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Impact of Economic Factors Changes on Paddy Farmers Household Income in Lebak Swampland (Case of Swampland in HSU District, South Kalimantan Province-Indonesia)

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Abstract

Paddy farmer household at *Lebak* swampland are poor because of low income. Efforts to increase household paddy farmer's income in *Lebak* swampland are always associated with the economic factor as price; subsidies and expansion area (*extensification*). This study aims to analyze the impact of economic factors change on farm household incomes in the *Lebak* swampland. Data is analyzed by using agricultural economic household models, with simultaneous equations. The results showed that the increase in input prices of paddy (seeds, fertilizers, pesticides and labor outside the family) would decrease farmer household income. The increased of input price followed by an increased in paddy output price in same proportion were able to increase farm households income. Seed subsidies are also able to increase the household income. In contrast; paddy area expansion or extensification would decrease household income. Therefore, the expansion program option at *lebak* swampland is not priority choice.

Keywords: Lebak swamplands; farmer income; extensification; inputs price, price of output.

I. INTRODUCTION

Swamplands typology is an alternative area developed to address the needs of food, especially paddy. Swampland resources in Indonesia reached 39 million ha, spread across the island of Sumatra, Kalimantan; Sulawesi and Papua (Noor, 2004). Noor (2007) states one typology that has swamplands is Lebak swamplands. The land has become one alternative in order to achieve an increase in paddy production as well as to increase revenue in order to strengthen farm households economy. In fact there are many farmers plant paddy in the lebak swamplands is poor because of low income, as well as in the District of Hulu Sungai Utara (HSU), South Kalimantan. In this context, the poverty is structural poverty. This can not be solved only with short-term solutions, such as direct cash assistance.

Paddy farmers income in *Lebak* Swampland is not able to meet household needs because of low productivity caused by natural factors, also vulnerable to changes in input price and output. Theoretically; interventions commonly performed in rice fields with different typologies, namely rain fed and irrigation to increase revenue, provision of subsidized inputs especially seed subsidy and expansion policy (*extensification*). However, this approach is not exactly an attempt to increase farm household income when applied in *Lebak* swamplands. Changes in economic factors or external factors include price factor; subsidies and expansion policy (*extensification*) has always been an important issue in paddy farmers income in *Lebak* swampland. The question is the extent impact of these economic factors changes on household paddy farmers income in *Lebak* swampland.

On the other hand; household swampland paddy farmers in the *Lebak* is a subsistence farm households. They do not separate the production aspects to consumption, with the main objective to meet family needs (Ellis, 1988; Mendola, 2007; Kusnadi, 2005; Elly, 2008). Efforts to increase household farmers income is manifested in input

allocation decision-making behavior and regulation of production in farming management, as well as the behavior of decision-making related to labor allocation. According to Singh; Squire and Strauss (1986), Ellis (1988); Sadoulet and Janvry (1995); decision to increase farm households income always associated production aspects, consumption and manpower allocation. The approach is through agricultural household models. Household economic studies typically use a basic model as originally proposed by Chayanov (Ellis, 1988), Becker (1965); Gronou (1977), which were further developed by Singh; Squire and Strauss (1986). Economic behavior of farmers in countryside based on land typology have a particular characteristic, such as *Lebak* swamplands, becomes important because agriculture still plays an important role in many countries including Indonesia (OECD, 2003).

Several previous studies associated with increased paddy farmers income in "Lebak" swampland - among others by Abdurrahman (1992) - approached only on production aspects. Various research or other articles relate to various aspects that becoming research focus but still relevant farm household economic behavior in relation to farmers income. The article studied by Sawit (1993); Kusnadi (2005); Cornejo *et al* (2005); Hendriks and Mishra (2005) Jean-Paul Chavas; R. Mivhael Petrie and Roth (2005); Dewbre and Mishra (2007); Fariyanti et al (2007); Fariyanti (2008); Cornejo, *et al* (2007); Cristian and Herne Henningsen (2007); Hung-Hao Chang and Fang Wen-I (2010); and Chi kezie *et al* (2011). However, all research and article is motivated by farming is done on dry land typology. Therefore, to answer the questions above and parallel efforts to increase household paddy farmers income in Lebak swampland to reduce poverty, then this article aims to analyze the impact of economic factors changes, including: (1) increase in input and output paddy price; (2) paddy seed subsidy, and (3) the expansion of paddy plant, each of household farmers income in *Lebak* swampland.

