

CHAPTER 5

TECHNICAL EFFICIENCY OF MICROFINANCE AND FARM HOUSEHOLD PRODUCTION

As mentioned in chapter 4, it can be seen that the operation of microfinance plays a role as a funding source for members to invest in the agricultural sector. Therefore, this chapter will discuss the of microfinance operation and the technical efficiency of farm households along with factors that affect the efficiency of microfinance operation and the technical efficiency of farm household members. This data is derived from analyzing information from 100 groups of microfinances and 399 household.

5.1 Efficiency of microfinance

5.1.1 Operation of microfinance

From the analysis of the operations of microfinances that have been mentioned in chapter 4, it can be said that the operations of credit unions have a higher average result than production groups in all aspects. To exemplify, credit unions have a larger number of members, 1,203, which is more than six times that of production groups. Moreover, credit unions have 25 times more savings, 58 times more deposits, and 24 times more loans in comparison with the production groups; despite having the same number of fulltime employees (see Table 5.1). This indicates that the operation of credit unions is more effective.

Table 5.1 Average operation of microfinance in some aspects.

Operational	Production group	Credit union	Average total
Number of members(person)	158	1,023	426
Number of fulltime employee(person)	4	4	4
Loan (baht/year)	972,989	23,658,946	8,005,635
The value of land, building, and other assets (baht)	75,767	2,265,164	754,479
Deposit (baht)	321,874	8,068,410	2,723,300
Credit union rent deposit (baht)	95,609	5,559,256	1,789,340
Capital stock (baht)	652,885	12,285,872	4,259,111
Retained earnings (baht/year)	32,583	769,938	261,163
Member benefit fund (baht/year)	8,364	229,104	76,793
Number of sample(group)	69	31	100

Source: from survey.

5.1.2 Efficiency of microfinance

The study of efficiency of operation is of a sample of 100 microfinances. The data collected from the survey becomes variables in evaluation of technical efficiency of the operation. These variables include product variables, which are loans given to member having values equivalent to 8,005,635 baht/year/group; an average net profit of 548,533 baht/year/group; an average investment in other assets of 1,576,532 baht/year/group; and an average member benefit fund of 126,379 baht/group. Production variables include average capital stock at 4,259,111 baht; an average value of physical capital at 236,480 baht/group; average loans including all types of deposit at 3,757,449 baht/group; and average employee wages of 67,517 baht/group (Table 5.2).

From the analysis of the effective level of operation among saving groups by using the data development analysis model (DEA), it can be said that the effective level of saving groups are drastically different, considering the maximum value (0.81-1.00) to the minimum value (lower than 0.21), and the overall effective level is rather

low for its average level is only 0.0464. The sample is effective at the level of 0.21-0.40 to 34% of the sample (Table 5.3). However, the most effective microfinance from the sample is at 21%. It can be observed that credit union groups are more effective than production groups. Credit union groups have the highest effectiveness at 38.71% of all credit union groups, compared to production groups, which only have an effective level of 26.09%. Many production groups have low to the lowest effective level (62.32%). Moreover, the average effective level of credit unions is higher than production groups (0.531 and 0.434, respectively). Nonetheless, it is observable that microfinances that have high to the highest effective level are the groups that have a large number of member, working capital, and have been established for a long period of time. On the contrary, the saving groups which have low to lowest effective level will often have completely opposite qualities: low membership size and low working capital. This is to say that the level of effectiveness directly correlates with performance variables (Table 5.4).

Table 5.2 The data of variables used in the study.

Variables for the Output (O)	Maximum Value	Minimum Value	Average
O ₁ : Loan given to members (baht)	233,819,260	32,000	8,005,635
O ₂ : Net profit (baht/year)	16,065,296	- 977,636	548,533
O ₃ : Money invested in other assets (baht)	29,297,488	2,123	1,576,532
O ₄ : Member benefit fund	3,043,093	540	126,379
Variables for the production input(F)			
F ₁ : Capital stock (baht)	93,102,930	2,759	4,259,111
F ₂ : Value of physical capital (baht)	4,394,623	610	236,480
F ₃ : Loans,savings, and deposits (baht)	93,861,681	1,711	3,757,449
F ₄ : Employee wages (baht/year)	836,565	500	67,517

Source: from survey and calculation.

Table 5.3 Level of technical efficiency of microfinance.

Level of effectiveness Saving groups		Production Groups			Credit Unions			Total		Weighted Mean TE
Rating	Definition of efficiency	Amount	Percentage	Average TE	Amount	Percentage	Average TE	Amount	Percentage	
0.81-1.00	Highest	16	23.19	0.991	5	16.13	0.921	21	21.00	0.974
0.61-0.80	High	2	2.90	0.612	7	22.58	0.667	9	9.00	0.655
0.41-0.60	Medium	8	11.59	0.489	9	29.03	0.495	17	17.00	0.492
0.21-0.40	Low	25	36.23	0.291	9	29.03	0.295	34	34.00	0.292
0.00-0.20	Lowest	18	26.09	0.095	1	3.23	0.088	19	19.00	0.094
Total		69	100	0.434	31	100	0.531	100	100	0.464

Source: from calculation.

Table 5.4 The level of efficiency and performance of microfinance.

Level of efficiency	performance				
	Number of members (person)	Working capital (baht)	Net profit (baht)	Loans given to members (baht)	Member benefits fund (baht)
0.00-0.20	152	685,289	- 42,173	436,982	4,050
0.21-0.40	269	1,737,511	153,392	1,935,380	51,038
0.41-0.60	453	2,805,502	297,240	3,493,328	95,934
0.61-0.80	477	8,138,742	781,595	11,412,264	107,510
0.81-1.00	885	12,617,555	1,509,719	26,874,334	184,668

Source: survey and calculation.

5.1.3 The problem of input slack in microfinance

According to the aforementioned low technical efficiency level of microfinance, it's estimated that microfinances have ineffectively managed their input factors which results in input slack. The microfinance could decrease input factors and would still receive similar input. The results from the DEA analysis model found that 47% of all the saving groups are facing problems of input slack. The production groups will need to decrease input to 49.27 % of all production groups. As for the credit unions, there are groups that should decrease input to 41.93% of all credit unions. However, if inputs that should be decreased are taken into consideration, it is evident that most of the microfinances will only have to decrease one input (Table 5.5).

Table 5.5 Number of groups and the number of inputs that must be decreased.

Number of input	Production Group		Credit Union		Total	
	Amount	%	Amount	%	Amount	%
1 input must be decreased	26	37.68	4	12.90	30	30.00
2 inputs must be decreased	7	10.14	6	19.35	13	13.00
3 inputs must be decreased	1	1.45	3	9.68	4	4.00
Total of groups that have to be decreased	34	49.27	13	41.93	47	47.00
Total of groups that do not have to be decreased	35	50.73	18	58.07	53	53.00

Source: from calculation.

Nevertheless, if other characteristics of microfinance are considered, it is clear that the groups that need to decrease many inputs are likely to be the groups which have many members along with funding for loans and operating capital. However, the net profit of these groups is decreased (which is true for both production groups and credit unions as seen in Table 5.6). The cause of this dilemma is that the groups face the problem of members' outstanding debts. The groups who do not have this problem use a solution of limiting the amount of loans given to members as in the case of Ban Tung Yao credit union cooperative.

