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Economic Behaviors of Virginia Tobacco Farmers Households in Facing Farming Risks in Lombok Island, Indonesia

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Abstract This study aim is to analyze the economic behaviors of virginia tobacco farmer households in facing farming risks and the impacts of these behaviors on the farmer welfare in Lombok Island, Indonesia. Data were collected from 240 farmer households which were chosen by proportionate cluster random sampling. Thus, Data were analysed by econometric approach using simultaneous equations. The results showed that farmer households in Lombok island conducting virginia tobacco farming had a risk-taking behavior. This behavior was resulted not only from economic rational considerations, but also from socio-cultural considerations, such as belief and heritage. These behavior and considerations will motivate the farmers to increase the planting area and labors allocation in tobacco farming. It will encourage the farmers in conducting tobacco farming and will have impacts on the increase of economics incomes and welfare of farmer households.

Keywords Behavioral economics, Farming risk, Household welfare

1. Introduction

Tobacco is a controvercial commodity. It is looked as the cause of many diseases and it may cause death [1], but in the other hand, it plays an important role in the economy of many countries. In Indonesia, tobacco bussiness play an important role in the citizen socio-economic, either as labors absorber, a source of income for farmers and labors, as well as the source of costums and foreign exchange for the country [2].

Lombok island is the central production of virginia tobacco in West Nusa Tenggara (NTB) province, even in Indonesia. In 2011, it contributed approximately 80% from total national production and more than 9.7 trillion rupiah of foreign exchange. This tobacco trade is covering a total area of approximately 24,000 hectars and involving 15,000 households. Thus, around 75,000 people living is depend on virginia tobacco trading activities [2, 3].

Virginia tobacco is a highly capital and labor intensive commodity, sensitive to climate changes, pest attack, in country and foreign country regulations; and its market is olygopsony. Therefore, it faces many risks, including production, output price, input price, financial, organisation and regulation risks [4-6]. But, from all of those risks, production and price risks are faced the most by farmers every year [7-9].

There are three possibilities of farmers' behaviors in facing the risk, those are; (i) risk aversion, (ii) risk taker, and (iii) risk neutral [10]. Those farmer behaviors have impacts on farming production and income [4]. Risk averse farmers will produce less than the risk taker and risk neutral farmers. If there is an increse in risks, averse farmers will decrease the output, while the risk taker farmers will try to increase the production with a bigger loss probability [4, 7]. Therefore, farmer behaviors in facing the risk will have impacts on the economic welfares of households.

The aim of this study is to analyze the economic behaviors of virginia tobacco farmer households in facing farming risks and its impacts on the economic welfares of farmer households in Lombok island, West Nusa Tenggara, Indonesia.

2. Material and Methods

This study was conducted in Lombok island, West Nusa Tenggara, Indonesia. The locations were determined in stages, starting from regency, sub-district, up to village levels using purposive sampling methods based on the production centre of tobacco or the most tobacco farmers in each area. Through this process, there are four sample villages as the study location. Two villages are located in the northern part of tobacco plantation areas, i.e Montong Gamang and Rarang Selatan villages that have loose soil

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conditions and relatively close to water sources. The other two villages are located in the southern part of tobacco planting areas, i.e.: Ganti and Jerowaru villages that have heavy soil and relatively far from water sources.

The objected households of this study were the farmer households who have done tobacco farming and flue curing it; consists of farmer households who are in partnership with tobacco companies and self-supporting farmer households who are not in partnership with tobacco companies. The total numbers of farmer households were determined using proportionate cluster random sampling by the following equation [11]:

$$n = \frac{N \sum N_h \sigma_h^2}{N^2 \frac{d^2}{Z^2} + \sum N_h \sigma_h^2} \quad (1)$$

Description :

n	Total of sample
N	Total of population
N_h	Total of farmer population in each cluster; h=1,2 (1 = self-supporting farmers; 2 = supporting farmers)
d	The maximum error that can be tolerated (maximum 5%)
Z	Table Z on the level trust of 97,5%
σ_h^2	The variance of farming area population in each cluster

The total of samples obtained (n) were distributed proportionally in each cluster of supporting farmers and self-supporting farmers. Based on the formula above, from the total of 12,101 farmers population, the farmer households being sampled were 240 farmer households consisted of 150 self-supporting farmers and 90 supporting farmers.

All data were analyzed using simultaneous equations based on econometric approach. It to understand the economic behaviors of farmer households to face the production and price risk. The production and price risk measurements were conducted by measuring both of expectation and variance of production and tobacco price in each samples using following equations

$$EPRDT_i = p_{ih}PRDT_{ih} + p_{ir}PRDT_{ir} + p_{in}PRDT_{in} \quad (2)$$

$$VPRDT = p_{ih}[PRDT_{ih} - EPRDT_i]^2 + p_{ir}[PRDT_{ir} - EPRDT_i]^2 + p_{in}[PRDT_{in} - PRDT_i]^2 \quad (3)$$

$$EHT_i = q_{ih}\,HT_{ih} + q_{ir}\,HT_{ir} + q_{in}\,HT_{in}, \quad (4)$$

$$VHT_i = q_{ih}[HT_{ih} - EHT_i]^2 + q_{ir}[HT_{ir} - EHT_i]^2 + q_{in}[HT_{in} - EHT_i]^2 \quad (5)$$

Description:

EPRDT	=	Tobacco production expectation (Kg/Are; an Are is equal to 0.01 hectare)
EHT	=	Tobacco price expectation (Rp/kg)
VHT	=	The variance of tobacco price or tobacco price risk (RHT)
VPRDT	=	The variance of tobacco production or tobacco production risk (RPRDT)
PRDT	=	Tobacco productivity (Kg/Are)
HT	=	Tobacco price (Rp/kg)
p	=	Tobacco productivity opportunities
q	=	Price tobacco opportunities (%)
i	=	Sample number-i
h,r,n	=	Showing high (h), normal (r) and low (n) opportunities.

