashion, if a bag size was 70kg, we used 63.8kg, and if it was 90kg, we used 99.9kg. In the case of the other size like 55kg and 60kg, we used the size as they were.

Table.4 Maize yields data per household

	Kateya	Mizenje	Gomani	Mdala	Kampaka	Rafu Maunde	Temani	Zimba	Chinseu Sawa	Average
(8) Practicing farmers' maize yields in 2011/2012 season from total maize garden(kg/hh)	454	634	569	286	444	750	531	458	458	509
(9) Practicing farmers' maize yields in 2011/2012 season from contour ridged maize garden (kg/hh)	-	536	413	134	286	415	328	283	214	326
(10) Practicing farmers' maize yields before practicing contour ridging(kg/hh)	156	424	324	175	144	468	254	256	369	286
(11)Not practicing farmers' maize yields in 2011/2012 season(kg/hh)	270	691	517	422	424	577	445	298	375	447
(12) Not practicing farmers' average maize yields (kg/hh)	-	-	470	424	255	353	365	353	309	361

In Table.4, (8)~(10) are data about the practicing farmers' maize yield, (11) and (12) are data about the not practicing farmers' maize yield. It is found that practicing farmers' maize yield increased compared with that before practicing contour ridging. Table.5 shows the maize yield per hectare (ha) calculated by using data in Table.3 and Table.4

Table.5 Maize yields per ha and per household

	Kateya	Mizenje	Gomani	Mdala	Kampaka	Rafu Maunde	Temani	Zimba	Chinseu Sawa	Average
(13)Practicing farmers' yields before practicing per ha (kg/ha/hh)	337	691	544	278	371	735	392	455	375	464
(14) Practicing farmers' yields after practicing per ha of total garden (kg/ha/hh)	1036	1033	955	454	1147	1177	841	813	466	880
(15) Practicing farmers' yields after practicing per ha of contour ridged garden (kg/ha/hh)	1145	1237	1077	499	1301	1872	1230	1240	701	1144
(16)Not practicing farmers' yields per ha (kg/ha/hh)	515	-	1403	883	1050	1662	729	755	1093	1011

(13) shows the practicing farmers' maize yield per ha before they practiced contour ridging. (14) shows the practicing farmers' maize yield per ha in each total maize garden in 2011/2012 season (after they practiced contour ridging). (15) shows the practicing farmers' maize yields per ha only in contour ridged maize garden in 2011/2012 season. (16) shows the not practicing farmers' maize yield per ha in 2011/2012 season. We found that the practicing farmers' maize yield per ha in 2011/2012 season is bigger than that of before they practiced contour ridging. In particular, the practicing farmers' maize yield per ha only in contour ridged maize garden increased largely. However, in the case of Gomani, Mdala and Chinseu Sawa, the not practicing farmers' maize yields per ha are larger than practicing farmers'. Such situations are supposed to happen in the case that there is little slope at the region, and are influenced by the degree of compost and chemical fertilizer, weather condition etc. We should analyze the reasons in exact detail in future survey.

Table.6 shows the increase of maize yield.

Table.6 Increase of maize per household

	Kateya	Mizenje	Gomani	Mdala	Kampaka	Rafu Maunde	Temani	Zimba	Chinseu Sawa	Average
(17)Practicing farmer's increase of maize in each total area of maize garden.(kg/hh)	298	210	245	111	301	282	278	202	89	224
(18)Practicing farmer's increase rate of maize yield in each total area of maize garden (%)	208	50	76	64	209	60	115	79	24	98
(19) Practicing farmer's increase in of contour ridged maize garden (kg/hh)		237	204	58	204	252	223	179	100	182
(20) Practicing farmer's increase per ha in contour ridged maize garden (kg/ha/hh)	585	546	532	221	929	1138	838	785	326	656
(21)Expected increase if practicing farmer practice contour ridging in not contour ridged garden. (kg/hh)	108	98	113	77	156	472	306	263	221	202
(22) Expected maize yield if practicing farmer practice contour ridging in total maize garden (kg/hh)	-	759	641	306	504	1192	777	699	689	696
(23) Expected increase per ha if not practicing farmer practice contour ridging. (kg/ha/hh)	-	-			250	210	502	485		362

Next, Table.7 shows the expected income per household if the farmers sell the increase

of maize. We used 46.6MK, the average price of maize per kg in 2011/2012 season and past some seasons to calculate.

Table.7 Expected income by increased maize per household (Average)

	Kateya	Mizenje	Gomani	Mdala	Kampaka	Rafu Maunde	Temani	Zimba	Chinseu Sawa
(24)Expected income if the farmer sell the maize increased in contour ridged maize garden (MK/hh)	9,040	11,022	9,523	2,712	9,517	11,761	10,401	8,331	4,634
(25)Expected income if practicing farmer practice in not contour ridged maize garden (MK/hh)	5,013	4,584	5,246	3,597	7,257	22,004	14,270	12,273	10,280
(26) Expected income if practicing farmer practice in total area of maize garden (MK/hh) ((24)+(25)=(26), we used average of the other villages' value to calculate Kateya's value)	12,672	15,607	14,770	6,309	16,774	33,765	24,671	20,608	14,914
(27)Expected income if the not practicing farmers practice contour ridging in their maize garden (MK/hh)		-	-	-	4,712	3,398	14,282	6,697	-

The values in Table.8 are the summation of the values in Table.7 of the participants.

Table.8 Total expected income of by increased maize

	Kateya	Mizenje	Gomani	Mdala	Kampaka	Rafu Maunde	Temani	Zimba	Chinseu Sawa
(28) Total expected income if the farmers sell the maize increased in contour ridged maize garden(MK)	316,421	429,882	428,552	89,500	390,215	576,283	416,019	400,061	41,710
(29) Total expected income if the practicing farmers practice in not contour ridged maize garden(MK)	443,535	608,674	664,640	208,210	687,749	1,654,470	986,832	989,168	134,230
(30) Total expected income if the practicing farmers practice in total area of maize garden (MK)	175,440	178,793	236,088	118,710	297,534	1,078,186	570,813	589,107	92,520
(31) Total expected income if the not practicing farmers practice contour ridging in their maize garden (MK)		-	-	-	14,606	173,290	285,635	180,809	-

(24) and (28) shows the expected income if the practicing farmers sell the increased maize due to contour ridging in 2011/2012 season compared with maize yields before practicing contour ridging. We can see these are already actualized economic impact by dissemination of contour ridging in COVAMS. Moreover, (25)~(27), (29)~(31) are kind of potential the villages and farmers have, and we can make it actualized by more dissemination.