Simulations conducted to determine the impact of changes in household rice farmers income in the event of price changes, subsidies and expansion of rice land. Simulation was done through: (a) increase in rice price production factor inputs simultaneously cover the cost of seeds, fertilizer, pesticides and labor outside the family of 10%, (b) multiple form simulation increase in total paddy production cost by 10 % with 10% rice price increase, (c) seed subsidy provision for paddy 10%, (d) paddy acreage expansion in the "lebak" area by 25%.

II. METHOD

2.1. Data and Procedures

This research uses primary data. Methods for determination of sample farmers for primary data are stratified sampling. First, Sungai Pandan subdistrict selected purposively. The consideration is the largest area of paddy crop in HSU district. From this sub districts, it is selected Rantau Karau Hulu Village. The justification is the paddy farmers if this village are : (a) diversification in farming other than paddy, particularly in duck and egg production; as well as fishing business; (b) most farmers work on off-farm and non-farm activities, (c) implementing paddy in shallow lebak area (*watun* I) and middle lebak area (*watun* II). Firstly, it is conducted a census on paddy production at Rantau Karau Hulu villagers to determine population range. From 314 KK (head of family) in people Rantau Karau Hulu villagers; there were 257 KK become paddy farmers. From this census, it is obtained various population census to calculate the number of respondents used in study sample. The number of the sample is calculated based on formula by *Parel et al* (1973). Samples were taken with purposive random from farm households in each sub-village (dusun). The goal is to obtain the amount of sample predetermined based on above equation. Based on this method, it is selected 100 samples of farmers.

This study uses agricultural economic household model with a simultaneous equations system. Models specification used are described as follows:

Land for Paddy Production in *lebak* swampland:

$PTP = a_0 + a_1 LHP + a_2 PBP + a_3 PPUR + a_4 TKP + a_5 POP + E$ .....[1]

The sign and magnitude of the expected parameter estimations are: $a_1, a_2, a_3, a_4, a_5 > 0$

Total Use of Labor paddy :

$TKP = TKDKP + TKLK$ .....[2]

The use of paddy seed

$PBP = b_0 + b_1 HPBP + b_2 LHP + b_3 TKP + E$ .....[3]

The sign and magnitude of the expected estimations parameter are: $b_2, b_3 > 0$; $b_1 < 0$

urea fertilizer usage

$PPUR = co + c_1 HPUR + c_2 LHP + c_3 PNPNGN + E$ .....[4]

The sign and magnitude of the expected estimations parameter are: $C_2 > 0$; $C_1, C_3 < 0$

Pesticide usage

$POP = do + d_1 HPOP + d_2 LHP + E$ .....[5]

The sign and magnitude of the expected estimations parameter are: $d_2 > 0$; $d_1, < 0$

paddy input usage value

$NPIP = (PBP * HPBP) + (PPUR * HPUR) + (POP * HPOP)$ .....[6]

Labor in-household for paddy farming

$TKDKP = f_0 + f_1 TKDKOF + f_2 TKDKNF + f_3 TKLK + f_4 LHP + E$.....[7]

The sign and magnitude of the expected estimations parameter are: $f_1, f_3, < 0$; $f_1, f_4 > 0$

Labor out-household for paddy farming

$TKLK = g_0 + g_1 UTKLK + g_2 TKDKP + g_3 LHP + E$ .....[8]

The sign and magnitude of the expected estimations parameter are: $g_1, g_2 < 0$; $g_3 > 0$

TKDK usage at farming beside rice

$TKDKSP = h_0 + h_1 TKDKP + E$ .....[9]

The sign and magnitude of the expected estimations parameter are: $h_1 < 0$

In-household labor usage for off-farm activity

$TKDKOF = j_0 + j_1 UTKDKOF + j_2 TKDKP + j_3 TKDKNF + j_4 TKDKSP + E$ .....[10]

The sign and magnitude of the expected estimations parameter are: $j_2, j_3, j_4 < 0$; $j_1 > 0$