The production and price risk obtained from equation (3) and (5) were entered to the farmer household economic model as the exogenous variable. The model of farmer household economic used were described below:

$$LLUT = LLMUT + LLSUT \quad (6)$$

$$LLMUT = a_0 + a_1EHT + a_2RPRDT + a_3RHT + a_4SLUT + a_5PRTSMT + a_6\,PENGRT + a_7MITRA + E_1 \quad (7)$$

$$LLSUT = b_0 + b_1EHT + b_2RPRDT + b_3RHT + b_4SLUT + b_5SPRT + b_6\,JTKRT + b_7MITRA + E_2 \quad (8)$$

$$PRDT = c_0 + c_1EPRDT + c_2\,RPRDT + c_3RHT + c_4PKNO3 + c_5\,PNPK + c_6TKUT + c_7MANUT + c_8MITRA + E_3 \quad (9)$$

$$PROT = LLUT*PRDT \quad (10)$$

$$BIBIT = d_0 + d_1EHT + d_2RPRDT + d_3RHT + d_4LLUT + d_5MITRA + E_4 \quad (11)$$

$$PUREA = e_0 + e_1EHT + e_2RPRDT + e_3RHT + e_4BNH + e_5MITRA + E_5 \quad (12)$$

$$PSP36 = f_0 + f_1EHT + f_2RPRDT + f_3RHT + f_4PUREA + f_5MITRA + E_6 \quad (13)$$

$$PNPK = g_0 + g_1EHT + g_2RPRDT + g_3RHT + g_4PKNO3 + g_5PRTSMT + g_6\,MITRA + E_7 \quad (14)$$

$$PKNO3 = h + h_1EH + h_2RPRDT + h_3RHT + h_4PNPK + h_5\,MITRA + E_8 \quad (15)$$

$$NOBAT = i_0 + i_1EH + i_2RPRDT + i_3RHT + i_4PUREA + i_5MITR + E_9 \quad (16)$$

$$BBPT = j_0 + j_1EHT + j_2RPRDT + j_3RHT + j_4PROTB + j_5PRTSMT + j_6MITRA + E_{10} \quad (17)$$

$$NINPUT = BIBIT*HBIBIT + PUREA*HPUREA + PSPO36*HPSP36 + PNPK*\,HPNPK + PKNO_3*HPKNO_3 + OBAT \quad (18)$$

$$TKPDKUT = k_0 + k_1\,EHT + k_2RPRDT + k_3RHT + k_4LLUT + k_5TKPLKUT + k_6TKPOF + k_7\,PRTLHK + k_8LDESA + E_{11} \quad (19)$$

$$TKWDKUT = l_0 + l_1EHT + l_2RPRDT + l_3RHT + l_4LLUT + l_5KWLKUT + l_6TKWOF + l_7LDESA + E_{12} \quad (20)$$

$$TKDKUT = TKPDKUT + TKWDKUT \quad (21)$$

$$TKPLKUT = m_0 + m_1\,EHT + m_2RPRDT + m_3RHT + m_4EPRDT + m_5LLUT + m_6\,PRTSMT + m_7\,LDESA + E_{13} \quad (22)$$

$$TKWLKUT = n_0 + n_1EPRDT + n_2EHT + n_3RPRDT + n_4RHT + n_5LLUT + n_6PRTSMT + n_7LDESA + E_{14} \quad (23)$$

$$TKLKUT = TKPLKUT + TKWLKUT \quad (24)$$

$$TKUT = TKDKUT + TKLKUT \quad (25)$$

$$TKPOF = o_0 + o_1EHT + o_2RPRDT + o_3RHT + o_4LLUT + o_5TKPNF + o_6SPRT + E_{15} \quad (26)$$

$$TKWOF = p_0 + p_1EHT + p_2RPRDT + p_3RHT + p_4LLUT + p_5TKWNF + p_6SPRT + E_{16} \quad (27)$$

$$TKOF = TKPOF + TKWOF \quad (28)$$

$$TKPNF = q_0 + q_1\,RPRDT + q_2RHT + q_3LLUT + q_4PNPGN + q_5PRTSMT + q_6JTKRT + q_7PKRT + E_{17} \quad (29)$$

$$TKWNF = r_0 + r_1RPRDT + r_2RHT + r_3LLUT + r_4PPGN + r_5PRTSMT + r_5JTKRT + r_6PIRT + E_{18} \quad (30)$$

$$TKNF = TKPNF + TKWNF \quad (31)$$

$$TKRT = TKUT + TKOF + TKNF \quad (32)$$

$$BUT = SLUT*LLUT + HBIBIT*BIBIT + HPUREA*PUREA + HPSP36 * PSP36 + HPNPK*PNPK + HPKNO3*PKNO3 + UTKPUT* TKPUT + UTKWUT* TKWUT + NOBAT + BBPT + BLLUT \quad (33)$$