Finally, we applied these values to 244 villages in which the trainings of contour ridging were organized in 2011/2012 and calculated the total economic impact of the project area. In the area survey, the total area of contour ridged maize garden was 2,376ha and the average per household was 0.25ha. The average maize yield before the farmers practiced contour ridging in the 9 villages was 480.7kg and that after they practiced there was 1144.7kg. Therefore the total increase in 2,376ha was 1,578,607.27kg and the expected income, if the farmers sold all, was 73,563,098.78MK. The expected income per household was 7,853.43MK because the number of practicing households in 244 villages was 9,367.

This monetary form economic impact survey made clear that maize yield surely increased due to contour ridging and huge positive economic impact could be expected if the increase was sold. Furthermore, the huge area of maize garden where contour ridging has not been practiced yet can be seen as a hopeful potential of future economic impact.

What we should be careful about is, however, this estimation is based on a little strong assumption that the farmers sell all amount of increased maize yield. Actually, there were very few farmers selling their surplus maize and almost all farmers consumed the increased maize for themselves or gave it to their relatives. Considering this current situation, selling all increased maize is a little unrealistic assumption.

However, if the increased and stable maize yield continues hereafter, it is supposed that farmers who choose selling the increased maize will augment gradually, and that assumption may become realistic. For that, it is necessary to disseminate contour ridging and to put forward that the farmers will be able to choose selling increased maize.

3.2. Tree Planting

In this section, we would like to show the result of the survey about tree planting. First, Table.9 shows the current achievement of tree planting and direct sowing.

Table.9 Current achievement of tree planting and direct sowing

	Kateya	Mizenje	Gomani	Mdala	Kampaka	Rafu Maunde	Temani	Zimba	Chinseu Sawa	Average
The number of household practicing tree planting in group activity	35	41	60	47	47	72	51	33	22	45
The percentage of household practicing tree planting in group activity (%)	97	51	78	87	65	71	84	45	58	71
The number of household practicing tree planting individually	36	62	68	43	64	97	52	59	29	57
The percentage of household practicing tree planting individually (%)	100	78	88	80	89	95	85	80	76	86
The number of household practicing direct sowing	-	44	40	34	41	58	30	13	20	35
The percentage of household practicing direct sowing (%)	-	55	52	63	57	57	49	18	53	51

The number of seedlings planted in group activity is shown in Table.10 below. Incidentally, in the case of over 1001, we set the maximum at average 3,356 and the minimum at 1001. In Table.11, meanwhile, the number of seedlings planted individually is shown. In the same way, in the case of over 51, we set the maximum at average 160 and the minimum at 51.

Table.10 Number of seedlings planted in group activity

	Kateya	Mizenje	Gomani	Mdala	Kampaka	Rafu Maunde	Temani	Zimba	Chinseu Sawa
1~250	-	-	18	11	25	34	9	20	9
251~500	-	-	25	9	6	6	19	5	0
501~750	-	-	6	10	6	13	8	4	0
751~1000	-	-	11	7	9	13	9	4	2
1001~	-	-	2	10	1	6	7	1	10
Maximum average	-	-	632	1177	555	755	966	525	1801
Minimum average	-	-	315	480	261	330	434	214	548
Middle average	-	-	474	828	408	543	699	369	1174

Table.11 Number of seedlings planted individually

	Kateya	Mizenje	Gomani	Mdala	Kampaka	Rafu Maunde	Temani	Zimba	Chinseu Sawa
1~10	-	-	30	9	26	31	19	22	9
11~20	-	-	14	9	21	23	13	18	5
21~30	-	-	2	6	7	16	5	6	5
31~40	-	-	3	2	1	6	3	1	1
41~50	-	-	12	4	5	9	4	7	2
51~			7	13	4	12	8	5	7
Maximum average			36.5	65.3	28.4	39.8	42.3	33.1	55.2
Minimum average			16.7	25.9	12.8	18.1	17.6	15.2	21.7
Middle average			26.8	46.7	20.6	29.2	30.4	24.2	39.3

In Table.12 the number of stations of direct sowing was showed.

Table.12 Number of stations of direct sowing

	Kateya	Mizenje	Gomani	Mdala	Kampaka	Rafu Maunde	Temani	Zimba	Chinseu Sawa
Total	-	1360	761	383	495	1186	227	306	210
Average	-	25	15	6	9	21	5	17	4

We calculated the economic impact of tree planting with the assumption that all of the planted trees were sold as firewood. This assumption is supposed to be proper because almost all species of trees planted were Gliricidia, Keshya and Eucalyptus were for firewood or timber, only few trees are for fruits. Although ignoring timber use is unrealistic, it can be supposed to be valid because the price of timber is as much as or higher than that of firewood (The average price of firewood for 3 or 4 days was 200MK). That is, we can think that the economic impact of tree planting we calculated is the lower bound.

The number of trees planted individually in all of the project villages can be calculated by the average number of trees planted in 7 villages except for Kateya and Mizenje, 31 per household, and the average percentage of practice, 85.9%. The result was 894,202 (the

number of households in the project villages, 33,580×85.9%×31). The total number of stations of direct sowing in the project villages can be calculated as 278,364.8 because the average percentage of practice was 47.1% and the average number of stations was 17.6 per household. We used the area survey result, 664,087 as the total number of trees planted in group activity in the project villages because it was impossible to estimate it from the result of the individual survey. From these results, expected total number of trees was 1,836,654, and expected earnings, that is the economic impact of tree planting was about 367,330,800MK in the case of survival rate is 100%. However, it is impossible for trees to survive perfectly. Therefore, we adopted the average of hearing results, 50% as the survival rate and the economic impact was 183,665,400MK totally. The economic impact of individual tree planting was 3,100MK per practicing household and that of direct sowing was 3,520 per practicing household.