Inputs that microfinances need to decrease include all inputs according to DEA models because the groups have surplus loans that are as high as 11 million baht, followed by fixed assets (5 million baht) according to Table 5.7. When comparing the two types of microfinance, the details of surplus input are as follows:

1) Fixed assets: the microfinance will have to decrease these types of assets by 36%, and the value that has to be decreased on average per group of this type of input is equivalent to 1,645,005.7 baht/group. Comparing the types of microfinances, it can be found that production groups will have to decrease the inputs

more than credit union groups by decreasing an average of 724,575.40 baht/group, which is 4.5 times more than credit union because credit unions groups only have to decrease inputs on average by 160,835.20 baht. This shows that credit unions are more efficient in using fixed assets than production groups.

2) Loans which have deposits from members is the second input that needs to be decreased. The microfinance needs to decrease deposits by 14% or on an average 2,456,672.1 baht/group. Credit unions will need to decrease deposits by 3,966,488 baht/group. On the other hand, production groups must decrease loans by an average of 946,855.80 baht/group. This is because most credit unions open for business every day and acquire deposits from members causing the higher deposit amount. As for most production groups, the groups are not open every day. From the survey data, it shows that most production groups only open 1-2 times/month and they are not likely to receive deposits from members. Besides, the survey also shows that some members of credit unions work outside of the agricultural sector. For example, some credit union members are civil servants or merchants, which causes deposits from credit unions to be higher than the production groups in which the majority of members work in the agricultural sector.

3) In terms of employee wages, 12% of the groups could potentially lower their wages on average by 46,640.60 baht/group. Credit unions will need to lower their employee wages by 93,175 baht/group on average, while production groups will need to decrease employee wages on average by only 106.2 baht/group. This is because most credit unions are open every day, so their employees are employed fulltime, while that is not necessary for production groups as they are not open every day.

4) Capital stock: In terms of capital stock, 8% of microfinances do not sufficiently utilize their capital stock; the value that needs to be decreased on average is 442,705.3 baht /group. In other words, credit unions who have a technical efficiency level of high to very high are able to manage their capital stock well, so they do not have to lower this type of input at all. In other words, credit unions will only need to decrease capital stock by 160,835.20 bath/group, while production groups need to decrease capital stock by 724,575.40 bath/group, which is 4.5 times higher than credit unions. Looking at the overall data, it can be seen that credit unions are more efficient at capital stock management than production groups. Still, one of the reasons that microfinances have a remaining operating fund is because their committee members are afraid of their members' inability to repay the loan so the groups protect and distribute risk by limiting their members' credit lines. As a result, these microfinances have operating capital from the remaining capital stock because microfinances, especially credit unions, set a limit requiring their members to have a minimum deposit of 100 baht per month. Thus, any group which does not have remaining capital stock will face the problem of excess liquidity even though their members still have loan demand.

Table 5.6 Overall operations of microfinances that need to decrease input.

Number of input which must be decreased	Production group				Credit union				Total microfinance			
	Members (person)	Loan given to members (baht)	Net profit (baht)	Operating capital (baht)	Members (person)	Loan given to members (baht)	Net profit (baht)	Operating capital (baht)	Members (person)	Loan given to members (baht)	Net profit (baht)	Operating capital (baht)
None	164	1,064,947	86,257	696,151	1,284	38,133,823	2,243,149	19,763,886	531	13,183,618	791,395	6,929,834
1 input	143	788,681	61,321	678,657	483	2,281,038	219,886	2,899,857	189	987,662	82,463	974,817
2 inputs	178	1,103,241	41,931	558,276	816	6,877,020	562,137	6,172,212	497	3,990,131	294,860	3,365,244
3 inputs	202	1,634,691	27,584	256,097	740	9,296,343	136,387	7,013,795	606	7,380,930	112,773	5,324,370

Source: survey and calculation.

Table 5.7 Size of input slack of microfinance.

Inputs which must be decreased		Technical efficiency value of Production Groups (PG) ¹					Technical efficiency value of Credit Unions (CU) ¹				
		Highest	High	Medium	Low	Lowest	Highest	High	Medium	Low	Lowest
Capital stock (baht)	Amount	1	2	2	1	0	0	0	1	1	0
	Percentage ²	1.45	2.90	2.90	1.45	0.00	0.00	0.00	3.23	3.23	0.00
	Input slack ³	1,376,231	1,488,797	462,709	295,140	0	0	0	402,088	402,088	0
Value of fixed assets (baht)	Amount	2	3	3	11	5	2	2	5	2	1
	Percentage	2.90	4.35	4.35	15.94	7.25	6.45	6.45	16.13	6.45	3.23
	Input slack	163,517	824,033	94,662	342,773	691,249	3,900,201	2,030,927	5,300,624	652,886	2,449,185
Loan (baht)	Amount	1	3	3	3	1	0	1	1	0	1
	Percentage	1.45	4.35	4.35	4.35	1.45	0.00	3.23	3.23	0.00	3.23
	Input slack	2,531,910	890,442	382,648	713,822	215,457	0	8,232,470	11,350,489	0	249,483
Employee wages (baht)	Amount	0	1	1	0	0	2	1	4	2	1
	Percentage	0.00	1.45	1.45	0.00	0.00	6.45	3.23	12.90	6.45	3.23
	Input slack	0	307	224	0	0	93,873	132,997	82,061	11,942	145,002

Note: 1. PG stands for production groups and CU stands for credit union.

2. Percentage refers to percentages for the sample in each type of microfinance.

3. Input slack.

Source: from calculation.

However, if looking at the size of input slack of microfinance in comparison to efficiency, it can be seen that production groups of the high-highest technical efficiency level have the most capital stock. The production groups have the least technical efficiency do not have capital stock surplus. By contrast, only credit unions which have a low to medium the technical efficiency level have capital stock surplus. Surprisingly, considering the value of fixed assets, groups which have the lowest efficiency have higher value of fixed asset surplus than the groups that have the highest technical efficiency level. As for credit unions, the analysis shows that groups that have medium to highest technical efficiency levels have more fixed asset value than groups that have high and low technical levels. It is observable that every technical efficiency level has asset surplus. Credit unions have more asset surplus than production groups. However, in terms of loans and all types of deposits, it is

found that every technical efficiency levels has surplus loans; the groups that have the highest technical efficiency levels would have the largest size of surplus loans, and the groups that have the least technical efficiency will have the smallest size of surplus loans. However, this differs from credit unions in which ones with medium technical efficiency levels have the largest size of loans. The groups which have the highest and lowest technical efficiency level do not have this particular problem. When considering the surplus input regarding employee salary, it is found that production groups with medium to high technical efficiency have surplus employee salary and wages. As for the credit unions, the data shows that every level of technical efficiency has a surplus employee wages problem. The groups that have the lowest technical efficiency levels have the highest employee wages surplus (Table 5.7).

