Rice Fish-Farming System (RFFS) Contribution To The Income And Food Security Of Farm Households

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Abstract- Indonesia is the country with the fourth largest population in the world, each year experiencing an increase in population at an increasing rate. The increase in population has always had an impact on increasing the number of food needs. In order to keep face with the rate of population growth, an increase in agricultural production and productivity is a must for Indonesia. The irony is that the population continues to grow, but agricultural land is decreasing due to land conversion, and land damages due to environmental pollution which results in decreasing productivity and in a decrease in income especially of small farmers in the countryside. Various efforts have been made to increase food production, preserve the environment and improve food security, one of which is through "Rice-Fish Farming System (RFFS)" program. The RFFS program is an intensification program that aims to optimize the use of existing land to increase farmers' income and the food security of farm households. This study aims to determine the contribution of the RFFS income to farm households' income, analyze the level of household food security of RFFS farmers and analyze the affecting factors of Food Expenditure Share (FES). Primary and secondary data were analyzed using Microsoft Excel and SPSS version 19 for Windows. The level of food-secure of RFFS farm households was analyzed using the Food Expenditure Share (FES) value approach, which is a comparison between food expenditure and total costs derived from food and non-food expenditure; the value of food expenditure proportion <60% is categorized food-scure, while the value of food expenditure share $\geq 60\%$ is categorized food-insecure. Multiple regression is used to analyze the factors affecting Food Expenditure Share of farm households. The results showed that : (1) the average income contribution of RFFS to the average income of farm households was 61 percent, (2) the number of RFFS farmers in the food-secure category was 83 percent and in the food-insecure category was 17 percent, and (3) the Food Expenditure Share of farm households is strongly affected by the income level of the farm family, value of rice, value of egg and value of sugar.

Index Terms- (1) Rice Fish Farming System (2) Income (3) Food Security (4) Farm Households

I. Introduction

Indonesia is the country with the fourth largest population in the world, Indonesia's population growth rate of 1.2 percent per year is estimated that the population in 2020 will reach 271 million (BAPPENAS, 2013). An increase in population has always an impact on increasing the number of food needs. In order to keep pace with the rate of population growth, an increase in agricultural production and productivity is a must for Indonesia. Unfortunately the population continues to grow but agricultural land decreasing due to land conversion, and land damage due to environmental pollution, decreased productivity, increase production cost and decreased farmer income.

The threat of conversion of agricultural land to non-agriculture is increasingly out of control. According to the Ministry of Agriculture (2011), in Java and Bali since 2010 the water deficit and the rate of land conversion have taken place without a solution, resulting in higher food supply uncertainty, this is due to Java and Bali contributing to the largest national rice production (60%).

The foregoing resulted in a decrease in income for small farmers in the countryside. Various efforts have been made to increase food production, preserve the environment and improve food security, one of which is a cultivation program Rice-Fish Farming System (RFFS). RFFS was developed with the aim of optimizing land use, increasing farmers' income and increasing the food security of farmers' household. Integrated rice-fish farming offers a solution to this problem by contributing to food and income (Ahmaed N et. al. 2011)

According to the Center for Rice Crop Research (2017), RFFS has advantages including indirectly applying the principles of Integrated Pest Management (IPM), increasing the efficiency of fertilizer and water use, increasing intercropping land use with rice plants and fish in rice fields, increasing efficiency labor that is devoted to the management rice-fish, especially in fertilizing, spraying, and weeding, then increasing the variety of animal potential and providing new employment. Cultivation of fish in rice fields is a form of integrated farming, ideally the results of cultivation with an integrated system or diversification will increase the income of farmers, because in it occurs intensification, increased resource efficiency, increased productivity.

According to Nhan et al. (2007), Integrated farming systems are very suitable to be implemented by small farmers who have limited resources so they can maximize their works. Characteristics of farmers in developing countries such as Indonesia in general have a narrow land area. Land becomes a very scarce resource, so land use really has to be efficient. In RFFS of

cultivation practices, fish are integrated with rice so that land and water use occurs at the same time, resulting in savings in water and land resources.

Based on the background above, this study aims to determine the contribution of RFFS income to farm household's income and analyze the level of food security of rice-fish farmer households and the factors that influence Food Expenditure Share.