We would like to make a discussion about the influence of the economic impact of tree planting from the view point of the farmers' ways to get fuel. Table.13 shows how the farmers get fuel.

Table.13 Farmers' fuel procuration

	Kateya	Mizenje	Gomani	Mdala	Kampaka	Rafu Maunde	Temani	Zimba	Chinseu Sawa
Own Woodlot(the number of household)	-	8	20	17	15	45	22	18	12
Community Woodlot(the number of household)	-	21	9	21	20	27	13	12	21
Homestead(the number of household)	-	11	5	12	10	14	11	12	7
Buying Firewood(the number of household)	-	14	26	0	18	6	10	26	2
Buying Charcoal(the number of household)	-	7	16	2	2	5	2	5	0
Anyhow(the number of household)	-	14	1	1	7	5	3	4	1
The percentage of households that buy their fuel(%)	-	28	55	4	28	11	20	40	5

It is found from Table.13 that averagely 25% of the farmers buy firewood or charcoal. The price of firewood for 3, 4 days is 200MK, so these 25% households spend yearly 18,250~24,333MK for fuel per household, which accounts for 29~39% of the farmers' average income, 62,829MK. The average expected earning of selling trees planted

individually or also consuming for themselves can compensate 12.7~17% of the expenditure. In addition, a lot of the farmers got their firewood from community woodlot or other communal places and they took part in tree planting in group activity at the communal places. These shows the social meaning of tree planting is significant.

We found that enough room to plant trees in the farmers' homestead or other places remains even though the percentage of farmers practicing tree planting was very high. Therefore more economic impact of tree planting can be expected.

3.3. Soil

We estimated economic impact of the effect of contour ridging preventing soil erosion. We defined economic impact of the effect of contour ridging preventing soil erosion as economic value of soil kept in maize garden, and used an estimation method adopted in Blantyre ADD to calculate it. Blantyre ADD estimated the monetary value of soil from the market value of nutrition (nitrogen) (M. T. Chigow(2011)).

It was found from the area survey that the amount of soil COVAMS prevented from eroding and running off out of maize garden in 2011/2012 season was 12,426~87,729m^3, which was equivalent to 31,065~219,322.5t when the specific gravity was 2.5. And then, the amount of nitrogen included in soil in Malawi is 0.212% according to a research by Blantyre ADD. Therefore the amount of nitrogen COVAMS kept in maize garden was estimated to 65.86~464.96t. Since the market price of urea, half of which was nitrogen, was 11,200MK per 50kg, so the unit price of nitrogen was 448,000MK/t. From these values, the economic value of soil kept in maize garden by COVAMS was estimated to 29,505,280~208,302,080MK and 3,150~22,238MK per household practicing contour ridging averagely.

However, it is supposed that we shouldn't separate the economic impacts of maize and soil because the relation between the two is complicated and both influence each other. This means it is possible that double count and over- or under-estimation happens. It is needed to study the relation between maize and soil more.

3.4. CVM

In this section we would like to show the result of CVM. First of all, Table.14 shows the result of the individual survey. At the trial at Kateya, we had only 3 patterns: {amount in

(1), amount in (2), amount in (3)}={50, 100, 25},{100, 200, 50},{200, 400, 100}. However, the number of YY ("YES" in (1) and "YES" in (2)) was bigger than we expected. This meant the presented amounts were small, so from the survey at Mizenje we added another 2 versions: {400, 800, 200} and {800, 1600, 400}.

Table.14 CVM survey result

Q.(1)	Q.(2)	Q.(3)	YY	YN	NY	NN	SUM
50	100	25	89	12	3	4	108
100	200	50	70	17	7	7	101
200	400	100	72	32	19	14	137
400	800	200	52	30	21	19	122
800	1,600	400	49	20	17	33	119

Table.15 and Table.16 show the result of estimation. These are estimated by using a free software "EXCEL de Dekiru CVM version 3.2" programmed by Mr. Kohich Kuriyama, professor of Kyoto University in Japan. In the software we can estimate WTP by Log-Linear Logit Model and Weibull Survival Analysis Model. While these both are simple model, Log-Linear Logit Model as a full model is available to analyze influencing factors.

Table.15 Estimation result: Log-Linear Logit (Simple)

valuations	coefficient	t-valut	p-value	
constant	6.8979	17.139	0.000	***
ln(Bid)	-1.0675	-16.404	0.000	***
n	587			
log likelihood	-654.270			

***: significant at the 99% level

Estimated WTP

median	640	
average	9,551	Without truncation at the maximum amount(1,600MK)
	800	With truncation at the maximum amount(1,600MK)

Table.15 Estimation result: Weibull Survival Analysis (Simple)

valuations	coefficient	t-valut	p-value	
Location	7.0000	88.168	0.000	***
Scale	1.2245	15.725	0.000	***
n	587			
log likelihood	-660.552			

***: significant at the 99% level

Estimated WTP

median	700	
average	1,225	Without truncation at the maximum amount(1,600MK)
	813	With truncation at the maximum amount(1,600MK)

The estimation results were valid and every coefficient was significant at the 99% level. Median of the WTP was estimated to 640~700MK, and average of the WTP was 800~813MK per household.

Next we analyzed influencing factors to the WTP by Full model. First we listed 22 factors (questions) in Table.17 and made estimations in three times because we were able to set only 10 explanatory valuables in the model.