In-household labor usage for off-farm activity

$TKDKNF = k_0 + k_1 UTKDKNF + k_2 TKDKP + k_3 LHP + E$ .....[11]

The sign and magnitude of the expected estimations parameter are: $k_1 > 0$; $k_2, k_3 < 0$

Total labor usage for rice activity with off-farm activity

$TKDKN = TKDKP + TKDKOF$ .....[12]

Total farmer labor usage

$TPTKP = TKDKP + TKLK + TKDKSP + TKDKOF + TKDKNF$ .....[13]

Total cost of paddy farming

$TBUTP = (PBP * HPBP) + (PPUR*HPUR) + (POP*HPOP) +$
$(TKLK*UTKLK) + BTPLL$ .....[14]

Paddy farming household income

$PUTP = (PTP * HPP) - TBUTP$ .....[15]

Non paddy farming household income

$PUTSP = i_0 + i_1 TKDKSP + i_2 LHP$ .....[16]

The sign and magnitude of the expected estimations parameter are: $i_1 > 0$; $i_2 < 0$

Total income from on-farm activity

$PTOF = PUTP + PUTSP$ .....[17]

Household income from off-farm activity

$PKOF = l_0 + l_1 TKDKN + l_2 UTKDKOF + l_3 LHP + E$ .....[18]

The sign and magnitude of the expected estimations parameter are: $l_1, l_2 > 0$; $l_3 < 0$

Household income from non-farm activity

$PKNF = m_0 + m_1 TKDKU + m_2 UTKDKNF + E$ .....[19]

The sign and magnitude of the expected estimations parameter are: $m_1, m_2 > 0$

Total use of labor to off-farm activities with non-farm activities

$TKDKU = TKDKNF + TKDKOF$ .....[20]

Paddy farmer household income

$PRT = PTOF + PKOF + PKNF$ .....[21]

Farmer household expenditure for food consumption

$PPNGN = n_0 + n_1 AKPP + n_2 PRT + E$ .....[22]

The sign and magnitude of the expected estimations parameter are: $n_1, n_2 > 0$

Farmer household expenditure for non food

$PNPNGN = p_0 + p_1 AKPP + p_2 PRT + E$ .....[23]

The sign and magnitude of the expected estimations parameter are: $p_1, p_2 > 0$

Farmer household expenditure for health

$PGNKS = q_0 + q_1 AKPP + q_2 PRT + E$ .....[24]

The sign and magnitude of the expected estimations parameter are: $q_1, q_2 > 0$

Farmer household expenditure for education

$PGNPD = r_0 + r_1 AKPPS + r_2 PRT + E$ .....[25]

The sign and magnitude of the expected estimations parameter are: $r_1, r_2 > 0$

Farmer household expenditure for food and non food consumption

$PKONS = PPNGN + PNPNGN$ .....[26]

Total farmer household expenditure

$PGNRT = PKONS + PGNKS + PGNPD$ .....[27]

Saving

$TAB = PRT - PGNRT$ .....[28]

Note :

PTP = total paddy production (tons)
LHP = land area for paddy (ha)
PBP = paddy seed usage (kg)
Scene = Total labor use for paddy (HKO)
TKDKP = In-household labor usage for paddy (HKO)
TKLK = Out-household labor usage from outside the family for rice (HKO)
HPBP = Price of paddy seeds (Rp / kg)
HPUR = Price of fertilizer (Rp / kg)
PNPNGN = farm household expenditure for non-food consumption (Rp)
POP = Use of pesticide (liters)
HPOP = Price of pesticide (Rp /liter)
NPIP = Total value of input use (Rp)

TKDKSP = In-household labor usage for other than paddy (HKO)
TKDKOF = In-household labor usage for off-farm activities (HKO)
TKDKNF = In-household labor usage for non-farm activities (HKO)
UTKLK = labor wage for out-household (Rp / HKO)
UTKDKOF = labor wage for off-farm activities (Rp / HKO)
UTKDKNF = labor wage for non-farm activities (Rp / HKO)
TBUTP = Total cost of rice farming (Rp)
PUTP = income from rice farming households (Rp)
HPP = Price of paddy output (Rp / kg)
PUTSP = farm income than paddy (Rp)
PTOF = total income on farm / paddy farming+ besides paddy farming (RP)
PKOF = family income off-farm activities (Rp)
PKNF = family income non-farm activities (Rp)
PRT = Total household income (Rp)
PPNGN = farmer household expenditure on food (Rp)
PGNKS = farmer household expenditure on health (RP)
PGNPD = farmer household expenditure on education (Rp)
AKPP = Paddy farmer family (soul)
PKONS = Expenditure on food and non-food consumption (RP)
AKPPS = Paddy farmer family members who are still in school (soul)
PGNRT = Total household expenditure (RP)