Nonetheless, in reality, many microfinances cannot lower some inputs such as capital stocks because it is a major source of operating funding. Therefore, the microfinance will have to increase effectiveness in managing input slack to increase technical efficiency. From analyzing output slack, it is discovered that if microfinances fully utilize surplus inputs, they will be able to increase these following outputs:

- 1) Loans, namely surplus inputs of capital stocks and of deposits from members: If a microfinance is able to distribute more loans to members, then the loans will be considered their major source of income. The analysis also shows that the microfinance should increase the amount of loans to their members by an average of 1,350,410 baht/group (for groups that have surplus). Credit unions will need to increase loans to their members by an average of 2,423,434 bath/group, which is almost 9 times higher than production groups. Moreover, production groups will need

to increase loans to their members by an average of 277,387 baht/group (Table 5.8). If the microfinance is able to increase the amount of loans given to their members, this will increase their income generated from interest. In doing so, it will also affect the effectiveness of group operation. Nevertheless, the survey data shows that the microfinance is able to give more loans to their members because their loan limit is not very high due to their fear of bad debt. This is especially true for a microfinance which has not been established for long and has low operating capital. By contrast, credit unions that have registered as a cooperative will not have this particular problem because they are able to perform a legal transaction to mortgage real estate that the members use as collateral because they have become a legal entity. On the other hand, unregistered microfinances, especially production groups, will not be able to request other types of property except to ask their members to cosign the loans, which causes the limit of the amount that can be borrowed. To exemplify, Ban Tung Yao credit union has a high operating capital surplus because the intended credit line for each member does not exceed 60,000 baht/person.

2) Net profit: When looking at the inputs that needs to be decreased other than capital stock and loan, there still remains value of fixed assets and employee wages. For these mentioned inputs, if the microfinance can completely utilize these inputs, there will be higher net profit. This is to say that if the microfinance is effective in management, especially in terms of giving loans to their members, these aforementioned inputs will foster business transactions of this microfinance, which will positively increase their profit and result in the effective operation of the groups. Furthermore, the analysis also demonstrates that microfinances could increase their profit to 508,853.50 baht/group. Credit unions

would be the groups which would have to increase the most with a net profit to 862,496.50 baht/group; this is more than production groups which will have to increase net profit to 155,210.50 baht/group, which is 6 times less than credit unions (Table 5.8). At this point, it can be deduced that production groups do not fully employ their input potential causing a lack of opportunity to seek net profit. In other words, microfinances invest in fixed assets and hire employees more than is necessary, which results in high assets, especially in fixed assets.

Table 5.8 Output slack of microfinance.

Inputs that need to be increased		Level of technical efficiency as categorized according to group type									
		Production group					Credit union				
		Highest	High	Medium	Low	Lowest	Highest	High	Medium	Low	Lowest
Loan	Amount	2	4	7	6	0	1	2	2	2	0
	Percentage	2.90	5.80	10.14	8.70	0.00	3.23	6.45	6.45	6.45	0.00
	Surplus	163,111	268,847	436,013	518,964	0	8,507,324	1,956,474	938,481	714,889	0
Net profit	Amount	2	5	2	7	4	1	0	4	3	1
	Percentage	2.90	7.25	2.90	10.14	5.80	3.23	0.00	12.90	9.68	3.23
	Surplus	104,266	25,651	31,093	44,570	104,841	84,282	0	80,536	107,628	1,452,547

Source: from calculation.

5.1.4 Returns to scale and economy of scale of microfinance

The purpose of microfinance operation is to meet the demand of the highest production and operation of the groups directly correlating to expenses of operating capital. The operation of ineffective inputs will result in higher operating capital. Thus, a microfinance will need to use inputs that are efficient and use the least amount of capital that will cause the groups to receive the most net profit. Microfinance is a production unit that transforms inputs to products, which is called production function. The microfinance here demonstrates the correlation between inputs and

products by indicating the quantity of the product depending on the amount of inputs that are used during the production process.

The consideration for return to scale will analyze the results of changes in inputs simultaneously in order to see how it will affect the quantity of total production. Thus, analysis of return to scale will be concerned long term production operation by analyzing the following aspects:

1) If the ratio of increase in all inputs is equal to the ratio of increase of production, this process is referred to as constant returns to scale (CRS). For example, if all the inputs are doubled and the technical efficiency is doubled, then it means the return is constant.

2) If the ratio of increase in inputs is more than all types of inputs, this type of return is referred to as increasing returns to scale (IRS).

3) If the increase in products is less than the ratio of increase in all types of inputs, then this type of return is called decreasing returns to scale (DRS).

In consideration of the returns to scale of the microfinance, the analysis shows that the majority of the groups (69%) has DRS. Only 7% of the microfinances have CRS. The remaining groups (24% of the groups) have IRS. When analyzing the groups in detail, it can be seen that almost all credit unions have the technical efficiency in the level of DRS and 59% of production groups are in the DRS level as well. This is because these groups have less members when compared with existing operating capital, so the groups increase credit limits to their previous borrowers to the point that marginal technical efficiency of investment (MEI) of borrowers decreases and they are unable to repay the loans according to the agreement. This microfinance then has debts, and this affects net profit. However, 32% of production

groups operate under the IRS level because the level of loans given to members is low. The operating capital of these groups tends to be deposited with banks. Thus, production groups are able to expand their technical efficiency by using operating funds to extend more loans to their members.

In considering the returns to scale compared to the technical efficiency level of microfinances, it can be seen that 42 microfinances are in the DRS level also 60.87 percent of all microfinance that are in the DRS level are in the technical efficiency level of 0.0000-0.4000 (low-lowest). Furthermore, among the microfinances that have the technical efficiency level of 0.6001-1.000 (high-highest), there are 20.29% of all the microfinances which are in the DRS level (14 groups). 45.83 % of all the microfinances are in the IRS level as they are in the technical efficiency level of 0.6001-1.000 (high-highest). Nine groups (or 37.50%) are in the technical efficiency level of 0.4000 (low-lowest), none of which are credit unions. Looking at microfinances that are in the CRS level, it is found that only 7 groups fit into this category and only one credit union fits into this category along with 4 production groups. It can be noticed that the majority of the groups (71.37%) are in the technical efficiency level of 0.8001-1.000 (highest). There are two groups that have the lowest level of technical efficiency (not exceeding 0.2000) (Table 5.9). It can be concluded that most of the microfinances in the DRS level are groups that have low technical efficiency levels. On the other hand, microfinances which are in CRS and IRS levels are groups that have high-highest level of technical efficiency. Testing of the relationship between the level of technical efficiency and returns to scale by using *Chi-Square test* implies that there are major statistical implications at the level of 0.01. From the aforementioned analysis, it can be seen that the majority of

microfinances with low technical efficiency levels will have to decrease the size of production to decrease cost of production or increase skills in input management in order to increase income which will help increase net profit.

Table 5.9 Returns to scale and the level of technical efficiency of microfinance.