Table.17 List of explanatory valuables

Do you practice contour ridging? (YES: 1, NO: 0)
Do you know the current situation in which there are soil erosion in farmland and much damage of maize yield like pictures you saw now? (YES: 1, NO: 0)
Yearly income(MK)
Academic background (Secondary, Vocational school:1，Primary school, Nothing:0)
Is your impression to JICA “Good”? (YES: 1, NO: 0)
Do you know about Global Warming? (YES: 1, NO: 0)
Do you know about Ecosystem Services? (YES: 1, NO: 0)
Do you know about Biodiversity? (YES: 1, NO: 0)
Do you think your life was improved by COVAMS? (YES: 1, NO: 0)
Do you practice tree planting in group activity? (YES: 1, NO: 0)
Do you practice tree planting individually? (YES: 1, NO: 0)
Did your maize yield increase in 2011/2012 season compared with last year’s ?(YES: 1, NO: 0)
Did your maize yield increase in 2011/2012 season compared with average of past some years’? (YES: 1, NO: 0)
Occupation (maize farmer, maize and vegetable farmer: 1, the others: 0)
The reason of increased maize (contour ridging or Compost: 1, the others: 0)
Do you practice organic compost? (YES: 1, NO: 0)
Is your daily meal enough? (Enough: 1, Not enough, Poor:0)
Collect firewood by yourself or not (YES:1, NO:0)
The number of trees planted individually
Do you practice natural regeneration? (YES: 1, NO: 0)
Do you practice direct sowing? (YES: 1, NO: 0)
The maize yield in 2011/2012 season(kg)

Secondly we estimated a full model again with explanatory valuables which were significant at the 99/95/90%. The final estimation result is shown in Table.18

Table.18 Final estimation result (Full model)

Valuables	Coefficient	t-value	p-value
Constant	6.2554	11.260	0.000***
ln(Bid)	-1.2256	-14.268	0.000***
Do you know the current situation in which there are soil erosion in farmland and much damage of maize yield (like pictures you saw now)? (YES: 1, NO: 0)	0.4250	1.708	0.088*
The maize yield in 2011/2012 season(kg)	0.0040	0.178	0.859
Yearly income(MK)	0.0056	4.190	0.000***
Do you know about Global Warming? (YES: 1, NO: 0)	1.1723	4.063	0.000***
Did your maize yield increase in 2011/2012 season compared with average of past some years'? (YES: 1, NO: 0)	0.2490	1.575	0.116
Do you practice organic compost? (YES: 1, NO: 0)	0.5185	2.308	0.022**
Is your daily meal enough? (Enough: 1, Not enough, Poor:0)	0.5239	2.406	0.017**
n	436		
Log likelihood	-456.6932		

***: significant at the 99% level, **: significant at the 95% level, *: significant at the 90% level

We can see that "Yearly income" and "Do you know about Global Warming?" are significant at the 99% level, "Do you practice organic compost?" and "Is your daily meal enough?" are significant at the 95% level, and "Do you know the current situation in which there are soil erosion in farmland and much damage of maize yield" is significant at the 90% level. The coefficients are all positive. This means every significant explanatory valuable has positive influence to the WTP, and the sign condition is satisfied considering the contents of each factor.

It is trivial that yearly income gives WTP proportional influence. Knowledge about Global Warming seems to be related to the farmers' concern about weather condition because some changes of rainfall pattern happened recent years and that phenomenon resulted in poor crop of maize. Therefore their WTP were raised.

Up to this section we estimated the economic impact of maize, tree planting, and soil, and the WTP. When we discuss them, it is necessary to be careful about the relationship between them. That is, the WTP and the other three economic impacts can't be summated. That is because the farmers considered benefits from maize, tree planting and soil, so WTP already include all kinds of benefits the farmers felt and imagined from their experiences

and our explanation. Therefore, if the WTP and the three economic impacts are summed up, it could be double count.

It is said that the summation of the economic impact of maize, tree planting and soil is equal to the WTP or smaller than the WTP theoretically because WTP includes use value and non-use value (Bateman and Willis (1999)). However, in this survey, sum of the three economic impacts is much bigger than the WTP. The reason is supposed that we set a little strong and unrealistic postulations and those caused overestimation of the three economic impacts. As an example of the postulations, we substituted averages for individual values to calculate the economic impacts of the total project area. Moreover, we assumed that all of increased maize and planted trees were sold at each average price. To ease these strong assumptions, it is necessary to conduct larger and more specific survey.

Another reason is supposedly that we could not derive the farmers' WTP adequately. That may have been because the maximum amount we showed to the farmers, 1,600MK, was too small. We should have set higher amounts in options.

Another possibility of the low WTP is that the farmers were not able to imagine they sold maize and trees well. Regarding the result of the survey, the number of people who had sold maize was just 82 (13.6%) and 51 farmers in the 82 was focused in Rafu Maunde. This means just about 4 people have a experience to sell their maize on an average in the other villages. Therefore almost all the farmers except for them were not able to envisage that they sold increased maize and planted trees and earned some money, and also to think the benefits in monetary form well.

4. Cost-Benefit Analysis

Regarding the result of our economic impact survey, the farmers practicing contour ridging benefited 7,853MK per household from increased maize and 3,150MK~22,238MK from the effect to prevent soil erosion on an average. And also, the benefit of the individual tree planting was 3,100MK per household and benefit of the direct sowing was 3,520MK per household on an average. The WTP estimated by CVM was 800~813MK on an average, and the median was 640~700MK.

Meanwhile the training cost of one practicing farmer was 608.36MK regarding the early estimation by COVAMS, which was to explain the expected budget to begin the training at new area to Malawi government. This unit cost includes monitoring cost, field allowance

and some expenses for COVAMS activity, and depreciation cost of motor bikes supplied for COVAMS extension staff based on an assumption that 20 COVAMS extension staff organizes Specified Village Training Approach (SVTA) in 200 villages for 20,000 households. This estimation is based on actual record in 2010/2011 season.

Comparing the economic impacts and cost, any economic impacts of COVAMS eclipses the cost. This means the project for COVAMS should be recognized from an economic standpoint. Moreover, we have some effects that we couldn't value in this survey. For example, we should have valued the effect of contour ridging to prevent soil siltation in the dams. The WTP is supposed not include the benefit because the farmers don't know the serious situation there and aren't given the benefit of electricity. Therefore the CVM survey should organized in urban cities and for the residents. At least, we can say that the benefit of COVAMS surpass the cost largely if the benefit of preventing soil siltation in the dams.

5. Conclusion

This survey evaluated the economic impact of COVAMS: maize increased by contour ridging, tree planting, soil kept in maize garden by contour ridging. Also, farmer's WTP for COVAMS was estimated by CVM. Table.19 shows the whole results.

