

## CHAPTER 4

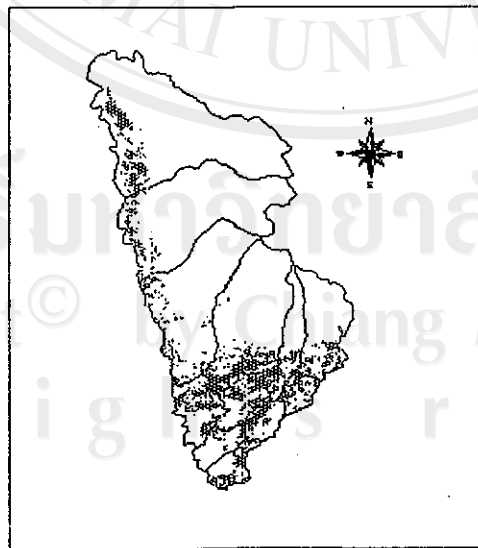
### RICE PRODUCTION SYSTEM IN SAN SAI DISTRICT

This section discussed the rice production system in San Sai district, Chiang Mai province. The discussions include biophysical and socio-economic conditions, rice cultivating activities, rice yield and net margin of rice production.

#### 4.1 Biophysical and Socio-economic Conditions of Rice Production

##### 4.1.1 Rice Growing Area

In San Sai district, the total rice planted area in the district was 33,697 rai. The area under glutinous rice was 21,947 rai and non-glutinous rice was 11,750 rai. The glutinous rice area was more than non-glutinous rice area because most of farmers in this area consumed glutinous rice. Figure 4.1 demonstrates the rice planted area in San Sai district.



**Figure 4.1** Rice planted area in San Sai district, Chiang Mai province

#### 4.1.2 Rice Farm Household

The average member of rice farm household in the area was nearly 4 persons/ household. Majority of them (63%) have 3-4 members. Table 4.1 shows distribution of farm households according to number of member in the household.

**Table 4.1** Number and percentage of rice farm households in the study area classified by number of household member, San Sai district, Chiang Mai province, 2001/02

Member in household	No. of household	% of total household
1 – 2	12	9.76
3 – 4	78	63.41
5 – 6	29	23.58
Equal or more than 7	4	3.25
<b>Total</b>	<b>123</b>	<b>100.00</b>
<b>Average member</b>		<b>3.98</b>

Note: There were 3 households did not respond to this issue.

Source: Survey, 2002

From field survey, it shows that rice farm household size is generally small that consists of father, mother and one or two child. The adult members play full-time labor on farm. The child members go to school and some teen-age members help their parent on farm like part-time labor. Table 4.2 demonstrates member and percentage of rice farm households classified by members who play full-time in agriculture. On the average rice farm household has 2 full-time labors.

**Table 4.2** Number and percentage of rice farm households classified by number of full-time labor on farm, San Sai district, Chiang Mai province, 2001/02

Full-time on farm	No. of household	% of total household
1 person	21	16.94
2 persons	84	67.74
Equal or more than 3 persons	19	15.32
<b>Total</b>	<b>124</b>	<b>100.00</b>
<b>Average full-time on farm</b>		<b>2.05</b>

Note: There were 2 households did not respond to this issue.

Source: Survey, 2002

There were many agricultural institutions in the area that support farmer in the form of saving, marketing, credit, input supply, agricultural extension and etc. Saving and loaning for rice farmer in this district is mainly done with the Bank for Agriculture and Agricultural Cooperatives (BAAC). Forty percent of total rice farm households were member of Bank for Agriculture and Agricultural Cooperatives. Agricultural cooperatives were other institution that supports farmers in several forms such as credit, marketing, input supply and etc. Approximately, 29 percent of total rice farm households were member of agricultural cooperatives (Table 4.3).

**Table 4.3** Number and percentage of rice farm households classified by membership of institutions, San Sai district, Chiang Mai province, 2001/02

Institution	No. of household	% of total household
Bank for Agriculture and Agricultural Cooperatives	44	40.00
Agricultural cooperatives	32	29.09
Farmer groups	3	2.73
Village funds	2	1.82
None	29	26.36
<b>Total</b>	<b>110</b>	<b>100.00</b>

Note: There were 16 households did not respond to this issue.

Source: Survey, 2002

#### 4.1.3 Farm Size

The average farm size of the study was very small 6.65 rai/household. Eighty five percent of farm households occupied 2-10 rai of farmland. Only two percent of farm household own more than 20 rai of land (Table 4.4).