Level of technical efficiency	Production groups			Credit unions			Overall		
	CRS	IRS	DRS	CRS	IRS	DRS	CRS	IRS	DRS
0.8001-1.0000	4	8	4	1	1	3	5	9	7
0.6001-0.8000	0	1	1	0	1	6	0	2	7
0.4001-0.6000	0	4	4	0	0	9	0	4	13
0.2001-0.4000	0	5	20	0	0	9	0	5	29
0.0000-0.2000	2	4	12	0	0	1	2	4	13
Total	6	22	41	1	2	28	7	24	69

Note: CRS refers to constant returns to scale

IRS refers to increasing returns to scale

DRS refers to decreasing returns to scale

Source: from calculation.

However, by comparing the returns to scale in conjunction with surplus inputs, it is found that microfinances that have returns in the DRS level have higher membership, operating capital, and employee wages than microfinances that have returns in the IRS level. Still, microfinances in DRS level give more loans to their members and have lower average net profit than microfinances that are in the CRS level (Table 5.10). This phenomenon happens to groups that have high membership so that they are able to raise more operating funds. While they face problem of non-performing loans, they can solve the problem by reducing the amount of loans given which reduces net profit.

Table 5.10 Comparing returns to scale with surplus inputs.

Returns to scale	Number of members (person)	Operating fund	Loans	Net profit	Employee wages
IRS	202	988,241	599,845	85,312	4,332
CRS	176	10,414,129	10,036,313	1,687,577	10,972
DRS	530	11,789,014	9,609,884	609,410	90,751

Source: survey and calculation.

5.2 Farm household and technical efficiency

The purpose of establishing a microfinance is to be a source of funding for farm households to provide quality inputs to be used in production. It is a hope that the result of the microfinance establishment will help farm households subsidize appropriate inputs and quality factors to increase effectiveness. According to the data analysis of 399 farm households that are members of a microfinance, the economic and demographic characteristics of the farm households as well as the analysis of technical efficiency are as follows:

5.2.1 Characteristics of farm households

From the sample of farm households, it is found that most of the heads of the households are middle-aged (around 39-53 years old). This majority is composed of 202 households or 50.62% of the sample. Secondly, the head of the household is between 54-68 years old in 159 households or 39.85% of the sample. As for the level of education, the survey shows that most of the heads of family have graduated primary school: 236 households or 59.16% of the sample. Secondly, 72 households (18.04%) and 55 household (13.78%) graduated from junior high school and high school respectively. As for marital status, 85.67% (or 343 households) of heads of the families from the sample are married (Table 5.11).

Table 5.11 Characteristics of heads of farm households from the sample.

Age range (years)	male		female		Total	
	Amount	Percentage	Amount	Percentage	Amount	Percentage
24-38	12	3.01	12	3.01	24	6.02
39-53	133	33.33	69	17.29	202	50.62
54-68	108	27.07	51	12.78	159	39.85
69-83	10	2.51	1	0.25	11	2.76
84-98	2	0.50	1	0.25	3	0.75
Level of education						
Uneducated	5	1.25	5	1.25	10	2.50
Primary school	155	38.85	81	20.30	236	59.15
Junior high school	55	13.78	17	4.26	72	18.04
High school / vocational certificate	32	8.02	23	5.76	55	13.78
Associate degree/high vocational certificate	9	2.26	3	0.75	12	3.01
Bachelor degree	9	2.26	4	1.00	13	3.26
Higher than bachelor degree	0	0.00	1	0.25	1	0.25
Status						
Single	6	1.50	12	3.01	18	4.51
Married	250	62.66	93	23.31	343	85.97
Widowed	3	0.75	18	4.51	21	5.26
Divorced	4	1.00	8	2.01	12	3.01
Separated	5	0.50	3	0.75	8	1.25

Source: from survey.

In terms of economics, households that are members of credit unions have higher economic status than those in production groups when incomes from inside and outside the agricultural sector are considered. The savings including personal investment funds are higher than households in production group while expenditures in agricultural investment, consumer expense, and debts are lower (Table 5.12). This data reflects that the economic status of households in credit unions is better than that of households in production groups.

Table 5.12 Characteristics of the household sample.

Aspect	List	Production group	Credit union	Overall
Economic	1) average gross income from agriculture (baht/year)	230,595	271,671	257,899
	2) average non-farm income(baht/year)	82,074	97,598	90,683
	3) average expenditures in agricultural sector(baht/year)	99,130	40,665	56,994
	4) average consumer expenses (baht/year)	100,328	93,207	99,502
	5) average debts(baht/year)	91,133	53,398	79,406
	6) average saving(baht/year)	59,644	86,815	72,142
	7) average assets for investment(baht/year)	93,466	90,043	92,397
	8) average personal investment(baht/year)	59,644	196,392	102,142
	9) average loan from microfinance (baht/year)	14,229	31,629	19,636
	10) average loan from other source (baht/year)	78,623	29,056	63,219
	11) average source of institution that receives loan(sources)	2	1	1
Production	12) characteristics of farm household			
	12.1) rice farming	89 (32.36)	63 (50.81)	152 (38.10)
	12.2) farming (other than rice)	8 (2.91)	26 (20.97)	34 (8.52)
	12.3) raising livestock	3 (1.09)	2 (1.61)	5 (1.25)
	12.4) rice farming in combination with other plants	62 (22.55)	17 (13.71)	79 (19.80)
	12.5) growing other plants in combination with raising livestock	6 (2.18)	0 (0.00)	6 (1.50)
	12.6) rice farming and raising livestock	107 (38.91)	16 (12.90)	123 (30.83)
	13)average labor(person)	2	2	2
	14) average household member(person)	4	4	4
	15) average experience in agriculture(years)	22	24	23
	16) average times in training (times)	3	2	3
17) average farm size (rai) for production	14	9	13	

Source: survey and calculation.

As for production, the survey shows that most households in credit unions (58.01%) only do rice farming. Secondly, the households that grow other types of plants are 20.97% of the sample. There are no households that grow other plants in combination with raising livestock. While the majority of households in the

production groups (38.91%) farm rice and raise livestock. Secondly, 32.26% of the households that are members of production groups only grow rice. The data also shows that most microfinance members still do rice farming (38.10% of the sample). Secondly, microfinance members which grow rice in combination with raising livestock comes to 30.83 % of the sample. The number of members and labor in the households with experience in agriculture from both groups are similar, but the size of the farm is not. Farms belonging to households in production groups are bigger than the farms of credit union members by five rai (Table 5.12).

5.2.2 Technical efficiency of farm households who are members of microfinances

The study of technical efficiency of farm households has a samples of 399 households (one is missing because the data was incomplete). In the area of Chiang Mai and Chiang Rai, the data received from survey which becomes variables in evaluating the technical efficiency, are products and inputs (Table 5.13).

Farm households have incomes from farming rice of 147,503 baht/household. The second source of income comes from other types of farming such as keeping livestock, which is on average 141,130 baht/household. Incomes outside of the agricultural sector are on average 105,476 baht/household, and incomes outside the farming are at 100,683 baht/household. The range between the different types of incomes is extremely varied because the households have different types of resources.