Table.19 Economic impact of COVAMS

	Whole economic impact	Economic impact per household
Maize	73,563,098.78MK	7,853.43MK
Tree planting	183,665,400MK	Individual:3,100MK Direct sowing:3,520MK
Soil	29,505,280~208,302,080MK	3,150MK~22,238MK
WTP	26,864,000~27,300,540	800~813MK

This result shows COVAMS has given huge economic impact to the farmers. Moreover, the economic impact of COVAMS is much larger than that cost, so it can be said COVAMS is a very effective development project. This economic impact except for WTP is only for the 9,367 farmers practicing contour ridging and also the farmers practicing tree planting. The 244 villages COVAMS is covering have 33,580 households in total and The 24,113 households haven't practiced contour ridging. This means there is huge possibility of more economic impact. Also, the economic impact of maize was estimated based on maize

garden area in which contour ridging was already done and the economic impact of tree planting was did based on the number of already planted trees. That is, even farmers practicing contour ridging and tree planting has possibility to widen the benefit they are given because they have much area where contour ridging is not done or trees are not planted.

These economic impacts were estimated based on some strong assumptions. We already said that there were huge difference between the bag size the farmers answered and amount of the actual content, so we used the average of actual amounts in estimation. In addition, we could scale the actual amounts of very few farmers' bags, so we must say that these estimations have some error. To get more accurate estimations, it will be needed to conduct more extensive survey and collect more data. In this regard, it was harvested that student of technical college were beneficial for survey like this kind, so we should employ more to do next survey more extensively. Another necessity to avoid error and to get accurate estimation of the economic impact is supposed to be basic education to the farmers and spread of a scale method. For example, some farmers knew acre and hectare as a unit of area but the others didn't and they didn't recognize the area of their own maize gardens. In the case of latter, we had to translate the amount of maize seeds they sowed to area. This confused the employed students and generated some errors. Also they recognized the amount of maize bags from the labels on the bags and they didn't know the actual amount of those maize bags, so we had to scale actually. This is because there is no custom to scale them, so nobody had a scale at all. If they can scale their maize bags and recognize them accurately, we can save the trouble from checking and estimate the economic impact more accurately.

Although there are many difficulties to estimate economic impact, after all, it is valuable to calculate it in monetary form and evaluate projects from the view point of it because it is very easy to be understood and has big persuasion. The farmers will be able to realize how valuable contour ridging and tree planting they practice are and how much they will earn if they sell the increased maize and planted trees. Even more, it can be expected that more farmers practice aggressively and voluntarily as they hear the economic impacts. Therefore, successive survey and feedback of the result to the farmers are recommended.

Reference

1) Kohich Kuriyama (2011) “EXCEL de dekiru CVM 3.2. (Excel file & Manual)”, HP http://homepage1.nifty.com/kkuri/.

2) M. T. Chigow (2011) “Land Degradation and Rehabilitation”, Blantyre ADD Land Resources Conservation Department.

3) J.J. Chigwiya and H. Kanazawa, “The result of contour ridging practice in 2011 planting season”, COVAMS Working Paper No.13, 2012.

4) Ian J. Bateman and Kenneth G. Willis, “Valuing Environmental Preferences”, Oxford University.

Appendix

1. Group survey sheet

DAY/MONTH	NAME OF VILLAGE	GROUP CATEGORY	NAME OF STUDENT
/		Contour ridging - PRACTICED	
		A or B	
		MALE / FEMALE	

Maize Garden Area

Q.1 How much is the area of your maize garden (ha or acre)? If you don't know, answer the amount of maize seed you sowed. **※Check the unit of the farmer's answer one by one!! (ha?acre?kg?)**

	Area(unit)		Area(unit)		Area(unit)		Area(unit)
F1	( )	F7	( )	F13	( )	F19	( )
F2	( )	F8	( )	F14	( )	F20	( )
F3	( )	F9	( )	F15	( )	F21	( )
F4	( )	F10	( )	F16	( )	F22	( )
F5	( )	F11	( )	F17	( )	F23	( )
F6	( )	F12	( )	F18	( )	F24	( )

Q.2 How much is the area of your maize garden where you are practicing contour ridging (ha or acre)? If you don't know, answer the amount of maize seed you sowed. **※Check the unit of the farmer's answer one by one!! (ha?acre?kg?)**

	Area(unit)		Area(unit)		Area(unit)		Area(unit)
F1	( )	F7	( )	F13	( )	F19	( )
F2	( )	F8	( )	F14	( )	F20	( )
F3	( )	F9	( )	F15	( )	F21	( )
F4	( )	F10	( )	F16	( )	F22	( )
F5	( )	F11	( )	F17	( )	F23	( )
F6	( )	F12	( )	F18	( )	F24	( )

When you finished Q.2, come to Mr.Kanazawa or Mr.Abe, and have them check the answers.

Maize yields

Q.3 How much is the maize yields of your **TOTAL** maize garden in 2011/2012?

	Number of Bags (Bag size)		Number of Bags (Bag size)		Number of Bags (Bag size)		Number of Bags (Bag size)
F1	(kg)	F7	(kg)	F13	(kg)	F19	(kg)
F2	(kg)	F8	(kg)	F14	(kg)	F20	(kg)
F3	(kg)	F9	(kg)	F15	(kg)	F21	(kg)
F4	(kg)	F10	(kg)	F16	(kg)	F22	(kg)
F5	(kg)	F11	(kg)	F17	(kg)	F23	(kg)
F6	(kg)	F12	(kg)	F18	(kg)	F24	(kg)

Q.4 How much is the maize yields of your maize garden **where you are practicing contour ridging** in 2011/2012 season? (**Caution!! The answers of this question should be smaller than or at least same as the ones of Q.3.**)

	Number of Bags (Bag size)		Number of Bags (Bag size)		Number of Bags (Bag size)		Number of Bags (Bag size)
F1	(kg)	F7	(kg)	F13	(kg)	F19	(kg)
F2	(kg)	F8	(kg)	F14	(kg)	F20	(kg)
F3	(kg)	F9	(kg)	F15	(kg)	F21	(kg)
F4	(kg)	F10	(kg)	F16	(kg)	F22	(kg)
F5	(kg)	F11	(kg)	F17	(kg)	F23	(kg)
F6	(kg)	F12	(kg)	F18	(kg)	F24	(kg)

Q.5 How much was the average of **TOTAL** maize yields before practicing contour ridging?