$$BIUT = SLUT*LLMUT + UTKPUT*TKPDKUT + UTKWUT*TKWDKUT \quad (34)$$

$$BEUT = BUT - BIUT \quad (35)$$

$$NPROT = PROT*HT \quad (36)$$

$$PUT = NPROT - BUT \quad (37)$$

$$PTKPOF = s_0 + s_1EHT + s_2RPRDT + s_3RHT + s_4TKPOF + E_{19} \quad (38)$$

$$PTKWOF = t_0 + t_1EHT + t_2RPRDT + t_3RHT + t_4TKWOF + E_{20} \quad (39)$$

$$PTKOF = PTKPOF + PTKWOF \quad (40)$$

$$PTKPNF = u_0 + u_1RPRDT + u_2RHT + u_3PKRT + u_4TKPNF + E_{21} \quad (41)$$

$$PTKWNF = v_0 + v_1RPRDT + v_2RHT + v_3PIRT + v_4TKWNF + E_{22} \quad (42)$$

$$PTKNF = PTKPNF + PTKWNF \quad (43)$$

$$PRTDMT = PUT + PTKOF + PTKNF \quad (44)$$

$$PRT = PRTDMT + PRTSMT + PRLHK \quad (45)$$

$$PPGN = w_0 + w_1EHT + w_2RPRDT + w_3\,RHT + w_4\,PRTSMT + w_5LLSUT + w_6\,JART + E_{23} \quad (46)$$

$$PNPGN = x_0 + x_1EHT + x_2RPRDT + x_3RHT + x_4PRTDMT + x_5LLMUT + x_6\,PKRT + E_{24} \quad (47)$$

$$PENGRT = PPGN + PNPGN \quad (48)$$

$$SPRT = PRT - PENGRT \quad (49)$$

The models were consisted of 44 equations, they were 24 behavioral equations and 20 identity equations. The model parameters were estimated by Two Stage Least Squarer (2SLS). Simulation was used to determine the farming risk impact on the welfare of farmer household economy, then was validated by Root Mean Squares Percent Error (RMSPE), U-Theil coefficients and its decomposition.

3. Result and Discussion

3.1. The Behavioral of Farmer Household Economic Facing Farming Risk

The analysis results of the economic behavior model of farmer households in equation (50)-(73) have determination coeffision (R^2) varried from 0,08383 (8,383%) to 0,99803 (99,80%). The behavioral equation which has low determination coeffision (under 50%) is the equation of land area owned by tobacco farm (LLMUT) which is around 41,48%, the equation of pesticide and plant growth regulator values (NOBAT) which is around 32,31%, the equation of male labor outpouring is 13,64% and female labors is 8,38% in the family in off-farm activities (TKPOF and TKWOF), the equation of male labor outpouring is 16,15% and female labors is 9,78% in the family in non-farm activities (TKPNF dan TKWNF), while the other equations have determination coeffisien of above 50%.

The low coefficient of determination in some of the above equations show that there are low contribution from explanatory variable in that equation to the variance of the explained variable. This condition is also found when analyzing the estimation of economic model of vegetable farmer households in Pangalengan sub-distric, Bandung Regency with determination coefficient ranged from 2% to 99% [8, 12-15]. The low determination coefficient of those results were caused by the data being analyzed were cross

section data, where the values of the explanatory variables entered to the models were not or less varied, therefore the value could not show their contribution to the variables being explained.

While statistical testing using F-test showed that the explanatory variables in all behavior equations gave significant effect at the level of less than one percent. Those mean that explanatory variables in each behavior equation simultaneously influence the variables being explained at the confident level of more than 99%.

The partial testing using t-test (equations (50)-(73) at the confident level of at least 90 % showed that the price risk (RHT) has a positive impact on the area of the renting land for tobacco farming (LLSUT), and the production risk positively affects tobacco productivities. It means that the farmer behavior in making decision on production is catagorized the risk taker. The higher the price risk, the wider the land they rent; and the higher the production risk (RPRDT), the higher the productivity of the tobacco (PRDT) produced by the farmers.

The Equation of Production Activity Behavior

$$\begin{aligned} LLMUT &= -25{,}8631 + 2{,}856994\ EHT^{*} - 15.3645\ RPRDT + 0{,}109792\ RHT - 0{,}0004 SLUT^{***} \\ &\quad + 5{,}532E\text{-}6\ PRTSMT^{***} - 9{,}84E\text{-}7\ PENGRT^{***} - 0{,}82675\ MITRA \end{aligned} \quad (50)$$

$$\begin{aligned} LLSUT &= -403{,}622 + 12{,}89123\ EHT^{***} + 74{,}65886\ RPRDT + 1{,}080073\ RHT^{**} \\ &\quad - 0{,}00095\ SLUT^{***} + 7{,}764E\text{-}6\ SPRT^{***} + 48{,}35826\ JTKRT^{***} + 2{,}763258\ MITRA \end{aligned} \quad (51)$$

$$\begin{aligned} PRDT &= 7{,}506669 + 6{,}174955^{***}\ EPRDT + 3{,}912915\ RPRDT^{***} - 0{,}00542\ RHT + 0{,}001453\ PKNO3 \\ &\quad + 0{,}001899\ PNPK^{***} - 0{,}00176\ TKUT^{***} + 0{,}020882\ MANUT + 0{,}138993\ MITRA \end{aligned} \quad (52)$$