On average, households own 13 rai for agriculture. The household which has the least amount of land owns one rai, and the household with the most amount of land owns 72 rai. On average households have loans from microfinance at only 33,626 baht/year/household. The majority of their loans, however, come from other sources

at 165,949 baht per year on average. This shows that farmers need to rely on other sources of funding more than microfinance. The average assets for investment are 92,442 baht/year/household.

Table 5.13 Variables used in the study.

Output variables (y)	Min. value	Max. value	average
Y ₁ =Net income from agriculture(baht/year)	3,000	1,820,000	147,503
Y ₂ =Net income from other farming (baht/year)	3,750	911,000	141,430
Y ₃ =Net income outside of agriculture (baht/year)	2,200	960,000	105,476
Y ₄ =Net income from outside of farming (baht/year)	2,000	948,000	100,683
Variables for production input (x)			
X ₁ =Quantity of land (rai)	1	72	13
X ₂ =Personal investment (baht/year)	2,150	1,635,355	138,459
X ₃ =Loan from microfinance (baht/year)	6,500	370,000	33,626
X ₄ =Loan from other source (baht/year)	5,000	1,560,000	165,949
X ₅ =Value of assets used in production (baht)	2,520	2,392,000	92,442
X ₆ =Household labor (working day:day)	1	6	2

Source: survey and calculation.

From the efficiency analysis using the DEA model (equation 3.1-3.5), it is shown that the average technical efficiency level is very low (0.2593). This is because the majority of households (62.15%) have a technical efficiency level of less than 0.10. Thirty-four farm households are in the highest level of technical efficiency (or at 8.52% of the sample). Eleven households (2.76%) are in the high level of technical efficiency. Thirty-three households (8.27%) are in the medium level of technical efficiency. Lastly, seventy-three households are in the low technical efficiency level (18.30 %).

However, from considerations based on the type of microfinance, members who belong to credit unions and production groups have a relatively close level of technical efficiency, and mostly the level of technical efficiency is in low-lowest level or 77.35% and 71.92% relatively (Table 5.14). This is because the characteristics of

the households from both groups are similar in terms of economic status and technical efficiency (appendix Table 6 and 7).

Table 5.14 Level of technical efficiency among farm households and returns to scale.

Technical efficiency level of farm households		Types of microfinance the households are members(%)		Total (%)	Average TE	Overall economy of scale		
Level of score	Definition of TE	Production group	Credit union			CRS	IRS	DRS
0.8001-1.0000	Highest	8.12	9.38	8.52	0.9913	23.26	17.24	1.57
0.6001-0.8000	High	2.58	3.13	2.76	0.6687	2.33	8.62	1.57
0.4001-0.6000	Medium	7.38	10.16	8.27	0.5102	11.63	12.07	6.27
0.2001-0.4000	Low	8.82	17.19	18.30	0.2797	22.09	20.69	17.25
0.0000-0.2000	Lowest	63.10	60.16	62.15	0.1000	40.70	41.38	73.33
Total		100	100	100	0.2593	100	100	100

Source: from calculation.

5.2.3 Problem of input slack in farm households

If we consider the number of farm households who are members of a microfinance, we will find that there will be 313 households or 78.44% of the sample that will need to decrease inputs. The majority of farm households will need to decrease more than one input. Only 3.26% of the sample needs to decrease one input. The household members of production groups will need to lower the greatest amount of inputs (by 92.73%) of all households who are members of production groups. Meanwhile households who are members of credit unions will have to decrease input by 46.77% (Table 5.15).

However, if we consider the characteristics of microfinance households who have to decrease inputs, it can be seen that the households have more land compared to households that do not have to decrease inputs. Additionally, operating capital and loans from microfinance are higher, while they receive lower gross incomes (Table 5.16).

Table 5.15 Number of inputs that must be decreased of farm household technical efficiency.

Number of inputs	Production group		Credit union		Total	
	Amount	Percentage	Amount	Percentage	Amount	Percentage
Decrease 1 input	13	4.73	0	0.00	13	3.26
Decrease 2 inputs	65	23.64	15	12.10	80	20.05
Decrease 3 inputs	126	45.82	12	9.68	138	34.59
Decrease 4 inputs	51	18.55	31	25.00	82	20.55
Total of amount that must be decreased	255	92.73	58	46.77	313	78.45
Total of amount that must not be decreased	20	7.27	66	53.23	86	21.55

Source: from calculation.

Table 5.16 General characteristics of farm households that need to lower their inputs.

Amount of inputs that need to be decreased	Production group				Credit union				Overall microfinance			
	Quantity of land (Rai)	Operating capital (baht)	Gross income (baht)	Loan (baht)	Quantity of land (Rai)	Operating capital (baht)	Gross income (baht)	Loan (baht)	Quantity of land (Rai)	Operating capital (baht)	Gross income (baht)	Loan (baht)
None	8	76,229	419,080	7,430	2	47,042	789,171	2,083	7	67,248	532,954	5,785
1 input	9	124,310	211,823	7,133	6	100,248	166,844	15,317	8	112,708	191,362	10,421
2 inputs	11	91,836	205,388	14,858	9	131,616	227,126	38,145	11	105,737	213,438	22,800
3 inputs	21	134,535	273,003	13,600	14	242,603	254,570	47,504	19	157,692	269,053	20,865
4 inputs	22	428,218	329,524	25,000	19	156,953	178,947	51,455	21	374,382	297,046	30,706

Source: from survey and calculation.

The inputs that farmers need to decrease will compose of :

1) Labor is the first input that needs to be lowered. 61.17% of all households will need reduce this input. The decrease will have to be equivalent to one person of the households who are members of production groups and credit unions.

Due to credit union rent, this is high labor cost in the agricultural sector. Farmers are now using machines in plowing and harvesting, which save time. This is especially true among rice farmers. Besides, the survey also shows that farmers use the method of paddy-sown field more than transplanting rice, which causes the households to not fully employ their labor.

2) Most farm households will need to reduce their use of land by 57.88% and will need to reduce land by 8.1 rai/household. The households who are members of production groups will need to reduce land by an average of 9.8 rai/household. As for the households who are members of credit unions they will have reduce their land by 6.4 rai/family (Table 6.4). This shows that credit union members have a greater technical efficiency in using land compared to production group households. Nonetheless, the reason that the land is not used at its full capacity is because the farmers tend to increase technical efficiency by expanding the farm size. The survey data shows that rice farmers have changed their farming technique from using rice seedlings (which has a high yield per rai, but uses many workers to sow), to a faster method which uses less workers and results in reduced technical efficiency. Also, capital used for insecticides is higher than farming.

3) Households that will need to decrease their investment assets account for 51.63% of all the households. Households from production groups will need to lower their assets on average by 86,471.20 baht/household. Moreover, credit union member households will have to decrease more assets on average by 100,167 baht/household (Table 5.17). The study reflects the technical efficiency in administering investment assets of farm households, mostly for agriculture machines such as tractors. Annually, farmers tend to use machines in a relatively low ratio. In doing so, it raises average capital per rai to be rather high. Besides, owning agricultural machinery will also require high maintenance cost. This results in less income and net returns. One solution that might help lower the cost is that a farm household may rent agricultural machinery from a microfinance. According to the survey result, microfinances play a small role in this part.