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**Table 4.4** Number and percentage of rice farm household classified by farm size, San Sai district, Chiang Mai province, 2001/02

Farm Size	No. of household	% of total household
Less than 2 rai	3	2.38
More than 2 – 5 rai	57	45.24
More than 5 – 10 rai	50	39.68
More than 10 – 20 rai	14	11.11
More than 20	2	1.59
<b>Total</b>	<b>126</b>	<b>100.00</b>
<b>Average Farm Size</b>		<b>6.65</b>

Source: Survey, 2002

Fifty one percent of total households planted rice on their own farm. As much as, 40 percent of total farm households had to rent farm for rice growing. These tenants had to pay money or allot yield to the land owners. Table 4.5 demonstrates the distribution of households according to land ownership and tenancy.

**Table 4.5** Number and percentage of rice farm households classified by land ownership, San Sai district, Chiang Mai province, 2001/02

Land tenancy	No. of household	% of total household
Owner farm	62	51.24
Rent farm	49	40.50
Owner farm+ Rent farm	7	5.78
Free charge farm	3	2.48
<b>Total</b>	<b>126</b>	<b>100.00</b>

Note: There were 5 households did not respond to this issue.

Source: Survey, 2002

#### 4.1.4 Cropping Pattern with Rice Base Cropping System

Rice-cash crop was the dominant cropping system in San Sai district. Cash crops were soybean, onion, garlic, potato, maize, vegetable and etc. Table 4.6 shows the cropping patterns in San Sai district. In rainy season, rice is planted at the end of June to July and harvested at the end of November to the early December. The second crop started shortly after the first crop which is usually in December while the third crop started in April.

**Table 4.6** Cropping pattern on rice base cropping system in San Sai district, crop year 2001/2002

Cropping Pattern	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rice-Cash crop									Rice			
Rice-Cash crop-Cash crop									Rice			
Rice-Rice									Rice			
Rice-Cash crop-Rice									Rice			
Rice-Rice-Cash crop									Rice			
Rice									Rice			

Source: Survey, 2002

#### 4.1.5 Rice Varieties

The many rice varieties were planted in the area. There were several reasons to select rice variety such as farmer's objective, tastes and etc. The favorite rice varieties in rainy season were RD6, KAOW DAWK MALI 105, NIEW SANPATONG, and SANPATONG1 (Table 4.7). Fifty eight percent of total household planted RD6 for home consumption since there are high quantity and good taste. KAOW DAWK MALI 105 (KDML105), non-glutinous rice variety, was chosen by 26% of total rice farm households as cash crop. The high price of KDML105 induce rice farmers to plant on their farm.

**Table 4.7** Number and percentage of rice farm households classified by rice varieties that they grown in rainy season, San Sai district, Chiang Mai province, 2001/02

Rice varieties in rainy season	No. of household	% of total household
RD6	84	57.53
KAOW DAWK MALI 105	38	26.03
NIEW SANPATONG	13	8.90
SANPATONG1	9	6.16
RD10	1	0.69
SUPANBURI	1	0.69
<b>Total</b>	<b>146</b>	<b>100.00</b>

Source: Survey, 2002

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Rice farmer admire to plant photo period-insensitive rice varieties in dry season. SANPATONG1 (SPT1) was the most popular as it was chosen by 24 percent of total farm household (Table 4.8). About 21 and 17 percent of rice farm households grew KDML105 and RD10 in the dry season.

**Table 4.8** Number and percentage of farm households classified by rice varieties that they grown in dry season, San Sai district, Chiang Mai province, 2001/02

Rice varieties in dry season	No. of household	% of total household
SANPATONG1	7	24.14
KAOW DAWK MALI 105	6	20.69
RD10	5	17.24
RD22	4	13.79
RD24	2	6.90
RD6	2	6.90
SUPANBURI	2	6.90
NIEW SANPATONG	1	3.45
<b>Total</b>	<b>29</b>	<b>100.00</b>

Source: Survey, 2002

## 4.2 Rice Cultivation and Practices

In the study area, rice farmers begin to plant rice in June-August that depend on farm household system such as climate, location and varieties chosen. Rice cultivation and practices are undertaken sequentially.