2.3. Estimation and Simulation

Model identification shows that economic model of rice farmers household in *lebak* swampland is over-identified. Therefore, this research model estimation using 2SLS (Two Stage Least Squares). Model validation aims to analyze the extent models are built to represent the real world. In this research, statistical criteria for validation of value estimation econometric model is the Root Means Squares Error (RMSE), Root Means Squares Percent Error (RMSPE) and Theil's Inequality Coefficient. The results of model prediction is considered appropriate or feasible as a base simulation if the value of RMSPE and U-Theil get smaller or close to zero.

Simulations conducted to determine the impact of rice farmer household income changes, when the price or other policy changes. Simulation was done through: (a) increase in the paddy production factor inputs price simultaneously to cover the cost of seeds, fertilizer, pesticides and labor outside the family (TKLK), respectively 10%, (b) multiple simulation the increases 10% for total cost rice farming with paddy price increase of 10%, (c) the provision of subsidies for paddy seed; and (d) 25 % expansion of paddy acreage in *lebak* swampland

III. RESULTS AND DISCUSSION

3.1. General variability Econometrics Model Results

The empirical results of estimation model in this study is good. All exogenous variables included in the structural model has a sign in accordance with the parameters and logical theory. Statistical criteria used in evaluating the prediction is quite good. From 16 behavioral equations, most equations indicate adjusted R^2 values above 0.67 or more than 67%. Generally, in simultaneous equations, this suggests that exogenous variables included in the structural equation model was able to explain endogen variance of each variable. The value test statistic F is generally high, there are 12 equations of 16 equations that have F count value greater than 10.3; meaning

variation explanatory variables in each equation is jointly able to explain the variation of endogenous variable

Results structural equation estimation for input demand showed the input prices, including the price of paddy seeds; urea fertilizer, pesticides and wages TKLK, has a negative sign. This indicates that input price is an important factor in input use decision-making. These results are consistent with Kusnadi (2005); Asmarantaka (2007); and Hung and Fang (2010). Estimating input demand equation, both equations to use paddy seeds, fertilizer urea, pesticides and TKLK, also significantly affected by land area, with a positive sign. This implies that an increase in the use of land requires more input factors.

In equation of rice production estimation; seeds, fertilizer, pesticides and labor usage have a positive sign. The seeds and fertilizers usage have significant effect on paddy production. This suggests the use of both inputs, including the price factor, to be one important factor in decision making.

The results of family labor estimation for paddy affected by land usage, with a positive sign. The labor usage for off-farm activities and employment outside the family has a negative sign. The reality in *lebak* swamplands indicates that addition of paddy farming land is always dependent on labor availability in family. Conversely, there is a trade off between non-farm labor TKLK with family labor for paddy. This means that if the non-farm labor to be enlarged, it will reduce the labor for paddy farming. Reduced labor for paddy will increase the use of TKLK for certain activities that are urgent, such as planting and harvesting. This is similar to the opinion Blanc *et al* (2005).

The results of labor out-household estimation for paddy; besides negatively affected by the wages, are also influenced by the positive sign of land wide. The increase in labor wage of out-household likely decrease the labor force allocation although relatively small though. This is consistent with studies Sawit (1993) and Fukui *et al* (2004), the wages have a negative impact on labor usage. Conversely, the land area increase will increase the amount out-household labor. In paddy farming at *lebak* swampland, out-household labor is used in planting and harvesting, due to urgent nature of the activity.