Table 5.17 Input slack of farm households.

Inputs that need to be decreased		TE value of household members of production groups					TE value of household members of credit unions				
		Highest	High	Medium	Low	Lowest	Highest	High	Medium	Low	Lowest
Quantity of land (rai)	Amount	0	6	7	35	124	1	2	6	11	39
	Percentage	0.00	2.18	2.55	12.73	45.09	0.81	1.61	4.84	8.87	31.45
	Input slack	-	14	13	10	12	2	2	10	11	7
Operating capital (baht/rai)	Amount	0	0	9	17	64	1	2	3	12	31
	Percentage	0.00	0.00	3.27	6.18	23.27	0.81	1.61	2.42	9.68	25.00
	Input slack	-	-	26,952	27,141	16,062	31,479	5,342	69,537	18,237	41,567
Value of investment asset(baht)	Amount	3	5	7	27	107	0	1	8	9	39
	Percentage	1.09	1.82	2.55	9.82	38.91	0.00	0.81	6.45	7.26	31.45
	Input slack	30,425	76,115	19,978	209,865	95,973	-	34,574	159,211	204,054	102,996
Quantity of labor (person)	amount	2	5	9	30	124	0	1	8	9	56
	percentage	0.73	1.82	3.27	10.91	45.09	0.00	0.81	6.45	7.26	45.16
	Input slack	1	1	1	1	1	1	1	1	1	1

Source: from survey and calculation.

4) Farm households will need to lower their operating capital to 34.84% of its original operating capital or on average by 23,631.7 baht/rai. As for credit union member households, the operating capital will need to be lowered on average by 33,232 baht per household, which is three times higher than production group households (Table 5.17). This phenomenon happens because farmers tend to use production factors such as chemical fertilizers and insecticides believing that these factors will help increase yield per rai without considering the higher capital, which might not correlate with higher returns. Also, farmers have many sources of loans, so they can easily obtain loans increasing their use of greater capital than necessary.

Here, farmers will have a higher production capital from interest, which increases gross capital. The net income from agriculture is then reduced. From the research in chapter 4, it can be concluded that the most important role of microfinance is to be a source of funding for farm households much more than any other role.

Furthermore, in analyzing opportunity to increase the said inputs, it can be seen that households can increase incomes by using remaining inputs without having to reduce inputs. The incomes can be increased in the following ways:

1) Income from farm: Farm households can increase incomes from farms by 84,907.70 baht/household. Households who are members of credit unions can increase income from farms by 77,849.80 baht/household. On the other hand, households who are members of production groups can increase their income from farms by 91,965.60 baht (Table 5.18). This shows that households who are members of credit unions use inputs more efficiently than households who are members of production groups. Nonetheless, households who are members of both types of microfinance still do not have effective management to the point that they can increase their income from the farm by fully using inputs that they already possess, especially for land input (since it cannot be reduced). Thus, microfinances should encourage members to receive training on technical efficiency techniques from related agencies. In doing so, farmers will receive knowledge in technical efficiency according to academic principle. It is easily noticeable that this training role of microfinance is still lacking.

2) Income from outside of farming: the results of the study show that farm households are able to increase average income by 56,973.30 baht per household. Credit union members can increase average income by 40,347 baht per household. It is evident that households that are able to increase income outside of the farming are the households that have the lowest technical efficiency. As for production group household members, they are able to increase income outside of farming on average by 73,599.60 baht/household (Table 5.18). If both types of

households are to compare, it can be seen that production group households have more opportunities to increase income outside of farming than credit union households. This is because production group households receive little support in processing and packaging or marketing opportunity from production groups despite the fact that production groups receive support from the Community Development Department, a government agency. Thus, if production groups receive support from Community Development Department in training on processing, packaging, and marketing, the training should assist the households to increase product value. As for credit union households, they receive more support from credit unions, but the level of support is still moderate. Therefore, if credit unions give more importance to this particular issue, their members will surely reap the benefits.

Table 5.18 Output slack in farm households.

Input factors that need to be increased		Level of technical efficiency categorized by group type									
		Production group					Credit union				
		Highest	High	Medium	Low	Lowest	Highest	High	Medium	Low	Lowest
Income from farming	Amount	1	1	5	3	4	1	3	2	4	1
	Percentage	0.36	0.36	1.82	1.09	1.45	0.81	2.42	1.61	3.23	0.81
	Average increase	6,180	22,185	204,182	165,988	61,293	167,752	135,551	155,014	32,658	66,026
Income from outside of farming	Amount	0	2	1	1	9	0	0	0	0	2
	Percentage	0.00	0.73	0.36	0.36	3.27	0.00	0.00	0.00	0.00	1.61
	Average increase	0	95,615	117,028	88,986	66,369	0	0	0	0	40,347

Source: from calculation.

5.2.4 Returns to scale in farm households

As mentioned in 5.1.4 regarding the importance of analyzing returns to scale in the production sector, which farmers are able to work by managing resources for production in and outside of farming from inputs that can be used to create

income, it appears that returns to scale are in three stages. Most of the farmers (255 cases, or 64% of the sample) are in the DRS stage, followed by the CRS stage at 22%, and the rest are in the IRS stage at 14% (Table 5.19). Analysis reflects that most farm households have increased their use of inputs. Yet, received outputs are still less than inputs. In other words, 231 have the low to lowest technical efficiency level which is 58% of all households or 90.59 % of households that have decreased returns to scale. Moreover, the test of the relationship between level of technical efficiency and returns to scale by *Chi-Square test* shows the statistical implication at the level of 0.01. Thus, these farm households should decrease their size of production.

Table 5.19 Returns to scale and economy of scale of farm households.

Level of technical efficiency	Production group			Credit union			Overall		
	CRS	IRS	DRS	CRS	IRS	DRS	CRS	IRS	DRS
0.8001-1.0000	10	9	4	10	1	0	20	10	4
0.6001-0.8000	2	4	2	0	1	2	2	5	4
0.4001-0.6000	6	5	9	4	2	7	10	7	16
0.2001-0.4000	10	10	32	9	2	12	19	12	44
0.0000-0.2000	24	16	132	11	8	55	35	24	187
Total	52	44	179	34	14	76	86	58	255

Source: from calculation.

5.3 Technical efficiency of microfinance that affect technical efficiency of farm households

There is a hypothesis that it is highly possible that operational technical efficiency and technical efficiency are related. For example, the technical efficiency of microfinance might affect technical efficiency of the household. Following the same train of thought, technical efficiency in households could affect microfinance technical efficiency. The technical efficiency of members and groups might credit union at the same time (but are not simultaneously determined) because the majority of inputs are emphasized on short-term production such as in rice farming.

However, the data from the survey is cross-section data, not time-series data. As a result, the selection of the model can be estimated by analyzing the AIC and lowest RMSE, which is the model that can be used to explain the study as follows:

5.3.1 Inputs that affect technical efficiency in farm households

The following is a detail of variables used in this analysis as shown in Table 5.20.