### 4.2.1 Land Preparation

Suitable land for rice growing should be flat and surrounded by side earth wall for water control. Firstly, land is flooded with 1-2 cm. of water for few days. Water either comes from cannel, deep well in the area or from rain.

Land preparation commences in July following the rainy season of the year. The land is ploughed by machine. Usually, the land is ploughed once or twice by tractor or pushcart.



After landed is flooded for few days, weed will grow. Farmer then plows the field, either by modern machinery. Plowing will eliminate weed without using chemical.

Small plot in the land is allocated for sowing. The rice farmer used about 9 – 10 kg of seeds to transplant in one rai. Table 4.9 shows that dosage of seeds used in each variety.

**Table 4.9** Dosage of seed used classified by rice variety (Kg./rai) of farmers in San Sai district, Chiang Mai province, 2001/02

Rice variety	Mean	S.D.
RD6	9.19	4.69
SANPATONG1	8.30	1.79
KAOW DAWK MALI 105	9.08	3.60
NI EW SANPATONG	10.98	4.58
<b>All average</b>	<b>9.27</b>	<b>4.18</b>

Source: Survey, 2002

Seed of rice planting is purchased from agricultural agencies such as sub-district agricultural office, agricultural cooperatives etc. However, some of rice farmers retain rice seed to plant the next year. Table 4.10 shows that number of household which select seed to plant in their area.

**Table 4.10** Number and percentage of rice farm households classified by sources of seed for rice cultivation of farmers in San Sai district, Chiang Mai province, 2001/02

Source	No. of household	% of total household
Buy	66	56.41
Retain	44	37.61
Buy and Retain by year to year	3	2.56
Exchange	4	3.42
<b>Total</b>	<b>117</b>	<b>100.00</b>

Source: Survey, 2002

#### 4.2.2 Planting

When rice was sown about a month in small plot. Immediately after plowing, rice sprout is transferred to well prepared field and transplanted. The labors used in this step come from several sources such as exchange labor in the village, hire, or use only labor in farm household.

One month after transplanting the rice farmers go to filling for some of them fails to grow by using the remaining rice sprouts.

Plant is left to grow for 3-4 months till it flowered, paddy formed, matured and turned light brown. During these months, farmer has to control water, do weeding, fertilizing and spraying chemicals when the incidences of pest and disease were observed.

#### 4.2.3 Fertilizer Applications

Organic and chemical fertilizers were the main source of nutrient to rice plant. Chemical fertilizer application was more important. Mostly 88 percent of total farm households used chemical fertilizer application in their rice farm (Table 4.11). The organic fertilizer was seldom used in rice farm witness by only 12 percent of total farm households.

**Table 4.11** Number and percentage of farm household classified by types of fertilizer used and rice variety, San Sai district, Chiang Mai province, 2001/02

Rice variety	Chemical Fertilizer Used		Organic Fertilizer Used		Total	
	No. of household	% of total household	No. of household	% of total household	No. of household	% of total household
RD6	52	45.22	6	5.22	58	50.43
SANPATONG1	10	8.70	1	0.87	11	9.57
KAOW DAWK MALI 105	28	24.35	5	4.35	33	28.70
NIEW SANPATONG	11	9.57	2	1.74	13	11.30
<b>Total</b>	<b>101</b>	<b>87.83</b>	<b>14</b>	<b>12.17</b>	<b>115</b>	<b>100.00</b>

Source: Survey, 2002



The average dose of chemical fertilizer use was nearly 20-25 kg./rai. Usually, rice farmer applied the chemical fertilizer twice according to the recommendation from office of agricultural extension to increase their productivity. Table 4.12 shows dose of chemical fertilizer application by rice farmer in each variety.

**Table 4.12** Dose of Chemical fertilizer application that farmers used classified by rice variety, San Sai district, Chiang Mai province, 2001/02

Rice variety	Mean	S.D.
RD6	20.71	12.40
SANPATONG1	27.95	15.90
KAOW DAWK MALI 105	21.15	16.07
NIW SANPATONG	17.53	9.07
<b>Average</b>	<b>21.17</b>	<b>13.65</b>

Source: Survey, 2002

#### 4.2.4 Weeding

In the modern agriculture, herbicide is used for weeding in rice production. The application of herbicide helps farmers to save energy and time in weeding activity. Table 4.13 shows number and percentage of rice farmers using different types of weeding. Nearly 46 percent of total farm households used herbicide and 27 percent of them used labor controlled for weeding.