	Number of Bags (Bag size)		Number of Bags (Bag size)		Number of Bags (Bag size)		Number of Bags (Bag size)
F1	(kg)	F7	(kg)	F13	(kg)	F19	(kg)
F2	(kg)	F8	(kg)	F14	(kg)	F20	(kg)
F3	(kg)	F9	(kg)	F15	(kg)	F21	(kg)
F4	(kg)	F10	(kg)	F16	(kg)	F22	(kg)
F5	(kg)	F11	(kg)	F17	(kg)	F23	(kg)
F6	(kg)	F12	(kg)	F18	(kg)	F24	(kg)

When you finished Q.5, come to Mr.Kanazawa or Mr.Abe, and have them check the answers.

Q.6 Do you produce Organic Compost and disseminate it to your maize garden?

	Circle YES or NO		Circle YES or NO		Circle YES or NO		Circle YES or NO
F1	YES / NO	F7	YES / NO	F13	YES / NO	F19	YES / NO
F2	YES / NO	F8	YES / NO	F14	YES / NO	F20	YES / NO
F3	YES / NO	F9	YES / NO	F15	YES / NO	F21	YES / NO
F4	YES / NO	F10	YES / NO	F16	YES / NO	F22	YES / NO
F5	YES / NO	F11	YES / NO	F17	YES / NO	F23	YES / NO
F6	YES / NO	F12	YES / NO	F18	YES / NO	F24	YES / NO

To confirm the number of farmers who sold or to sell

Q.7 When you sold your maize before practicing contour ridging, how many bags did you sell on an average in a season?

	Number of Bags (Bag size)		Number of Bags (Bag size)		Number of Bags (Bag size)		Number of Bags (Bag size)
F1	(kg)	F7	(kg)	F13	(kg)	F19	(kg)
F2	(kg)	F8	(kg)	F14	(kg)	F20	(kg)
F3	(kg)	F9	(kg)	F15	(kg)	F21	(kg)
F4	(kg)	F10	(kg)	F16	(kg)	F22	(kg)
F5	(kg)	F11	(kg)	F17	(kg)	F23	(kg)
F6	(kg)	F12	(kg)	F18	(kg)	F24	(kg)

Q.8 When you sold your maize before practicing contour ridging, how much was the average price of your each bag?

	Unit Price		Unit Price		Unit Price		Unit Price
F1	K	F7	K	F13	K	F19	K
F2	K	F8	K	F14	K	F20	K
F3	K	F9	K	F15	K	F21	K
F4	K	F10	K	F16	K	F22	K
F5	K	F11	K	F17	K	F23	K
F6	K	F12	K	F18	K	F24	K

Q.9 How many bags totally did you sell in 2011/2012 and will you sell hereafter?

	Number of Bags (Bag size)		Number of Bags (Bag size)		Number of Bags (Bag size)		Number of Bags (Bag size)
F1	(kg)	F7	(kg)	F13	(kg)	F19	(kg)
F2	(kg)	F8	(kg)	F14	(kg)	F20	(kg)
F3	(kg)	F9	(kg)	F15	(kg)	F21	(kg)
F4	(kg)	F10	(kg)	F16	(kg)	F22	(kg)
F5	(kg)	F11	(kg)	F17	(kg)	F23	(kg)
F6	(kg)	F12	(kg)	F18	(kg)	F24	(kg)

Q.10 When you sold your maize in 2011/2012 season, how much was the average price of your each bag?

	Unit Price		Unit Price		Unit Price		Unit Price
F1	K	F7	K	F13	K	F19	K
F2	K	F8	K	F14	K	F20	K
F3	K	F9	K	F15	K	F21	K
F4	K	F10	K	F16	K	F22	K
F5	K	F11	K	F17	K	F23	K
F6	K	F12	K	F18	K	F24	K

DAY/MONTH	NAME OF VILLAGE	GROUP CATEGORY	NAME OF STUDENT
/		Contour ridging -NOT PRACTICED	
		A or B	
		MALE / FEMALE	

Maize Garden Area

Q.1 How much is the area of your maize garden (ha or acre)? If they don't know, ask the amount of maize seed they sowed. **※Check the unit of the farmer's answer one by one!! (ha?acre?kg?)**

	Area(unit)		Area(unit)		Area(unit)		Area(unit)
F1	( )	F7	( )	F13	( )	F19	( )
F2	( )	F8	( )	F14	( )	F20	( )
F3	( )	F9	( )	F15	( )	F21	( )
F4	( )	F10	( )	F16	( )	F22	( )
F5	( )	F11	( )	F17	( )	F23	( )
F6	( )	F12	( )	F18	( )	F24	( )

Maize yield

Q.2 How much is the maize yield of your maize garden in 2011/2012 season?

	Number of Bags (Bag size)		Number of Bags (Bag size)		Number of Bags (Bag size)		Number of Bags (Bag size)
F1	(kg)	F7	(kg)	F13	(kg)	F19	(kg)
F2	(kg)	F8	(kg)	F14	(kg)	F20	(kg)
F3	(kg)	F9	(kg)	F15	(kg)	F21	(kg)
F4	(kg)	F10	(kg)	F16	(kg)	F22	(kg)
F5	(kg)	F11	(kg)	F17	(kg)	F23	(kg)
F6	(kg)	F12	(kg)	F18	(kg)	F24	(kg)

Q.3	How much was the maize yield on an average of previous seasons?							
	Number of Bags (Bag size)		Number of Bags (Bag size)		Number of Bags (Bag size)		Number of Bags (Bag size)	
F1	(kg)	F7	(kg)	F13	(kg)	F19	(kg)	
F2	(kg)	F8	(kg)	F14	(kg)	F20	(kg)	
F3	(kg)	F9	(kg)	F15	(kg)	F21	(kg)	
F4	(kg)	F10	(kg)	F16	(kg)	F22	(kg)	
F5	(kg)	F11	(kg)	F17	(kg)	F23	(kg)	
F6	(kg)	F12	(kg)	F18	(kg)	F24	(kg)	

When you finished Q.3, come to Mr.Kanazawa or Mr.Abe, and have them check the answers.