II.   RESEARCH METHODS

The survey method was used in this study. Data were collected from 30 Rice-fish farmers who were in the center of the RFFS Development Area in Leuwisari District, Regency of Tasikmalaya through the Random Sampling Method. Data were analyzed using Microsoft Excel and SPSS for windows.

Analysis of the contribution of Rice-Fish Farm's income to the total income of farm households is calculated by the value of percent. Research on farm's household food security of rice-fish was analyzed by Food Expenditure Share (FES) by Ilham and Sinaga (2007) with the following formula:

$$FES = \frac{FE}{TE} \times 100\%$$

Description :
FES   = Food Expenditures Share (%)
FE   = Food Expenditure (Rp / month)
TE   = The Total of Household Expenditure (Rp/ month)

The factors that influence Food Expenditure Share are analyzed using multiple regression, the equation is as follows:
$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10}$

Y	: Food Expenditure Share (FES) (%)
X_1	: Farmers' income (Rp)
X_2	: Number of family members (person)
X_3	: Farmer education (year)
X_4	: Value of rice (Rp)
X_5	: Value of vegetables (Rp)
X_6	: Value of fish (Rp)
X_7	: Value of eggs (Rp)
X_8	: Value of cooking oil (Rp)
X_9	: Value of sugar (Rp)
X_{10}	: Value of LPG (Rp)
α	: Intercept
b	: Regression coefficient (i = 1,.....10)

In this study, the hypothesis test used is a significant test on the test parameters simultaneously (Test -F) and partial testing (Test-t).

III.   RESULTS AND DISCUSSION

The contribution of Rice Fish Farmer's income to the income of farm households

The source of household income is classified into two parts, namely income from rice-fish farming and non-rice-fish farming (non-farm income in agriculture and other income): income from home industry, trade, employees, non-agricultural labor services and labor from other non-agricultural subsectors.

The results showed that the contribution of rice-fish farming's income to farm household income was 61 percent (Figure 1). This illustrates that Minapadi farming has become a source of income for farmers. Non-rice-fish income of 39 percent comes from trade, services, non-rice-fish of agricultural workers.
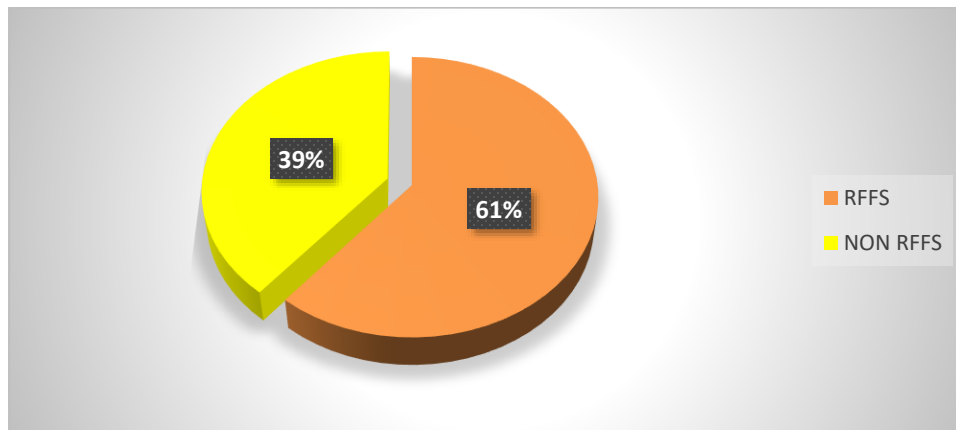

Figure 1. The average contribution of RFFS income to the Farmer's household income (per month)

In Figure 1 shows that the average RFFS household income is Rp.1,102,646 per month or contributes 61 percent of total household income. Then the average income from Non-Rice-fish is Rp. 704,971 per month or contribute 39 percent of total household expenditure.