Table 5.20 Variables used in the study.

variables	Detail	Maximum value	Minimum value	Average value
Z1	Number of household members(person)	11	1	3.9
Z2	Age of head of household (year)	91	24	52.1
Z3	Level of education	Higher than bachelor degree	Never received formal education	
Z4	Agricultural experience (year)	60	1	22.6
Z5	Size of farm (rai)	72	0.25	12.5
Z7	Location of farm (kilometer)	50	0.1	5.2
Z8	Loan from syndicated source (baht)	5,400,000	2,000	63,219
Z9	Number of loan sources (group)	5	0	1
Z10	Marketing opportunity (0-5)	5	0	1.8
Z11	Loan from microfinance(baht)	370,000	20,000	19,636
Z12	Training (times)	24	0	2.6
TEMF1	TE of microfinance operation (0.000-1.000)	1	0.026	0.5
Z6	Type of farm	Amount	Percentage	
Z ₆₁	Rice farming alone (household)	112	28.07	
Z ₆₂	Raising livestock alone (household)	97	24.31	
Z ₆₃	Rice farming, other plants and raising livestock (household)	190	47.62	

Source: from survey and calculation.

The Tobit model is the most appropriate model to calculate the results as it calculates the AIC and lowest RMSE. There are eight explaining variables from thirteen variables to solve the problem of multicollinearity (simple correlation higher than 0.5) by omission of variables: number of household members (Z_1), head of household's level of education (Z_3), agricultural experience of head of household (Z_4),

number of loan sources (Z_9), marketing opportunity (Z_{10}), loan from microfinance (Z_{11}), and times of training received from microfinance (Z_{12}) which have high correlation, including operational technical efficiency of the microfinance (TE_{MFI}) which does not affect technical efficiency of the household (TE_F) with statistical significance.

The study results show factors that affect technical efficiency of microfinance households in the upper northern region shown in Table 5.21 indicates that some variables with statistical significance can be used to explain technical efficiency of the sample households. These variables include amount of loan (baht) (Z_8) which has a 0.01 level of significance, age of head of household (Z_2), size of farm (rai) (Z_5), type of farm which only raises one type of animal (Z_{63}) (dummy) having a level of significance of 0.05 and the characteristic of farms that only grows only type of plant (dummy) (Z_{61}) (Table 5.20).

As for the effects of factors that influence productive efficiency of farm household members, by analyzing marginal effect values with statistical significance, they can be described as follows:

If the size of farm (rai) is increased (Z_5) by one rai, this will cause decrease in technical efficiency in farm household by 0.0024. Agriculture in the present day is different from the past which emphasized using what one possesses including seeds and labor. However, in the present day, the emphasis is on buying inputs such as labor. Consequently, if increase in the land exceeds labor in a household, there will be a need to hire labor which requires an increase in capital. Additionally, agriculture also requires care after planting. Therefore, if land is increased, this will lessen care

and lower the profit per rai, while producing cost per rai will be higher. As a result, the returns per rai will be lower.

If the age of the head of household (Z_2) is increased by one year, this will cause farm households to have higher productive efficiency by a level of 0.0028. This is because agricultural experiences of the farmer will be increased. In other words, farmers who are older tend to have more experience than farmers who are younger. Furthermore, agricultural skill learned is through the process of trial and error, so agricultural knowledge from each farmer is accumulated from his past experiences.

If amount of combined loans (Z_8) increases by 100,000 baht, the farm households technical efficiency is decreased by level of 0.0107. In other words, if the amount of combined loans increases 1%, the technical efficiency level will decrease by 0.0107. This is because farmers use more capital than necessary for buying inputs such as fertilizer and insecticide in believing that if there is more fertilizer along with more insecticides, there will be increased outputs, even though starting capital will now be higher than income, which lowers net profit.

In a type of farm that only grows one type of crop (Z_{61}), this will increase technical efficiency equivalent to 0.0471 when compared with households that grow crops and raise livestock. This is because farmers can fully use inputs for only one type of crop especially in rice farming. Still, farm households have input limitations especially for its land. If there is division of land and integrated agriculture, this will increase productive capital per unit, especially for fixed assets. For this reason, if a farmer only grows one type of crop, technical efficiency will increase.

If a farm only raises one type of livestock (Z_{62}), the technical efficiency level will increase by 0.178 when compared with households that grow crops and raise

livestock. This is similar to a farm that only grows one type of crop for the same reason. Furthermore, agricultural monoculture will not only lower fixed assets per unit, but it will also lower gross assets, which will help to increase returns.

Table 5.21 Factors which affect technical efficiency of farm households.

Variable	Coefficient	T-statistic	Marginal Effect	T-statistic
Constants	0.1484	1.587	0.1233	1.581
Z ₂	0.0033**	2.218	0.0028**	2.216
Z ₅	-0.0028**	-2.012	-0.0024**	-2.010
Z ₆₁	0.0567*	1.794	0.0471*	1.794
Z ₆₃	0.2142**	2.448	0.1780**	2.446
Z ₇	0.0004	0.182	0.0004	0.182
Z ₈	-0.0128***	-4.991	-0.0107***	-4.974
D	0.0445	1.398	0.0370	1.398

Source: calculation.

Note: *confidence level 0.1, ** confidence level 0.05%, ***confidence level 0.01%.

From the relation and effects of each factor that influences technical efficiency of microfinance households from the sample, the guidelines to increase technical efficiency in microfinance households are as follows:

1) The farm size should be appropriate. Namely, the farm size should not be too large compared to possessed inputs such as labor. If the farm size is big, farm households will employ more labor (or use machines instead of labor in the household), which will increase cost of production. If a farm household produces in an appropriate size farm and uses labor in the family, this will lower the cost of production.

2) Microfinances should become center of agricultural experience sharing. This is because the age of the head of household reflects experience in agriculture, which is a positive factor for technical efficiency. Thus, productive knowledge will expand if microfinances become centers for successful farmers to share their knowledge and techniques to interested farmers. This should increase

technical efficiency because the result of the analysis shows that the role of microfinance in teaching along with knowledge in production is rather low (Table 4.9).

3) Microfinances should emphasize distributing loans in the format of “credit with recommendations.” This means that members should consider a credit limit that is appropriate with the quantity of agricultural activity. This includes giving appropriate financial education. If a loan is higher than the appropriate quantity of investment activity, it will increase cost of production because of inappropriate use of inputs. This will also result in lower profit and lower technical efficiency.

4) Mono cultural agriculture should be promoted. This is to say that growing one type of crop or raising only one type of livestock is optimal because a farm household has limited inputs. Diversifying agricultural activity requires division of productive factors to different activities. Some activities might not receive sufficient inputs causing the activities to yield fewer products and decrease technical efficiency. On the other hand, if one activity is chosen, then that activity will fully receive inputs, which leads to high yield and incomes.