**Table 4.13** Number and percentage of farm households classified by methods of weeding and rice variety, San Sai district, Chiang Mai province, 2001/02

Rice variety	Chemical		Labor		Non-use		Total	
	No. of household	% of total household	No. of household	% of total household	No. of household	% of total household	No. of household	% of total household
RD6	26	22.61	15	13.04	17	14.78	58	50.43
SPT1	8	6.96	1	0.87	2	1.74	11	9.57
KDML105	13	11.30	10	8.70	10	8.70	33	28.70
NSPT	6	5.22	5	4.35	2	1.74	13	11.30
<b>Total</b>	<b>53</b>	<b>46.09</b>	<b>31</b>	<b>26.96</b>	<b>31</b>	<b>26.96</b>	<b>115</b>	<b>100.00</b>

Source: Survey, 2002

#### 4.2.5 Water Management

Few days after transplanting, rice sprout will grow to young plant. Water is then drawn into field, either by manual or electric pump. Water level must be below leaf by not exceeding 2-3 cm. Most of farmers in the study area manipulate water by hand. Water are from irrigated canal to support water from the rain. Water supply was not a serious problem where the irrigation projects can support most of the area under rice cultivation.

#### 4.2.6 Pesticide Application

Approximately 70 percent of total rice farm households used pesticide in their farms. Usually, the chemical pesticides were used to reduce amount of cherry snail in paddy field. Table 4.14 shows that pesticide application of farm households in the studied areas.

**Table 4.14** Number and percentage of farm households classified by pesticide application and rice variety, San Sai district, Chiang Mai province, 2001/02

Rice variety	Pesticide Use		Non-pesticide use		Total	
	No. of household	% of total household	No. of household	% of total household	No. of household	% of total household
RD6	41	35.65	17	14.78	58	50.43
SANPATONGI	10	8.70	1	0.87	11	9.57
KAOW DAWK MALI 105	23	20.00	10	8.70	33	28.70
NIEW SANPATONG	7	6.09	6	5.22	13	11.30
<b>Total</b>	<b>81</b>	<b>70.43</b>	<b>34</b>	<b>29.57</b>	<b>115</b>	<b>100.00</b>

Source: Survey, 2002

#### 4.2.7 Harvesting

When paddy seed turns light brown, water has to be drained off and left to dry. When field is absolutely dried and plant turn to hay color, paddy is harvested, either by hand using curved knife or by combined harvester. Usually, the farmer used family labor, exchange labor and hired labor for rice harvesting. It was estimated that nearly

90 percent of total farm households (Table 4.15) harvesting rice by hand. However, the combined harvester could reduce time by having harvesting and threshing at the same time.

**Table 4.15** Number and percentage of farm households classified by methods of harvesting, San Sai district, Chiang Mai province, 2001/02

Rice variety	Harvester machine		Labor		Total	
	No. of household	% of total household	No. of household	% of total household	No. of household	% of total household
RD6	1	0.87	57	49.57	58	50.43
SANPATONG1	5	4.35	6	5.22	11	9.57
KAOW DAWK MALI 105	4	3.48	29	25.22	33	28.70
NIEW SANPATONG	1	0.87	12	10.43	13	11.30
<b>Total</b>	<b>11</b>	<b>9.57</b>	<b>104</b>	<b>90.43</b>	<b>115</b>	<b>100.00</b>

Source: Survey, 2002

About two days after harvesting, rice farmers will thresh their rice. Generally, rice farmers threshed their paddy by hand witness by approximately 79 percent of total farm households (Table 4.16). Based on interviewing with the farmers, threshing machine has been used in the area increasingly.

**Table 4.16** Number and percentage of household classified by methods of threshing and rice variety, San Sai district, Chiang Mai province, 2001/02

Rice variety	Threshing machine		Labor		Total	
	No. of household	% of total household	No. of household	% of total household	No. of household	% of total household
RD6	8	7.69	49	47.12	57	54.81
SANPATONG1	2	1.92	4	3.85	6	5.77
KAOW DAWK MALI 105	8	7.69	21	20.19	29	27.88
NIEW SANPATONG	4	3.85	8	7.69	12	11.54
<b>Total</b>	<b>22</b>	<b>21.15</b>	<b>82</b>	<b>78.85</b>	<b>104</b>	<b>100.00</b>

Source: Survey, 2002

### 4.3 Rice Yield

On the average rice yield was approximately 712 kg./rai. NIEW SANPATONG gained the highest average yield of about 784 kg./rai. While that of KAOW DAWK MALI 105 was nearly 720 kg./rai. Table 4.17 demonstrates that average grain yield by each rice variety in crop year 2001/2002.