Household Food Security of Farmers of Rice-Fish Farming System based on the Proportion of Household Expenditures

The proportion of food expenditure is the percentage of the income of farmer households allocated for food needs. The amount of food expenditure on total expenditure is 46 percent, while non-food expenditure is 54 percent. The proportion of food, non-food expenditure is presented in Figure 2.
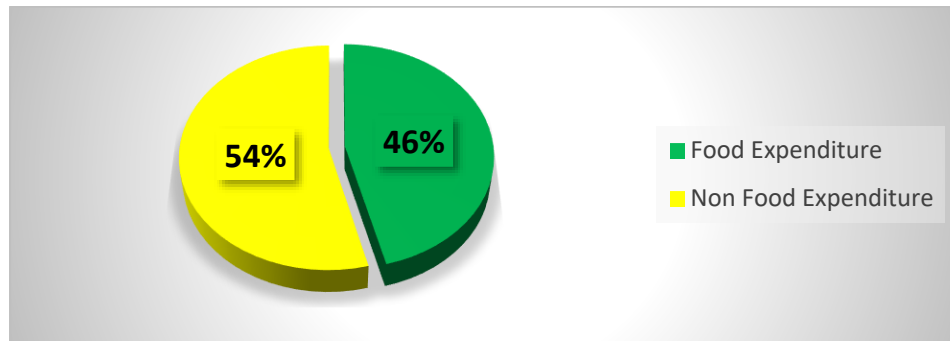
Figure 2. Proportion of Farm Household Expenditures (per month)
Source: Primary data processed, 2018

Based on the picture above it can be seen that the proportion of the average household expenditure of the total expenditure is Rp 1,807,617 consists of non-food expenditure of Rp. 976,687 or 54 percent and food expenditure which is Rp. 830,930 or 46 percent, it means that the respondent's household is in the category of food-resistant households. Because the proportion of food expenditure to total expenditure is lower than 60 percent. It can be used as an indicator to determine the level of welfare or household food security.

The most basic need for each person is the physiological need, namely the need to sustain life physically. These needs such as the need for food, drinks, shelter, sleep and oxygen (clothing, food, shelter). Physiological needs are the most basic and large potential for all fulfillment of their needs. Hungry humans will always be motivated to eat, not to find friends or be valued. Humans will ignore or suppress all other needs first until their physiological needs are fulfilled (G. Goble, Frank., 1987). Every human being, if his basic needs, especially food, have been fulfilled, will shift to meet other needs. The proportion of food expenditure that is greater than non-food expenditure shows that Rice-fish farmers still need to fulfill their basic needs, or are

referred to as food insecure households. Therefore, if households consume more luxury goods and other secondary needs, they are more prosperous households (Mor & Sethia, 2015).

The proportion of food expenditure is the ratio between food expenditure and total household expenditure per month. The proportion of food expenditure can be used as an indicator to measure household food security, if the expenditure proportion is <60% then the household is resistant to food, but if the proportion of food expenditure is ≥ 60% then the household is vulnerable to food. Through the expenditure proportion, it can be explained that the higher the proportion of food expenditure, the lower the level of household food security. The proportion of food expenditure is less than 60 percent indicates that the respondent's household has a level of income that is able to meet non-food needs.

Based on the results of the research that has been conducted, it shows that households of rice-fish farmer have a lower share of food expenditure than non-food expenditures, so it can be said that farm households of rice-fish are food-resistant. Distribution of rice-fish farm households based on the level of food security is presented in Figure 3.
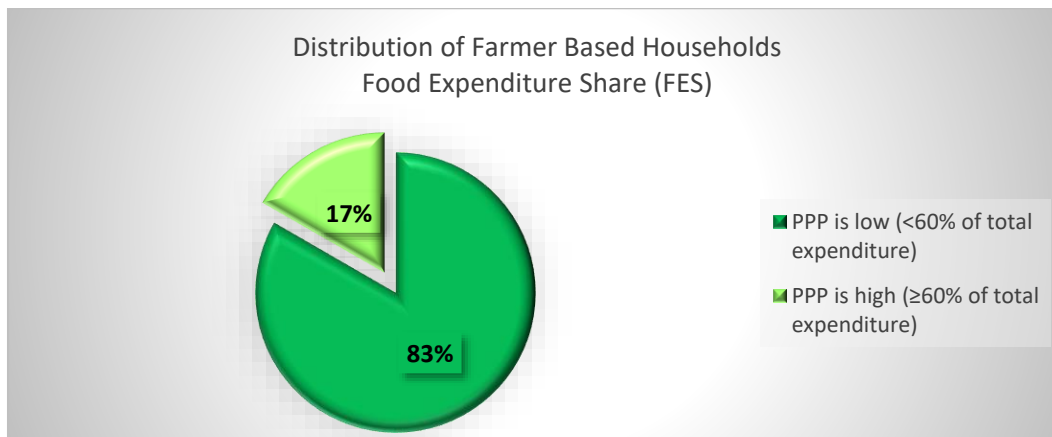
Figure 3. Distribution of Farm Households Based on Food Expenditure Share (FES).
Source: Primary Data processed, 2018.