3.2. Impact of paddy input factors price

The increase 10% for paddy price input (seeds, fertilizers, pesticides and wages TKLK) affect the PUTP of -7.61%. In addition to the decline of the PUTP, the increase in input prices also have an impact on the decline in farm income other than paddy about -0.223%; off-farm households income (PKOF) of -1.018% and non-farm household income (PKNF) also decreased -0.208%. The increase of input prices is evidently lowering paddy farmer household income (PRT) at *lebak* swampland of -2.44%. Income change comparison due the increase in paddy production cost is 10%, as shown in Figure 1

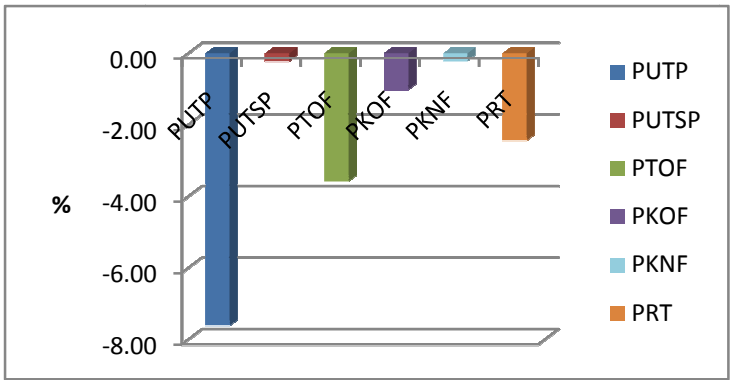

Figure 1. Income change comparison due to increased 10% cost of paddy farming

3.3. The impact of an input price increase to paddy output price in the same proportion

Multiple simulations, 10% increase in output price with 10% increase in paddy prices, intended to predict the impact on input use and income, both farm income (PUTP) and the household farmers income (PRT). The increase in total cost of paddy farming 10%, with a 10% increase in paddy prices, affect to a decrease in paddy seed usage of -3.88%, the decrease in urea usage of -35.97%, the decrease of pesticide use of -11.35% and -13.79% for TKLK. But despite this decline, the impact on paddy farming income (PUTP) remain positive, up to 2.52%. The impact of increased costs to paddy price with increase output price apparently lowering PUTSP (-0.223%); PKOF (-1.0185) and PKNF (-0.208%). The increase 10% in total cost of paddy farming with the increase 10% in paddy prices was still able to increase the farm households income (PRT) 0.54%. Income change comparison are shown in Figure 2.

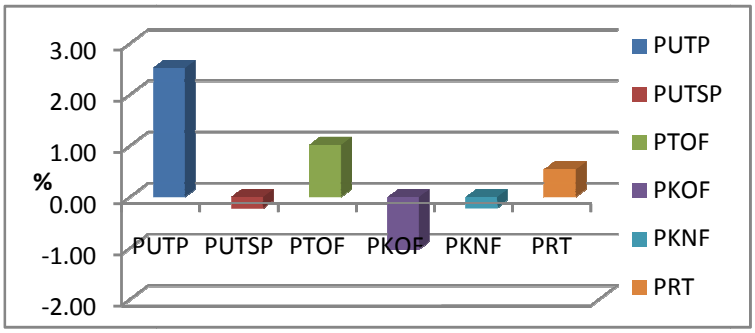

Figure 2. Income change comparison due to 10% cost increased cost and 10% paddy price increase

3.4. Impact of paddy seed subsidy

Input prices for paddy crops tend to increase along with the increase of inflation and economic conditions changes, both locally, regionally and nationally. This will put pressure on farmer household income levels. On the other hand, paddy production level increasingly erratic due to climate change, increasing the pressure on farmer household incomes, especially those from paddy farming. One of the government's policy options that have been executed but not yet holistic is seeds subsidy. The simulation results showed that seed subsidy can be lowered total cost of -17.05%. This cost reduction impact on the increase of farmer farming income (PUTP) of 12.028%; and PTOF 5.45%. Overall paddy seed subsidy would increase the farmer household income (PRT) of 3.53%. Income change comparison of seed subsidy provision is shown by figure 3.