**Table 4.17** Average rice yield classified by rice variety, San Sai district, Chiang Mai province, 2001/02

Rice variety	Yield (Kg. /rai)	S.D.
RD6	699.16	167.03
SANPATONG1	679.04	173.88
KAOW DAWK MALI 105	720.25	217.49
NIEW SANPATONG	784.29	338.98
<b>Total average</b>	<b>712.91</b>	<b>206.83</b>

Source: Survey, 2002

### 4.4 Marketing of Rice

Rice is cereal crop. Rice farmer grow rice mainly for household consumption. Surplus rice was vended for cash income. Fifty percent of farm households disposed their product immediately after harvest. Most of them did not have a place to keep the product and needed cash for debt repayment. Some of rice farmers kept the product until they got better price. Approximately 55 percent of total farm households sold rice to merchants in their villages at rice field or at farmers' store house (Table 4.18).

**Table 4.18** Number and percentage of farm household classified by selling channels, San Sai district, Chiang Mai province, 2001/02

Selling channel	No. of household	% of total household
Merchants	69	54.76
Rice mills	19	15.08
Cooperatives	6	4.76
People in villages	1	0.79
Not sell	31	24.60
<b>Total</b>	<b>126</b>	<b>100.00</b>

Source: Survey, 2002

## 4.5 Cost and Margin of Rice Production

### 4.5.1 Cost of Inputs

The material cost of rice production consists of expenditures for seeds, chemical fertilizer, insecticides and herbicides. The average cost of material inputs was 481.80 baht/rai. The highest cost of material inputs was chemical fertilizer. Based on the surveyed data, average cost of chemical fertilizer for rice production in San Sai district was nearly 171 baht/rai (Table 4.19).

**Table 4.19** Cost of material inputs in rice production classified by items and rice variety, San Sai district, Chiang Mai province, 2001/02

Unit: Baht/rai

Material Inputs	RD6	SPT1	KDML105	NSPT	Average
Seeds	39.57	37.02	59.44	30.77	44.03
Chemical fertilizer	160.76	204.24	173.83	182.65	171.14
Herbicide	33.77	49.18	21.67	19.15	30.12
Pesticide	31.68	59.18	38.34	63.55	39.82
Gasoline	37.68	90.11	45.17	22.15	43.09
Manure	3.19	0.00	0.49	10.77	2.97
Food	152.06	153.54	97.62	276.28	150.62
<b>Total Average</b>	<b>458.71</b>	<b>593.26</b>	<b>436.56</b>	<b>605.33</b>	<b>481.80</b>

Source: Survey, 2002

Labor is also an important cost of rice production. Different levels of labor used were needed at different rice production activities. Most of labors were used in transplanting and harvesting (averaged at 4.19 and 3.29 mandays per rai for all varieties grown – Table 4.20). In addition, machineries have been used in other activities such as harvesting and threshing in order to reduce time and damages to the produce.

**Table 4.20** Labor utilization classified by rice production activities, San Sai district, Chiang Mai province, 2001/02

Unit: Mandays/rai

Labor	RD6	SPT1	KDML105	NSPT	Average
Seeding	0.13	0.08	0.09	0.16	0.12
Land preparation	0.39	0.35	0.36	0.37	0.38
Transplanting	4.16	4.43	3.52	5.85	4.19
Maintenance	0.44	0.33	0.45	0.66	0.46
Fertilizer filling	0.30	0.43	0.28	0.34	0.31
Weeding	0.45	0.20	0.35	0.36	0.39
Pesticide	0.12	0.23	0.10	0.19	0.13
Water management	0.33	0.45	0.32	0.37	0.34
Harvesting	3.34	2.94	3.01	4.10	3.29
Threshing	1.29	1.55	0.69	1.33	1.15
Transferring	0.65	0.97	0.58	0.59	0.65
<b>Total</b>	<b>11.61</b>	<b>11.95</b>	<b>9.73</b>	<b>14.34</b>	<b>11.41</b>

Source: Survey, 2002

Labor used in rice production was classified into three sources; family labor, exchange labor and hired labor. For the use of exchange labor, the host farmer calls in neighbors for farming operations, mainly during transplanting, harvesting and threshing. In return, the host farmers have to pay back his/her labor on the calling in neighbors' rice field at equivalent mandays. The host had to provide food and drinks for these exchange labors a meal a day during the period. As is shown in Table 4.21, family and exchange labor were equally important in rice production in San Sai district. Hired labor was additionally needed during transplanting, harvesting and threshing.