Based on the data obtained in this study households of rice-fish farmers with the proportion of food expenditure <60 % is 83 percent. This means that 83 percent of rice-fish farmers households are already food resistant, while 17 percent of rice-fish farmers households as still not food-resistant. Meaning that 83 percent of rice-Fish farmers have been able to meet food needs for

their families while 17 percent of farmers are still in a vulnerable position if farmers do not try to increase their income. (Figure 4). This is, in accordance with Law No. 18 of 2012, that food security is a condition of fulfilling food for the country up to individuals.

IV. PROPORTION OF EXPENDITURES BY FARMER HOUSEHOLDS

Household expenditure is the cost incurred for the consumption of all household members in one house. The expenditure of these households is classified into two categories, namely expenditures for food consumption and expenditures for non-food consumption. The following is the average percentage of food expenditure in the respondent's household (Figure 4)

The largest average expenditure on food in farmer households is to buy rice, eggs and vegetables. Tofu and *tempe* as a source of vegetable protein still remain an option for farmers compared to meat and fish. Expenditures to buy chicken meat are still dominant compared to red meat and fish. The need for rice for rural farmers is still very dominant, the average rice need is 30 kg per month. The range of rice needs of farm households is between 15 - 60 kg per month. The high consumption of rice in farm families is because they assume that if they have eaten rice they will be full.

Farmers generally consume rice from their farms, the rice they produce is not entirely sold, they set aside rice to meet their family needs ranging from 10 to 15 percent of their production. Farmers and their families will feel safe if they already have rice. Farmers keep supplies in the form of grain. If necessary for consumption needs, the new family is ground into rice.
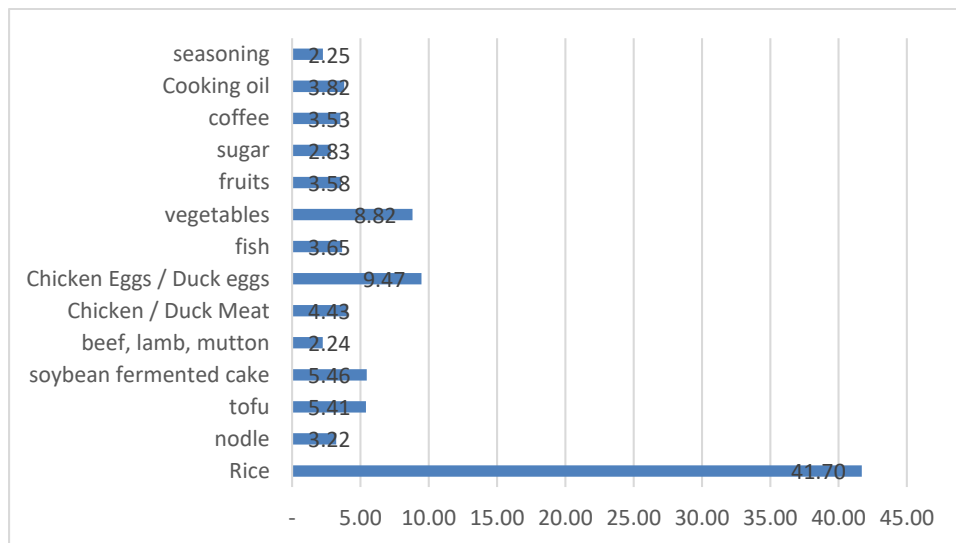

Figure 4. Average Percentage of Food Expenditure in Households of Rice-fish farm (per month)
Source: Primary Data processed, 2018

Rice produced from Rice-fish farming is healthy rice, because in the cultivation of Rice-fish systems, farmers do not spray with pesticides. So that the rice produced is rice that is safe for consumption. Fish produced from Rice-fish are seed fish with a size of 5-8 cm, 90 percent of farmers sell fish seeds to collectors, only 10 percent of farmers who use seeds to be planted again in their own ponds and are raised to consumption size.