The Equation of the Usage of Facilities and Fuel Behavior

$$BIBIT = -8878{,}86 + 281{,}7268\ EHT^{***} + 935{,}2220\ RPRDT + 24{,}36064\ RHT^{***} + 184{,}6199\ LLUT^{***} - 157{,}533\ MITRA \quad (53)$$

$$PUREA = 92{,}39920 + 2{,}100024\ EHT + 24{,}28563\ RPRDT - 0{,}40893\ RHT + 0{,}004982\ BIBIT^{***} - 194{,}741\ MITRA^{***} \quad (54)$$

$$PSP36 = -58{,}8513 - 18{,}6213\ RPRDT + 0{,}488372\ RHT + 1{,}289678\ PUREA^{***} + 171{,}3339\ MITRA^{***} \quad (55)$$

$$\begin{aligned} PNPK &= -371{,}510 - 13{,}6355\ RPRDT + 0{,}403023\ RHT + 1{,}449816\ PSP36^{***} \\ &\quad + 0{,}000015\ PRTSMT^{***} + 285{,}9448\ MITRA^{***} \end{aligned} \quad (56)$$

$$PKNO3 = -572{,}198 + 19{,}52040\ EHT^{***} + 95{,}80438\ RPRDT + 0{,}128942\ RHT + 0{,}675297\ PNPK^{***} - 6{,}69855\ MITRA \quad (57)$$

$$\begin{aligned} NOBAT &= -2027777 + 874691{,}4\ EPRDT^{***} + 1014676\ RPRDT - 5946{,}24\ RHT \\ &\quad + 3301{,}675\ PUREA^{***} + 0{,}023042\ PRTSMT^{***} + 513678{,}1\ MITRA^{***} \end{aligned} \quad (58)$$

$$BBPT = 1800911 - 840218\ RPRDT + 27885{,}5\ RHT^{*} + 450{,}1409\ PROTB^{***} + 0{,}024834\ PRTSMT - 130514\ MITRA \quad (59)$$

The Equation of Labors' Usage Behavior

$$\begin{aligned} TKPDKUT &= 22{,}36633 - 33{,}8156\ RPRDT + 0{,}216310\ RHT^{*} + 0{,}333825\ LLUT^{***} \\ &\quad - 0{,}07203\ TKPLKUT^{***} - 0{,}06097\ TKPOF - 1{,}86E\text{-}7\ PRTLHK + 13{,}50479\ LDESA \end{aligned} \quad (60)$$

$$\begin{aligned} TKWDKUT &= 22{,}01635 + 10{,}50062\ RPRDT + 0{,}043758\ RHT + 0{,}014489\ LLUT \\ &\quad + 0{,}027565\ TKWLKUT - 0{,}10548\ TKWOF^{*} - 0{,}14306\ LDESA \end{aligned} \quad (61)$$

$$\begin{aligned} TKPLKUT &= -614{,}061 + 145{,}5818\ EPRDT^{***} + 5{,}657287\ EHT^{**} + 156{,}7802\ RPRDT^{*} \\ &\quad + 1{,}064553\ RHT^{***} + 2{,}350545\ LLUT^{***} + 2{,}863E\text{-}6\ PRTSMT^{***} + 80{,}95051\ LDESA^{***} \end{aligned} \quad (62)$$

$$\begin{aligned} TKWLKUT &= 137{,}2599 - 33{,}4955\ EPRDT^{*} - 1{,}29503\ EHT - 90{,}5357\ RPRDT^{*} - 0{,}31059\ RHT \\ &\quad + 1{,}933376\ LLUT^{***} - 2{,}05E\text{-}6\ PRTSMT^{***} + 12{,}13007\ LDESA^{***} \end{aligned} \quad (63)$$

$$\begin{aligned} TKPOF &= 89{,}74204 - 0{,}03527\ EHT^{***} + 51{,}72352\ RPRDT^{**} + 0{,}213652\ RHT^{*} \\ &\quad - 0{,}06072\ LLUT^{***} + 0{,}007932\ TKPNF + 3{,}481E\text{-}7\ SPRT \end{aligned} \quad (64)$$

$$\begin{aligned} TKWOF &= 62{,}94910 - 2{,}22166\ EHT^{***} + 50{,}54038\ RPRDT^{**} + 0{,}173065\ RHT \\ &\quad - 0{,}02786\ LLUT - 0{,}01123\ TKWNF + 1{,}22E\text{-}7\ SPRT \end{aligned} \quad (65)$$

$$\begin{aligned} TKPNF &= -15{,}4085 - 18{,}4995\ RPRDT - 0{,}09143\ RHT - 0{,}21731\ LLUT^{***} + 2{,}091E\text{-}6\ PNPGN^{**} \\ &\quad + 2{,}332E\text{-}6\ PRTSMT + 8{,}499811\ JTKRT + 1{,}351570\ PKRT^{*} \end{aligned} \quad (66)$$

$$\begin{aligned} TKWNF &= -76{,}4607 + 48{,}15546\ RPRDT + 0{,}515423\ RHT - 0{,}27951\ LLUT^{***} \\ &\quad + 5{,}454E\text{-}6\ PPGN^{**} + 3{,}538E\text{-}6\ PRTSMT^{***} + 1{,}902309\ JTKRT + 0{,}179710\ PIRT \end{aligned} \quad (67)$$