**Table 4.21** Labor inputs classified by rice variety and sources of labor, San Sai district, Chiang Mai province, 2001/02

Unit: Mandays/rai

Rice variety	Family Labor	Exchange Labor	Hired Labor	Total Labor
RD6	5.03	3.94	2.65	11.61
SANPATONG1	5.42	3.70	2.82	11.95
KAOW DAWK MALI 105	3.87	3.54	2.32	9.73
NIEW SANPATONG	5.57	6.19	2.59	14.34
<b>Total average</b>	<b>4.80</b>	<b>4.05</b>	<b>2.56</b>	<b>11.41</b>

Source: Survey, 2002

#### 4.5.2 Price of Rice

The average price of paddy received by rice farmers in San Sai district in the crop year 2001 was 4.96 baht/kg (Table 4.22). The price of KDML was the highest at 5.07 baht/kg. which influenced rice farmers to grow this variety for commercial purpose.

**Table 4.22** Average price of rice received by rice farmers classified by rice variety, San Sai district, Chiang Mai province, 2001/02

Rice variety	Price (Baht/kg.)	S.D.	Max.	Min.
RD6	4.96	0.80	6.00	3.00
SANPATONG1	4.92	1.11	7.00	4.00
KAOW DAWK MALI 105	5.07	0.65	7.00	4.00
NIEW SANPATONG	4.44	0.38	5.00	4.00
<b>All average</b>	<b>4.96</b>	<b>0.75</b>	<b>6.25</b>	<b>3.75</b>

Source: Survey, 2002

#### 4.5.3 Margin Analysis

Gross margin is defined as total revenue minus total variable cost. The surveyed data showed that average total revenue for rice production in San Sai district, Chiang Mai province was 3,539.17 baht/rai. while the average total variable cost was 1,280.87 baht/rai. Thus the average gross margin of rice production was

2,258.30 baht/rai. The net margin was calculated by including opportunity cost of family labor and depreciation to total variable cost. The net margin was approximately 966.81 baht/rai (Table 4.23).

**Table 4.23** Summary of gross margin analysis classified by rice variety, San Sai district, Chiang Mai province, 2001/02

	Unit: Baht/rai				
	<b>RD6</b>	<b>SPT1</b>	<b>KDML105</b>	<b>NSPT</b>	<b>Average</b>
<b>Total Revenue</b>	<b>3,471.15</b>	<b>3,338.62</b>	<b>3,650.10</b>	<b>3,482.27</b>	<b>3,539.17</b>
Rice Yield (Kg./rai)	699.16	679.04	720.25	784.29	712.91
Rice Price (Baht/kg.)	4.96	4.92	5.07	4.44	4.96
<b>Total Variable Cost</b>	<b>1,260.14</b>	<b>1,486.24</b>	<b>1,180.79</b>	<b>1,453.62</b>	<b>1,280.87</b>
Material inputs	458.71	593.26	436.56	605.33	481.80
Hired labor	411.36	551.32	433.71	427.12	432.94
Hired machines	390.07	341.67	310.51	421.18	366.13
<b>Gross Margin</b>	<b>2,211.01</b>	<b>1,852.37</b>	<b>2,469.31</b>	<b>2,028.65</b>	<b>2,258.30</b>
Family labor	603.60	650.40	464.40	668.40	576.00
Capital Depreciation	695.06	800.12	678.91	827.92	715.49
<b>Net Margin</b>	<b>912.35</b>	<b>401.85</b>	<b>1,326.00</b>	<b>532.33</b>	<b>966.81</b>

Note: Family labor was calculated using opportunity cost of 120 baht/day

Data from Table 4.23 showed that KDML105 yielded the highest gross and net margin of 2,469.31 and 1,326.00 baht/rai respectively. This is because it has the highest price of 5.07 baht/kg., lowest production cost, while its yield was little lower than that of NSPT variety. RD6 was ranked second to KDML105 in terms of gross and net margin. The same reason could also be explained for this outcome.

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