Based on Figure 5, it can be seen that the largest non-food expenditure is for 18 percent transportation costs, which means transportation costs which are costs incurred by farm households to travel using public transportation, such as public transportation, and *ojeg*. The high cost of transportation is due to the accessibility of the location of farmers to public facilities that are not yet entirely affordable by public transportation so that they use *ojeg* services which cost much more expensive.
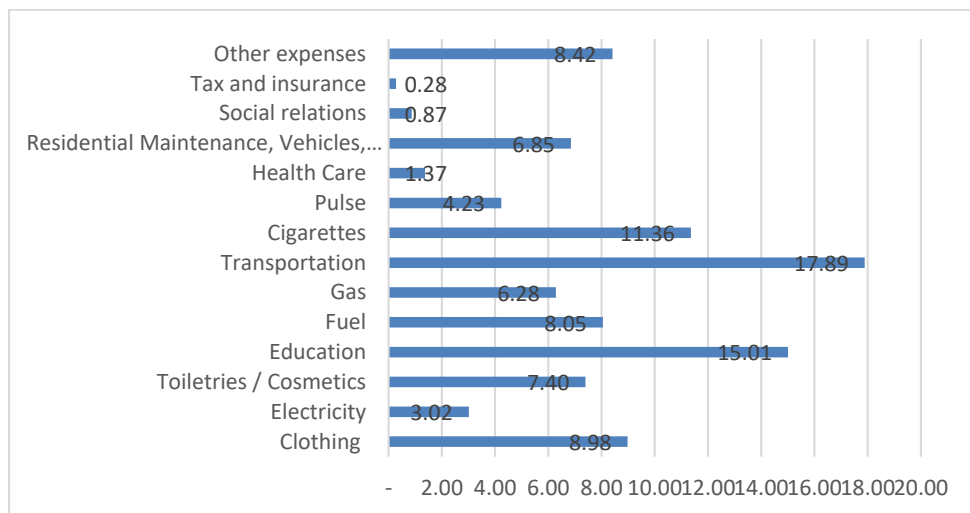
Figure 5. Average Percentage of Farm Household to Non-Food Expenditures (per month)
Source: Primary Data processed, 2018

Education expenditure is 15.01 percent. These education expenses are used for school fees, pocket money, stationery, and other school supplies. Education expenses are quite high; this indicates that farmers are aware of the importance of education so that they are expected to send their children to higher levels of schooling, so that their lives will be better.

The third non-food expenditure is expenditure on cigarettes by 11.36 percent. The average consumption of cigarettes is one pack per two days. Smoking habits for farmers cannot be eliminated, cigarettes for farmers are psychological needs, they prefer not to eat rice rather than not smoking.

Non-food expenditure is clothing. Clothing needs for farmers and their families occupy the fourth expenditure position. Farmers and their families buy clothes generally at the time of Eid, while other months rarely intentionally buy clothes so that the expenditure value is low. Besides that, the next non-food expenditure is expenditure on electricity, followed by expenditures for social activities and the last is expenditure for taxes. The rest of the expenditure is under 10 percent.

Another interesting thing from farmers' expenditure is that the expenditure for purchasing pulses is 4.23 percent. The development of information and communication technology cannot be stopped anymore. At present, the need for communication facilities has become a primary need, even though farmers live in the countryside. The use of communication by farmers in addition to communication needs with the family is also used for communication needs in other farmer groups. The smallest expenditure under 1 percent is expenses for taxes and insurance. Taxes issued by farmers are generally *PPB* (Land and Building Taxes) while insurance payments in agriculture are still rare. At this time there is insurance for rice, but not many farmers know.