The Equation of Household Income Behavior

PTKPOF = 345986,4 -13106,3 EHT – 289790 RPRDT + 1405,375 RHT + 33990,98 TKPOF*** (68)

PTKWOF = 307412,2 – 11414,1 EHT** + 4608,947 RPRDT + 665,2334 RHT + 23344,52 TKWOF*** (69)

PTKPNF = -564400 – 1267552 RPRDT + 4658,154 RHT + 52476,18 PKRT** + 57259,95 TKPNF**** (70)

PTKWNF = 489361,5 + 2034256 RPRDT -26171,7 RHT**+ 47181,00 PIRT**+ 49506,35 TKWNF*** (71)

The Equation of Household Consumption Behavior

PPGN = - 86488,7+ 2549830 EPRDT***- 6054546 RPRDT** – 17415,7RHT
+ 0,265012 PRTSMT***+ 22446,07 LLSUT*** + 1724770 JART*** (72)

PNPGN = -3619879 + 112361,2 EHT – 7179325 RPRDT + 1771,507 RHT
+ 0,561535 PRTPMT***+ 48195,91 LLMUT***+ 75560,84 PKRT (73)

Variable Descriptions:

A. Endogenous Variable:

1.	LLUT	=	Virginia tobacco farming land area (Are).
2.	LLMUT	=	Land area owned by virginia tobacco farming (Are)
3.	LLSUT	=	Virginia tobacco farming rent land (Are)
4.	PRDT	=	Productivity of dry virginia tobacco (Kg/Are)
5.	PROT	=	The production of dry virginia tobacco (Kg)
6.	NPROT	=	Virginia tobacco production values (Rp)
7.	BIBIT	=	Total of virginia tobacco seed (tree)
8.	PUREA	=	Total of UREA (Kg).
9.	PSP36	=	Total of SP36 (Kg)
10.	PNPK	=	Total of NPK (Kg).
11.	PKNO3	=	Total of KNO3 (Kg)
12.	NOBAT	=	Cost of drugs (Rp)
13.	BBPT	=	Cost of fuel virginia tobacco curing (Rp)
14.	NINPUT	=	Cost of virginia tobacco farming input (Rp)
15.	TKPDKUT	=	Total of male labors in the virginia tobacco farming family (HKO)
16.	TKWDKUT	=	Total of female labors in the virginia tobacco farming family (HKO)
17.	TKDKUT	=	Total of labors in the virginia tobacco farming family (HKO)
18.	TKPLKUT	=	Total of male labors in the outside virginia tobacco farming family (HKO)
19.	TKWLKUT	=	Total of female labors in the virginia tobacco farming family (HKO)
20.	TKLKUT	=	Total of labors in the virginia tobacco farming family (HKO)
21.	TKUT	=	Total of labors in the virginia tobacco farming (HKO)
22.	TKPOF	=	Total of male labors in the off-farm family (HKO)
23.	TKWOF	=	Total of female labors in the off-farm family (HKO)
24.	TKOF	=	Total of labors in the off-farm family (HKO)
25.	TKPNF	=	Total of male labors in the non-farm family (HKO)
26.	TKWNF	=	Total of female labors in the non-farm family (HKO)
27.	TKNF	=	Total of labors in the non-farm family (HKO)
28.	TKRT	=	Total of outpouring households labors (HKO)
29.	BUT	=	Cost of virginia tobacco farming (Rp)
30.	BIUT	=	Implicit cost of virginia tobacco farming (Rp)
31.	BEUT	=	Explicit cost of virginia tobacco farming (Rp)
32.	NPROT	=	Production cost of virginia tobacco farming (Rp)
33.	PUT	=	Income of virginia tobacco farming (Rp)
34.	PTKPOF	=	Income of male labors in the off-farm family (Rp)
35.	PTKWOF	=	Income of female labors in the off-farm family (Rp)
36.	TPOF	=	Income of labors in the off-farm family (Rp)
37.	PTKPNF	=	Income of male labors in the non-farm family (Rp)
38.	PTKWNF	=	Income of female labors in the non-farm family (Rp)

39.	TPNF	=	Income of households in the off-farm family (Rp)
40.	PRT	=	Income of household in a year (Rp)
41.	PPGN	=	Food consumption expenditure for a year (Rp)
42.	PNPGN	=	Non-food consumption expenditure for a year (Rp)
43.	PENGRT	=	Household consumption expenditure for a year (Rp)
44.	SPRT	=	Surplus of household income (Rp)