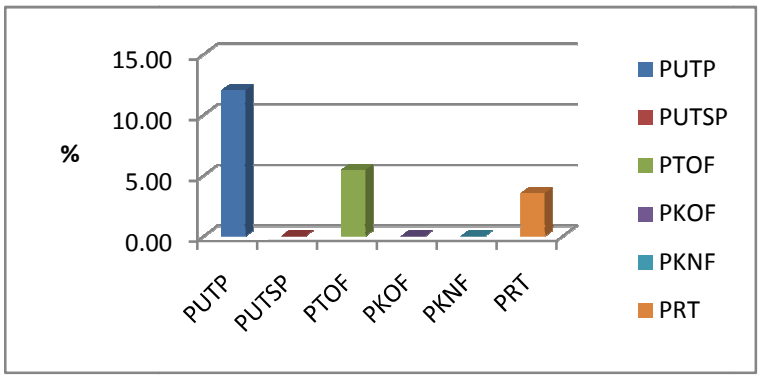

Figure 3. Income change comparison of seed subsidy

3.5. Impact of Paddy Extensification

Extensification of paddy acreage by 25%, assuming the input and output prices of paddy is constant, will increase the usage of paddy seeds (PBP) 5.74%, urea fertilizer (PPUR) 1.42% and pesticides (POP) 1.29%.

The increase usage of inputs result the increase input (NPIP) of 3.13% and also increase the total cost of paddy farming –TBUTP- (include wages of TKLK) of 10.98%. Comparison between changes in input use, changes in value of inputs usage and changes in total cost of paddy production due to an increase the total area of paddy crops in "lebak" area by 25% are shown in Figure 4.

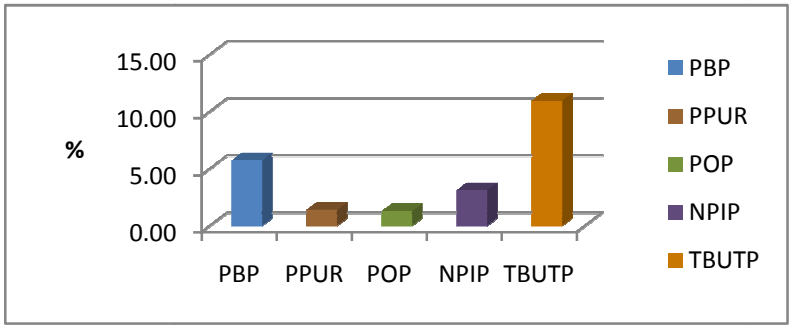

Figure 4. Comparison the changes of input use and cost due to 25 % paddy land wide increase

Not only inputs utilization, but vast areas of arable land expansion also affects labor usage. The labor usage in the family (TKDKP) should be added as an increase of 24.32%. Similarly, the use TKLK will increase 29.36%. Therefore, the labor usage for paddy (TKP) increased by 24.84%. Conversely, an increase TKDKP should reduce the amount of other labor than paddy farming (TKDKSP) of -14.16%, reduction in labor for off-farm activities (TKDKOF) of -12.78% and a reduction in labor for non- farm (TKDKNF) of -19.15%. Farm labor changes comparison due the increase in total area of paddy crops in lebak swampland area by 25% is shown in figure 5.