Q.4	Do you produce Organic Compost and disseminate it to your maize garden?							
	Circle YES or NO		Circle YES or NO		Circle YES or NO		Circle YES or NO	
F1	YES / NO	F7	YES / NO	F13	YES / NO	F19	YES / NO	
F2	YES / NO	F8	YES / NO	F14	YES / NO	F20	YES / NO	
F3	YES / NO	F9	YES / NO	F15	YES / NO	F21	YES / NO	
F4	YES / NO	F10	YES / NO	F16	YES / NO	F22	YES / NO	
F5	YES / NO	F11	YES / NO	F17	YES / NO	F23	YES / NO	
F6	YES / NO	F12	YES / NO	F18	YES / NO	F24	YES / NO	

To confirm the number of farmers who sold or to sell

Q.5	When you sold your maize, how many bags did you sell in one season on an average of previous seasons?							
	Number of Bags (Bag size)		Number of Bags (Bag size)		Number of Bags (Bag size)		Number of Bags (Bag size)	
F1	(kg)	F7	(kg)	F13	(kg)	F19	(kg)	
F2	(kg)	F8	(kg)	F14	(kg)	F20	(kg)	
F3	(kg)	F9	(kg)	F15	(kg)	F21	(kg)	
F4	(kg)	F10	(kg)	F16	(kg)	F22	(kg)	
F5	(kg)	F11	(kg)	F17	(kg)	F23	(kg)	
F6	(kg)	F12	(kg)	F18	(kg)	F24	(kg)	

Q.6	When you sold your maize, how much was the average price of your each bag?							
	Unit Price		Unit Price		Unit Price		Unit Price	
F1	K	F7	K	F13	K	F19	K	
F2	K	F8	K	F14	K	F20	K	
F3	K	F9	K	F15	K	F21	K	
F4	K	F10	K	F16	K	F22	K	
F5	K	F11	K	F17	K	F23	K	
F6	K	F12	K	F18	K	F24	K	

Q.7	How many bags totally did you sell in 2011/2012 and will you sell hereafter?							
	Number of Bags (Bag size)		Number of Bags (Bag size)		Number of Bags (Bag size)		Number of Bags (Bag size)	
F1	(kg)	F7	(kg)	F13	(kg)	F19	(kg)	
F2	(kg)	F8	(kg)	F14	(kg)	F20	(kg)	
F3	(kg)	F9	(kg)	F15	(kg)	F21	(kg)	
F4	(kg)	F10	(kg)	F16	(kg)	F22	(kg)	
F5	(kg)	F11	(kg)	F17	(kg)	F23	(kg)	
F6	(kg)	F12	(kg)	F18	(kg)	F24	(kg)	

Q.8	When you sold your maize in 2011/2012 season, how much was the average price of your each bag?							
	Unit Price		Unit Price		Unit Price		Unit Price	
F1	K	F7	K	F13	K	F19	K	
F2	K	F8	K	F14	K	F20	K	
F3	K	F9	K	F15	K	F21	K	
F4	K	F10	K	F16	K	F22	K	
F5	K	F11	K	F17	K	F23	K	
F6	K	F12	K	F18	K	F24	K	

2. Individual survey sheet

WTP Questionnaire

Today, along the middle Shire River, the amount of tree cut down has been increasing in proportion to the increase of population there since 1990's, and at the same time, the area of forest has been declining rapidly because a lot of trees has been used as wood fuel. Forest gives us various services. Those are not only timber, wood fuel, and food, but also keeping soil and water in ground, cleaning air, storm protection, and sand prevention. Although timber and wood fuel are kinds of the services, too much use of them leads to decrease of other services, which finally leads to some troubles of your life. Because of this huge decrease of forest area, we lose the water-holding function of forest, and the rain water run off on the ground and the water flow erode the ground. In the result, this erosion destroys farm area and forms big gullies, and gives negative influences to the residents near the river.

As seen above, deforestation and decrease of forest area that goes along with that causes soil erosion, which results in the obstacles of agriculture and livelihood. To prevent these influences becoming worse, Malawi government and Japan International Cooperation Agency (JICA) started to research the situation of forest along middle Shire River and the impact to residents, and they launch "the project for Community Vitalization and Afforestation in Middle Shire (COVAMS)" in 2007. The project of COVAMS aims to restore the forest by planting and growing, and instruct farmers about agricultural techniques and measurements against soil erosion and gullies. The project of COVAMS will not only resolve these problems, but also try to improve residential safety and the amount of agricultural production in the area.

The results of next questionnaire are going to be used just to evaluate the project of COVAMS. When you answer the questions, please be honest. We do not give you any payback even if you answer the questionnaire. Hereafter, we are going to ask you about money, but JICA will not change the principle of COVAMS and increase the amount of aid even though you express false value. This questionnaire is anonymous and we won't make sure who answers, so please put your heart at ease.

Individual Questionnaire

Check the farmer's card

Your signature	Card Number	Group Category① (Circle below)	Group Category② (Circle below)	Sex(Circle below)
		"A" or "B"	"P" or "NP"	MALE or FEMALE

※Show picture(1) and (2)(*A side*) and picture(3), (4) and (5)(*B side*), and explain the difference again.

NEXT,

Question		
Q) Do you know the current situation in which there are soil erosion in farmland and much damage of maize yield like pictures you saw now?	YES	NO

Next questionnaire is composed of hypothetical questions about the project of COVAMS. As a hypothetical situation, please assume that JICA is considering the discontinuance of the project of COVAMS. Also, please envisage that if the project of COVAMS breaks off, the situation of agriculture and gully gets back to previous situation that there is no contour ridging and measurement against gully. That is, when it rains heavily, your farm area would be destroyed and gullies would emerge.

However, suppose that JICA can continue this project if you pay an amount of money below for JICA. That is, if you practice contour ridging and tree planting, your farm area and tree area is kept as they are. If you haven't practiced them yet, you can begin them hereafter. Please be careful that paying the amount of money means decrease of your income you can use for food, utilities, and all of things you need or you want.