Note:
- An Are is equal to 0.01 hectare
- HKO means man-day

B. Exogenous Variables:

1.	RPRDT	=	Virginia tobacco productivity risks
2.	RHT	=	Virginia tobacco price risk
3.	EPRDT	=	Expectation dry virginia tobacco productivity (kg / are)
4.	EHT	=	Virginia tobacco price expectations (Rp/ kg)
5.	HT	=	Dry virginia tobacco prices (Rp / kg)
6.	SLUT	=	Virginia tobacco farming land renting (Rp)
7.	HBIBIT	=	The price of Virginia tobacco seedlings (Rp/pohon)
8.	HPUREA	=	The price of Urea (Rp/Kg)
9.	HPSP36	=	The price of SP36 (Rp/Kg)
10.	HPNPK	=	The price of NPK (Rp/kg)
11.	HPKNO3	=	The price of KNO3 (Rp/kg)
12.	UTKPUT	=	The salary of male labors in virginia tobacco farming (Rp/HKO)
13.	UTKWUT	=	The salary of female labors in virginia tobacco farming (Rp/HKO)
14.	PRTSMT	=	The income of household before virginia tobacco season (Rp)
15.	PRTLHK	=	The income of household from outside work (Rp/Th)
16.	MANUT	=	The experience of virginia tobacco farmer (tahun)
17.	JART	=	Total of farmer households (orang)
18.	JTKRT	=	Total of working farmer household labor (orang)
19.	PKRT	=	The education of head of household (tahun)
20.	PIRT	=	The education of housewife (tahun)
21.	MITRA	=	The status of partnership farmer (supported farmer = 1; self-supported farmer =0)
22.	LDESA	=	Research village location (North = 1; Others = 0)

The risk taker behavior in farmers are also shown in the positive impact of farming risk on the allocation of familiy labors on tobacco farming, including male labor allocation from outside family members. However, this behavior does not appear in the use of production facilities, such as the use of fertilizer, pesticides and plant growth regulators. It only appears in the use of seed and fuel for curing the tobacco.

In making decision on consumption, the farmer households seem to be afraid of taking risk (risk averse), which are shown by the negative effect of the production risk on the food consumption expenditure of farmer households. This behavior indicated that the presence of anticipation by farmer households in production activities. The act of anticipation can also be seen by the increase in the allocation of household labors to undertake activities outside the tobacco farming, especially from off-farm activities when the farming risks are increased, but tend to decrease in the non-farm activities.

The behaviors of virginia tobacco farmer households in the above production activities are different from the behaviors of farmer households generally, such as the paddy farmer household [16], vegetables farmer households [8, 17] and the other general small farmer households who tend to be afraid of taking risk (risk aversion), in which when the risk is higher, they will reduce the farming areas [4]. This finding is similar to the behaviors of red big chilli farmer households where the farmers are courageous to face the price risk [18]. This is shown by the positive influence of the price risk to the wide of farming areas. Whereas, the behaviors of tobacco farmer households in North Carolinia, USA show that the production risk gave non significant positive influence on the wide of farming areas, while the price risk gave non significant negative influence on the wide of farming areas [19].

Several indications of the risk taker behaviors of virginia tobacco farmers in Lombok Island are: (i) The courage of farmers to rent a land with high price, which is IDR 6-12 million per-hectare per-season of tobacco planting, while in the rainy season when enough water is available, the highest price of land rental per-planting season is only IDR 5 million

per-hectare; (ii) Virginia tobacco farming is capital and labor intensive. The average cost of virginia tobacco farming per hectare is IDR 47,609,986; and the farming activities require 503.50 man-day of labors. The average land area of tobacco farming per farmer is 1.68 hectare; meaning that the farming cost needed is IDR 80,708,815 and 847.38 man-day of labors. While the farmers have limited land and capital; (iii) Virginia tobacco is cultivated in monoculture and the market-oriented is oligopsony. Therefore, there are no other plants expected to cover the loss risk when the production or market are fail; (iv) Virginia tobacco faces global market. Therefore, when the global tobacco prices are low or global tobacco enters the Indonesian domestic market, the price of local tobacco will decrease. This situation happened in 2012, when several tobacco industries operated officially in Lombok island did not buy local tobacco and prefered to buy import tobacco that caused many virginia tobaccos were not sold [3].

Several things that motivate farmers to be the risk taker are: (1) There is no other crops, which can generate high income, to replace tobacco in the dry season. Several crops that have been tried to be planted in Lombok island are soybean, corn, small chilli, big chilli, tomatoes, watermelon, melon; and paddy in some areas. However, when viewed from the cost of farming in the tobacco season, such as land rent, water charges, and the cost of labors; that the farming production of several commodities such as rice, soybean, and corn can not cover the farming cost. The potential crops to replace tobacco are melon, watermelon and chilli; but its market uptake is limited and the uncertainity of the price that often goes down during the dry season. This causes farmers to rarely willing to cultivate these plants. (2) There is a trust from the society to tobacco farmers, for example if the farmers need loan for tobacco farming, they will get it faster than another type of corps; and (3) There are cultures heritages in the tobacco farmers that said "When the needle falls in a deep well, then do not try find it in other wells". This quote means that if the farmers suffer heavy loss in farming certain crop, then for recovering the loss, they should get it from farming crop not from farming other crops. The socio-heritage aspects, even though they are difficult to quantify, seem to motivate farmers to do tobacco farming.

3.2. The Impact of Farmer Behaviors in Facing the Risk on the Economic Welfare of Households

The model of economic behaviors of farmer households in equation (6)-(49) is worth to be used as a basis to conduct the simulation, after testing the validity of the model. Table 1 indicated that the actual value and the predictive value of endogenous variables are relatively close, the RMSPE values are mostly below 100%, U-theil coefficients are mostly close to zero, so do the UM values (the average bias) and the US (the slope regression bias); while the UC values (covariant bias) are approaching one. The values of these indicators showed that the household economic models are good enough to be used as the basis for the simulation.