V. FACTORS AFFECTING FOOD EXPENDITURE SHARE IN FARMERS HOUSEHOLD OF RICE-FISH FARMING

The results of the F test analysis in multiple regression show a Probability value of 0.000 smaller than alpha, which is 0.05, which means together with the factors of Income, Education Level, Number of Family Members, Education Costs, Rice Value, Tempe Value, Sugar Value, Vegetable Value, Fish Value, Egg Value and Oil Value. While the results of the t-test analysis show that the factors that influence the FES of the farm household in partial are income, rice value, egg value and sugar value. While the number of family members, education, LPG value, vegetable value, fish value, egg value, and cooking oil cannot be proven as a factor that affects the Food Expenditure Share of farmer households of Rice-fish Farming. The results of the Regression Analysis are presented as completely as in Table 1.

Table 1. Results of Multiple Regression Analysis Factors that influence Food Expenditure Share for households of Rice-fish farm.

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	50.169	7.116		7.050	.000
Income	-8.183E-6	.000	-1.083	-6.459	.000***
Farmer education level	1.094	.822	.188	1.331	.199
Family member	-.456	1.424	-.040	-.320	.752
Value of rice	2.526E-5	.000	.231	2.105	.049**
Value_of_eggs	2.274E-5	.000	.254	2.169	.043**
Value of fish	5.869E-5	.000	.105	.797	.435
Value_of_vagatables	3.161E-5	.000	.089	.838	.412
Value of cooking oil	2.532E-6	.000	.006	.026	.980
Value_of_sugar	.000	.000	.601	3.121	.006***
Value of LPG	-3.956E-5	.000	-.172	-1.282	.215

a. Dependent Variable: Food_Expenditure_Share_FES

Description:

*** : significant effect on α 1%

** : significant effect on α 5%

* : significant effect on α 10%

Income is very influential on the resilience of farm households, this can be explained that the higher the income, the higher the food security, all food needs will be covered by high income. The higher the level of income of the farm family, the more money spent on non-food needs, if food expenditure increases, it will certainly reduce the value of FES (Food Expenditures Share), indicated by a negative regression coefficient, smaller FES values indicate food security the higher. It is hoped that the increase in income from Rice-Fish Farming can increase food security because in addition to being able to access the food needs of farmers, they also obtain rice and fish from their farming products that are produced in a healthy, environmentally and friendly.

If the farm household income gets higher, then the farmer will allocate his income to non-food needs. Greater non-food expenditure illustrates that farmers are increasingly prosperous. Revenues will be allocated to food needs until sufficient. However, non-food expenditure will continue to increase in accordance with the level of income earned.

The value of rice expenditure influences the food security of farm households, the regression coefficient of the value of rice is positive, meaning that if the value of expenditure for rice is higher then the value of FES will be greater, the greater the value of FES, this indicates that food security will decrease. Because the portion of food expenditure is getting bigger.

Egg value is an expenditure that affects FES. Eggs are a cheap and easily available source of animal protein so spending on these eggs will still be a top priority for the fulfillment of the nutrition of the farm family. Whereas other sources of animal protein such as fish and meat are still not used to being consumed every day by the farm family because getting it is not as easy as buying eggs. Eggs are available in small shops and can be stored longer without refrigerators. So the expenditure to buy eggs will certainly increase food purchases so that FES will increase and eventually affect the level of food security.

All coefficients of food variable regression are positive, meaning that the greater the expenditure on food expenditure, the higher the value of the share of food expenditure, which means that food security decreases, whereas the regression coefficient for non-food variables is negative. This means that the higher expenditures for non-food will reduce the share value of food expenditure or the higher non-food expenditure shows that farm households are more food-scure. Households that are food-scure means that they can meet all food needs, so that their income is allocated for non-food.

VI. CONCLUSION :

Based on the research that has been done, it can be concluded that:

(1) The contribution of rice-fish farming income contributes 61 percent to the income of farmer families.

(2) The rice-fish farmer households are in the food-resistant category, namely 83 percent, and 17 percent are still in the category of not yet resistant to food.

(3) Food Expenditure Share of farm households is strongly influenced by the level of income of the farm family, the value of rice, eggs, and sugar.

VII. RECOMENDATION :

Based on the results of the study, the following things can be recommended:

1) Rice-Fish Farming System must be maintained because it is farming that contributes significantly to family income.

2) The pattern of high rice consumption in farmer households must be a concern, because food security can not only meet the needs of carbohydrates but also various other nutritional needs.

3) RFFS farmers households still food-insecure can increase their income through optimizing existing land use by planting various crops that can be harvested for a long time.

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