Q.1(Circle YES or NO)		
① Will you pay 200K in a year to have COVAMS continued?	YES(Go on to ①)	NO(Go on to ②)
Caution! Don't ask both ① and ②. Just one of the two.		
②If "YES", Will you pay 400K in a year to have COVAMS continued?	YES (Go on to Question(**3**))	NO (Go on to Question(**3**))
③If "NO", Will you pay 100K in a year to have COVAMS continued?	YES (Go on to Question(**3**))	NO (Go on to Question(**2**))

Q.2 Why won't you pay any money for COVAMS? **(Check✔)**	
1. I don't recognize the value of COVAMS.	
2. I don't believe JICA use money appropriately.	
3. I don't have enough money.	
4. I don't understand this questionnaire.	
5. The amount of money I want to pay is smaller.	

Q.3 Yearly Income
K( )

Q.4 Age
( ) Years Old

Q.5 Academic Background (Check✔)	
Sindinapite kusukulu	
Pulayimale	
Sekondale	
Sukulu ntchito ya manja	

Q.6-10(Circle YES or NO)		
(6) Is your impression to JICA "Good"?	YES	NO
(7) Do you know about Global Warming?	YES	NO
(8) Do you know about Ecosystem Services?	YES	NO
(9) Do you know about Biodiversity?	YES	NO
(10) Do you think your life was improved by COVAMS?	YES	NO

Q.11	How many times do you eat meals in a day?	Number of meals

Q.12	How do you think about your current amount of eating (breakfast, lunch, dinner) in a day? (Read all alternatives first.)	Feeling	Check✔
		Enough	
		Not enough	
		Poor	

Group activity about tree planting

Q.13	Do you practice the group activity of tree planting? **(If "NO" in Q 13, go to Q.16.)**	Yes or No (Circle)
		Yes / No

Q.14	Where did you plant seedlings in the group activity? (Read all alternatives first. Multiple answers allowed)	Place	Check✔
		River Bank	
		Home premises	
		Village Woodlot	
		Garden	

Q.15	How many seedlings did you plant in the group activity? (Read all alternatives first.)	Number of seedlings	Check✔
		0 – 250	
		251 – 500	
		501 – 750	
		751 – 1000	
		1001 – MORE(please ask "how much it is", and write down it)(_____)	

Individual tree planting

Q.16	Do you practice tree planting individually? **If "NO" in Q 16, go to Q.19.**	Circle YES or NO
		YES / NO

Q.17	Where did you plant seedlings individually? (Read all alternatives first. Multiple answers allowed)	Place	Check✔
		River Bank	
		Home premises	
		Personal woodlot	
		Garden	

Q.18	How many seedlings did you plant in the individual activity?	Number of seedlings	Check✔
		0 – 10	
		11 – 20	
		21 – 30	
		31 – 40	
		41 - 50	
		51 – MORE(please ask "how much it is", and write down it right)(_____)	

Q.19	Do you have natural regeneration area? **If "NO" in Q 19, go to Q.21.**	Circle YES or NO
		YES / NO

Q.20	How much is area of the natural regeneration area?(ha or acre)	AREA

Q.21	Do you practice direct sowing? **If "NO" in Q 21, go to Q.23.**	Circle YES or NO
		YES / NO

Q.22	How many stations did you sow?	Number of station

Q.23	Where do you get wood fuel usually? (Read all alternatives first.) **(If "Buying" or "Use charcoal" or "Anyhow", skip next Q.24, Q.25, and Q.26, and go to Q.27.)**	Place	Check✔
		Own woodlot	(If so, **go** to 24, 25 and 26)
		Communal woodlot	(If so, **go** to 24, 25 and 26)
		Homestead	(If so, **go** to 24, 25 and 26)
		Buying	(If so, **skip** 24, 25 and 26)
		Use charcoal	(If so, **skip** 24, 25 and 26)
		Anyhow	(If so, **skip** 24, 25 and 26)

Q.24	How many hours do you need to collect wood fuel? (Read all alternatives first.)	hours	Check✔
		1 hour	
		2 hours	
		3 hours	
		4 hours	
		5 hours	
		6 hours	
		more than 6 hours	

Q.25	Do you think the time to collect wood fuel is increasing?	Circle YES or NO
		YES / NO

Q.26	How long can you utilize the collected wood fuel? (Read all alternatives first.)	days	Check✔
		1day	
		2 days	
		3 days	
		4 days	
		5 days	
		6 days	
		more than 6 days	

Q.27	Why do you think your maize yield increased? (Read all alternatives first. One farmer can choose only one alternative.)	reason	Check✔
		Not increased	
		Contour ridging	
		Organic compost	
		Weather condition	
		Chemical fertilizer	
		Chemical pesticide	
		I don't know why	

Q.28	If you don't practice contour ridging currently, do you want to begin contour ridging after encouragement and explanation? (If the farmer has already practiced, skip this question.)	Circle YES or NO
		YES / NO

Q.29	If you don't practice tree planting neither in group nor individually, do you want to begin tree planting after encouragement and explanation?(If the farmer has already practiced, skip this question.)	Circle YES or NO
		YES / NO

Q. 30 What are your family members' occupations?(Check✔)	
Maize farmer	
Maize and Vegetable farmer	
Maize farmer and Another	
Maize farmer and Vegetable farmer and Another	

Finish‼ Thank you for your cooperation‼
(Please give this sheet to Mr.ABE and receive a new sheet.)

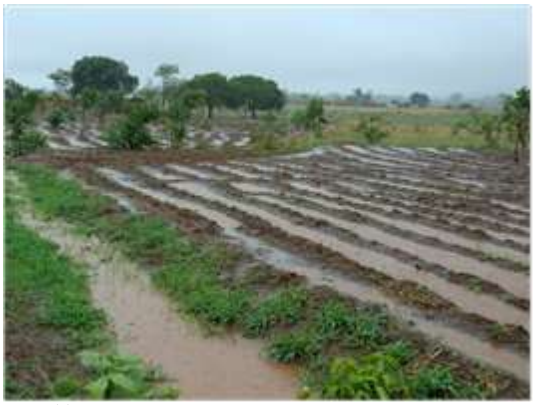
3.Pictures used in the individual survey

A side

Picture(1):Farmlands were damaged by floods because the ability to keep water in forest and farmlands became weaker.

Picture(2):Large gullies happen by deforestation.

B side



Picture(3):Contour ridging. You can see the rainwater doesn't run off but is kept in farmland.

Picture(4):A Measure against gully

Picture(5): Tree planting