The simulation assumes that the production and price risks increase up to 10% each. If there is a partial increase of production risk to as much as 10%, farmers will increase the wide of tobacco farming area to as much as 2.57% and the family labor allocation in tobacco farming to as much as 0.59%. The increase in labor allocation is followed by the increase of production and farmer income from tobacco farming to as much 2.69% and 5.07% respectively. The increase in farmer income will affect the overall increase of income and consumption expenditure of farmer household to as much as 2.81% and 1.78% per year respectively. The improvement of farmer household behaviors in the production activity, labor allocation and household consumption will in turn affect the increase of income surplus or the economic welfare of farmer household to the amout of 7.95% (Table 2).

However, if the price risks increased partially by 10%, then the impact is bigger than the increase of the production risk above. The wide of tobacco farming area will increase by 6.04%, followed by an increase in the allocation of family labors on tobacco farming to the amount of 3.60%, the increase of the production and farmer income from tobacco farming by 5.79% and 9.71%, respectively. The increase of tobacco farming income will affect the income and consumption expenditure of farmer households for that year by 5.25% and 3.94%, respectively. The income surplus of farmers will increase more to 11.80%.

Production risk and price risk faced by virginia tobacco farmers in Lombok island usually do not occur partially, but simultaneously. The climate change, such as heavy rainfall in the tobacco season which is known as a wet dry season, often cause damage to many tobacco plants. This condition does not only decrease the production of tobacco, but also decrease the quality, so that the price received by farmers will be low. The farmer courage to face both risks simultaneously will give bigger impacts than when faced only one risk, whether production or price risk (Table 2). If both production and price risk of tobacco increase by 10%, farmers will increase their tobacco farming area to the amout of 8,61%. Family labors allocation in the tobacco farming will also increase to 3,60%; as well as the production and income increase to 8.49% and 14.78%. These improvements will increase the income and household consumption expenditure in a year, each by 8.09% and 5.71%. The changes of economic behavior of farmer household in production activities, labors allocation and household consumption expenditure as the result of the increase in production and price risks will affect the improvement of the economic welfare of households to as much as 19.75%.

Table 1. The Validation Result of the Economic Model of Virginia Tobacco Farmer Households to Face Farming Risk in Lombok Island

NO.	Endogenous Variable	Average of Actual Value	Average of Prediction Value	Mean Error	RSMPE Value (%)	Coefficient of U-Theil	Average Bias (UM)	Slope Bias (US)	Covari-ance Bias (UC)
1	LLUT	168.0	167.3	-0.7	94.075	0.3019	0.00	0.05	0.95
2	LLMUT	56.5900	57.0997	0.5097	70.0607	0.2229	0.00	0.06	0.94
3	LLSUT	111.4	110.2	-1.2	0	0.4625	0.00	0.05	0.95
4	PRDT	19.4623	19.469	0.0067	3.0098	0.0157	0.00	0.07	0.93
5	PROT	3278.8	3248.5	-30.3	92.297	0.3009	0.00	0.05	0.95
6	NPROT	95433944	94566122	-867822	92.297	0.3001	0.00	0.05	0.95
7	BLUT	14570209	14465156	-105053	94.075	0.3142	0.00	0.08	0.92
8	BIBIT	31353.1	31223.3	-129.8	94.4201	0.3023	0.00	0.05	0.95
9	PUREA	221.4	220.8	-0.6	0	0.2525	0.00	0.00	1.00
10	PSP36	309.6	309	-0.6	80.4857	0.2534	0.00	0.00	1.00
11	PNPK	381.8	382.3	0.5	93.8	0.2799	0.00	0.00	1.00
12	PKNO3	263.4	263.8	0.4		0.2903	0.00	0.00	1.00
13	NOBAT	696137	692713	-3424	495.5	0.3384	0.00	0.04	0.96
14	BSAPUT	11999742	11908261	-91481	92.2993	0.2814	0.00	0.01	0.99
15	BBPT	11896318	11896172	-146	11.7362	0.0640	0.00	0.02	0.98
16	TKPDKUT	65.0628	64.5912	-0.4716	34.0727	0.1667	0.00	0.00	1.00
17	TKWDKUT	35.3682	35.3161	-0.0521	27.9971	0.1262	0.00	0.00	1.00
18	TKDKUT	100.4	99.9073	-0.4927	29.4707	0.1445	0.00	0.00	1.00
19	TKPLKUT	362.6	360.6	-2	136.6	0.3174	0.00	0.04	0.96
20	TKWLKUT	321.3	320.0	-1.3	132.4	0.3083	0.00	0.04	0.96
21	TKLKUT	683.9	680.6	-3.3	131.7	0.3124	0.00	0.04	0.96
22	TKUT	784.3	780.5	-3.8	87.9121	0.2932	0.00	0.04	0.96
23	BUT	80476904	80100726	-376178	60.921	0.2091	0.00	0.00	1.00
24	BEUT	71737068	71360890	-376178	79.9996	0.2305	0.00	0.00	1.00
25	PUT	23696876	23205232	-491644	136.1	0.4616	0.00	0.31	0.69
26	TKPOF	7.8828	7.7924	-0.0904		0.5362	0.00	0.46	0.54
27	TKWOF	5.954	5.9041	-0.0499		0.5843	0.00	0.52	0.48
28	TKOF	13.8368	13.6965	-0.1403		0.5509	0.00	0.48	0.52
29	TKPNF	41.2803	40.7128	-0.5675		0.4281	0.00	0.34	0.66
30	TKWNF	43.3975	43.9475	0.55		0.4703	0.00	0.51	0.49
31	TKNF	84.6778	84.6603	-0.0175		0.2900	0.00	0.43	0.57
32	TKRT	198.9	198.3	-0.6	33.6148	0.1398	0.00	0.14	0.86
33	PTKPOF	265795	262686	-3109		0.5349	0.00	0.44	0.56
34	PTKWOF	143264	141999	-1265		0.5799	0.00	0.49	0.51
35	PTKOF	409059	404685	-4374		0.5422	0.00	0.45	0.55
36	PTKPNF	2308692	2275199	-33493		0.4452	0.00	0.39	0.61
37	PTKWNF	2039603	2065051	25448		0.4963	0.00	0.54	0.46
38	PTNF	4348295	4340250	-8045		0.2687	0.00	0.46	0.54
39	PRTDMT	28454229	27950167	-504062	106	0.4033	0.00	0.30	0.70
40	PRT	42699479	42195417	-504062	67.5209	0.2948	0.00	0.28	0.72
41	PPGN	17013686	16989786	-23900	18.7202	0.0892	0.00	0.01	0.99
42	PNPGN	18381090	18133478	-247612	91.9173	0.325	0.00	0.25	0.75
43	PENGRT	35394776	35123263	-271513	48.0869	0.2216	0.00	0.20	0.80
44	SPRT	7304703	7072153	-232550	212	0.5273	0.00	0.25	0.75