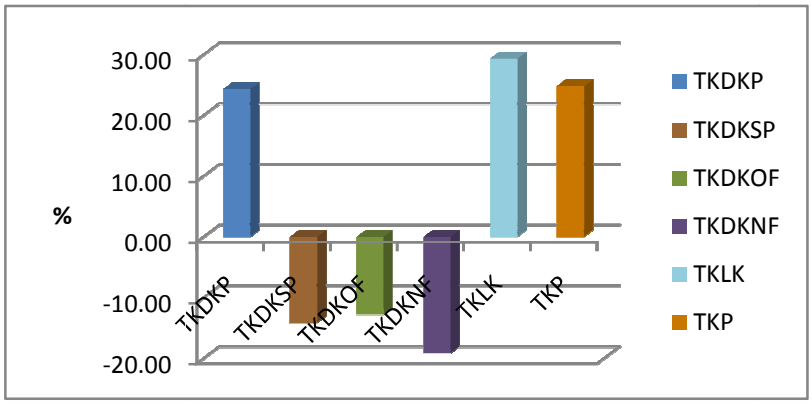

Figure 5. Farm labor change comparison due 25 % paddy land increased

The usage change of labor and input due to increased acreage of paddy plants have positive impact on farmer income. Therefore, it make paddy farmer income (PUTP) increased by 30.19%. In contrast, income from off-farm activities (PKOF) decreased by -44.19% and income from non-farm activities (PKNF) decreased by -10.83%. Overall, the expansion of paddy land 25% causes a decrease in farmers household income of -0.46%. There are two important causes of decline in rice farmers household income in lebak swampland, namely: (1) increase the use of paddy farming inputs adding to production cost, (2) farmers have to compensate the increase labor usage due to the expansion of rice farming with increase labor for paddy farming activities and/or reduce the labor usage in other activities. This suitable research proposed by Phimister and Roberts. (2006). When TKDK compensation is limited then add TKLK or leave the non-farm wages are higher. In addition, the expansion is also difficult to realize because in irrigation addition in *Lebak* swampland is difficult; too expensive.

This implies the need for further optimization for on-farm activities such as diversification than paddy such as vegetables, fisheries and livestock in order to increase household incomes of paddy farmers. This is in line with research by Suparwoto and Waluyo (2009). The decline in income from non-farm income was very influential on farmer household. Yet according to Adewunmi, *et al* (2011); Pam Zanohogo (2011); and Bereket Zerai and Zenebe Gebreegziabher (2011); non-farm income increased significantly to sustain household food security. It is implicitly also means strengthening the farm household economy. Income change comparison due the acreage increased of farmer household in lebak area by 25% shown in Figure 6.

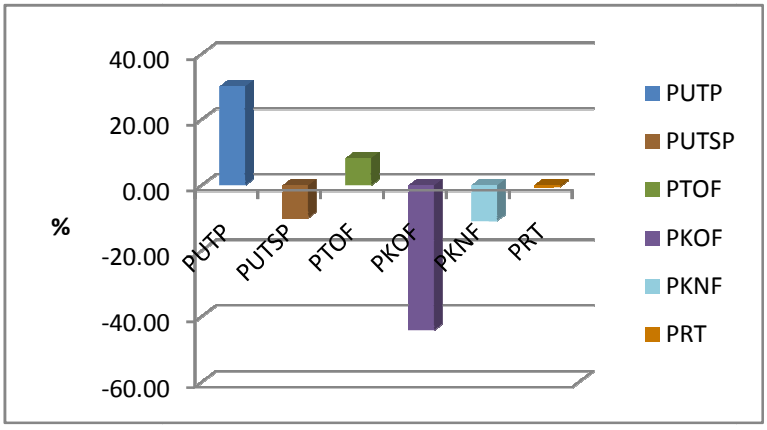

Figure 6. Income change comparison due to 25 % paddy land increased

IV. CONCLUSION

1. Price of paddy seed, fertilizer and wages TKLK affect input demand and the rising of input price (seeds; fertilizers; pesticides) would decrease household income of paddy farmers. Adversely, the input price increase coupled with paddy price output increase in the same proportion was still able to increase household farmer income in *lebak* swamplands. Negative impact of higher input price to household income of paddy farmers requires the input price stability at the farm level and smooth distribution. On the other hand, paddy price output must be maintained in order not fall or even can increase.
2. Seed subsidies also have positive impact on household income of paddy farmers. Therefore, seed subsidies policies that have been implemented can be expanded to include more farmers.
3. In paddy farming, as part of on-farm source of income, paddy crop area expansion (*extensification*) in *Lebak* swamplands had lower household income. In addition, the expansion is difficult to realize because of the difficulty of irrigation and too expensive. Negative impact of expansion on revenue has implications to the importance to optimize on-farm activities such as diversification other than paddy such as vegetables, fisheries and livestock that household rice farmer income in *Lebak* swampland. Farm diversification policy is the most likely alternative to increase farmer incomes in *Lebak* swamplands at on-farm level due the expertise that has been owned by the farmers and the land can still be used after paddy harvest. Efforts to increase farmer household income can also be done through non-farm activities. Moreover, wages level in non-farm activities likely continue to increase. Income maximization from non-farm activities can be done by improving farmer skills and opportunities utilization, not only around the *lebak* swampland area alone but covers a larger area. The increase in non-farm income is significant to sustain farmer household food security. It also means to strengthen the farm household economy.

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