5.3.2 Factors that affect the technical efficiency of microfinance

The result of the Tobit model analysis in equation 3.12 has eight explaining variables from eleven variables by omission of variable X_6 and X_7 which highly correlate to X_9 to solve multicollinearity (simple correlation higher than 0.6) and omits technical efficiency variable of household (TE_F) as it does not correlate with technical efficiency of group (TE_{MFI}) with statistical significance. The evaluation of the model shows that the AIC value is lower. The RMSE (root mean square error) is also

considered. Of all 10 variables, the chosen model was satisfactory. It is found that there are 7 out of 8 variables that can explain technical efficiency level. The level of confidence is at 0.01 except for dummy variables that have statistical significance at 0.05 (Table 5.22). The factors that do not affect technical efficiency level are transparency in management level which is an opinion of a committee (X_9). This is because some of the operations have to be kept confidential from members such as interest reduction or extension of repayment or lowering monthly payments for members who have problems with repayment and so on.

The ability to manage assets is the main source of technical efficiency. This can be seen when the rate of net profit/total asset (X_2) is increased by 1%, the technical efficiency level is then increased by 0.455. Asset management, especially in loans, accordingly becomes a major source of income. For this reason, committee members have to be knowledgeable and have experience in asset management, so the technical efficiency of the groups will be increased.

In terms of the committee's ability to manage funds (X_8), if this variable is increased by one level, it will affect group technical efficiency by decrease of 0.088. Hence, the level of ability of committees, especially the ability to motivate group members to feel the sense of group ownership is crucial. If members have a sense of group ownership, they will have a sense of group protection and fully participate in the group's activity. This will benefit technical efficiency. Furthermore, from the survey results, it is seen that credit unions have advantages over production groups because some of the credit union committees are retired civil servants who had experience on a saving cooperative committee. As for the committee who might have previous experience, there are workshops at the Credit union League of Thailand

limited. The league trains new committees, while production group committees come from members who are farmers. The production group committees may lack experience in financial management. In the past, agencies that support production groups have no credit union curriculum to educate the groups, except for the groups that have high profit that might send their committee to receive training arranged by educational institutions.

The ability to manage loans by providing funds and extending more loans shows the sign of technical efficiency. This can be seen that if loans are increased on average per person (X_4) by 100,000 baht, the technical efficiency level will increase by 0.086 because the loan is considered a major asset that yields income to the groups.

However, increasing loans to members will produce benefits in two ways: generating more income to groups and increasing capital for the members to invest more in the agricultural sector. This is considered technical efficiency for groups because groups can answer the capital demand of members so that members do not need to rely on loans from other sources. These analysis results correlate with surplus inputs for they show that microfinances are able to increase loans to their members without finding more operational capital.

When compared with the operation of both types of microfinance, it is shown that credit unions have a higher technical efficiency level than production groups at 0.069. This is because credit unions have an organized management system from the continual support of the Credit union League of Thailand Ltd., while production groups only receive support from the Community Development Department during

establishment. After a production group is established, support from the Community Development Department is discontinued.

The rate of net profit/capital stock (X_3) is the ability to manage funds swiftly and without cost. When this rate is increased by one percent, the technical efficiency level is increased by 0.061 because capital stock is considered to be the most important source of operational cost and there is no interest. If groups can operate well, there will easily be profit. The magnitude of the effect is slim because 15% of the groups still have remaining capital stock as a surplus input.

In terms of ratio of deposits/loan (X_5), if it increases by 1%, this will lower the technical efficiency level by 0.044 because the deposit is a fund that has assets which are interest. Moreover, the deposit system and loan system have periods that are not in accord. This means that there will be interest while the loan is not released. However, one of the goals of microfinance is to encourage saving. Thus, it is necessary to increase technical efficiency by improving other factors.

Saving from size has a part in a slight increase in technical efficiency. This can be seen if microfinance members (X_1) are increased by 100 members, the technical efficiency of microfinance will increase by only 0.007, even though number of members is an indicator of group activity. The membership is a source of origin and the source where the funds are used. When a group gets more members, its operating funds and the quantity of credit will increase. However, the effect of size is less than the ability to manage assets and source of various types of asset.

Table 5.22 Factors that affect technical efficiency analyzed by using the Tobit model.

Variable	Coefficient	T-statistic	Marginal Effect	T-statistic
Constant	-0.014	-0.150	-0.014	-0.150
X_1	0.00008***	3.476	0.00007***	3.479
X_2	0.501***	2.502	0.455***	2.504
X_3	0.067***	4.787	0.061***	4.797
X_4	0.095***	4.586	0.086***	4.581
X_5	-0.048***	-5.133	-0.044***	-5.130
X_8	0.097***	4.573	0.088***	4.586
X_9	-0.021	-0.781	-0.019	-0.782
D	0.076**	1.960	0.069**	1.963

Source: from calculation

Note: *** level of significance 0.01, ** level of significance 0.05

From the correlation and effect of different factors that influence technical efficiency of microfinance from the sample, the following microfinance management policies will increase technical efficiency:

1) Microfinance must manage to increase the ratio between net profit and assets. This is for the reason that the majority of group assets is operating capital. Thus, groups will need to manage the said funds to generate the most income. This does not mean that having a high income will come from having the highest interest, but it will come from the group trying to increase operating funds in the form of capital stock. Additionally, groups will need to continually circulate capital stock in the form of loans to members. In some groups, there are deposits from members, but they will have to take a part of the funds for withdrawal. In this way, the groups will lose an opportunity for members who want to ask for a loan and an opportunity to use the capital to generate income.

2) There should be more increase in the ability for committees to manage funds because the management ability of committees will affect group

operation. The knowledge in financial management that committees needs to have is finding operating capital that has low cost, especially from fundraising from members who want and don't want loans. Some groups use social capital by campaigning for people who are in good economic standing and have no need to request loans to make a deposit in the form of capital stock. In doing so, the groups will have operating capital to loan to members who are not in good economic standing and want to borrow more than their own capital stock. Also, committee members will need to have knowledge in analyzing credit and credit management after loans are given to members especially making sure that the loan is used according to its purpose to avoid misappropriation of funds which is a cause of bad debt.

3) There should be an increase in the ratio of net profit/capital stock. Capital stock is an origin of operating funds. Thus, groups will need to find a way to manage capital stock to reach its fullest advantage, such as expansion of credit limits or types of credit limits to promote investment and improve the quality of life of farmers. This type of operation might have more risk than depositing capital stock with financial institutions, but the benefits that groups will receive are much more. For example, higher interest will result in members will receiving benefits from using the said funds. It is only that committees will need to have sufficient knowledge and ability to manage funds.

4) There should be reduction in the ratio of deposit/loan. Operating capital of microfinances come from two parts: accumulation of funds from members (capital stock), this part of funds does not have cost, so interest is not high to relieve the interest burden for members. The second part of the operating capital is deposits from members, which has an interest as cost. If groups do not have the skills or ability

to manage these funds (deposits), groups will have more interest burden and their profit will lessen. Also, if a member withdraws his money, the group will immediately lack liquidity, especially for a group that has low operating capital. In other words, groups should increase capital stock rather than deposits.

5) There should be an increase in number of members because members are source of capital and the place where funds are spent. If any group has low membership, the quantity of business is also diminished. In contrast, if membership is high, then there is more capital and more credit given. As a result, members of a microfinance are very important to the effectiveness of group operation.