Table 2. The Simulation Result of the 10 % Increase in Production and Price Risks on the change of Behavior and Economics Welfare of Farmer Households

NO.	Endogenous Variables	Initial	Risk of Prod + 10%		Price Risk +10%		Risk of Prod & Price +10%	
		Condition	Predictions	%	Predictions	%	Predictions	%
1	LLUT	167.3	171.6	2.57	177.4	6.04	181.7	8.61
2	LLMUT	57.0997	56.3475	-1.32	56.1942	-1.59	55.4424	-2.90
3	LLSUT	110.2	115.3	4.63	121.2	9.98	126.2	14.52
4	PRDT	19.469	19.4926	0.12	19.4174	-0.27	19.4411	-0.14
5	PROT	3248.5	3336	2.69	3436.7	5.79	3524.2	8.49
6	NPROT	94566122	97119872	2.70	100060000	5.81	1.03E+08	8.51
7	BLUT	14465156	14851829	2.67	15376694	6.30	15763096	8.97
8	BIBIT	31223.3	32022.9	2.56	33179.3	6.26	33978.3	8.82
9	PUREA	220.8	225.0	1.90	228.9	3.67	233.1	5.57
10	PSP36	309.0	314.2	1.68	321.4	4.01	326.6	5.70
11	PNPK	382.3	389.8	1.96	402.0	5.15	409.4	7.09
12	PKNO3	263.8	269.8	2.27	277.6	5.23	283.6	7.51
13	NOBAT	692713	715716	3.32	694666	0.28	717658	3.60
14	BSAPUT	11908261	12180305	2.28	12513804	5.09	12785654	7.37
15	BBPT	11896172	11888613	-0.06	11780669	-0.97	11773111	-1.03
16	TKPDKUT	64.5912	64.866	0.43	66.7882	3.40	67.0624	3.83
17	TKWDKUT	35.3161	35.6355	0.90	36.0865	2.18	36.4056	3.08
18	TKDKUT	99.9073	100.5	0.59	102.9	3.00	103.5	3.60
19	TKPLKUT	360.6	372.1	3.19	388.6	7.76	400.1	10.95
20	TKWLKUT	320	327.5	2.34	338.2	5.69	345.6	8.00
21	TKLKUT	680.6	699.6	2.79	726.8	6.79	745.7	9.57
22	TKUT	780.5	800.1	2.51	829.6	6.29	849.2	8.80
23	BUT	80100726	81478450	1.72	83337493	4.04	84714302	5.76
24	BEUT	71360890	72738614	1.93	74597658	4.54	75974467	6.47
25	PUT	23205232	24381258	5.07	25459474	9.71	26634169	14.78
26	TKPOF	7.7924	8.1939	5.15	8.3575	7.25	8.759	12.40
27	TKWOF	5.9041	6.3129	6.92	6.4397	9.07	6.8486	16.00
28	TKOF	13.6965	14.5068	5.92	14.7972	8.04	15.6076	13.95
29	TKPNF	40.7128	40.7972	0.21	40.6777	-0.09	40.7613	0.12
30	TKWNF	43.9475	43.5024	-1.01	44.2213	0.62	43.7767	-0.39
31	TKNF	84.6603	84.2996	-0.43	84.8990	0.28	84.5380	-0.14
32	TKRT	198.3	199.3	0.50	202.6	2.17	203.6	2.67
33	PTKPOF	262686	273727	4.20	287715	9.53	298756	13.73
34	PTKWOF	141999	151585	6.75	157258	10.75	166845	17.50
35	PTKOF	404685	425312	5.10	444973	9.96	465601	15.05
36	PTKPNF	2275199	2268626	-0.29	2292482	0.76	2285866	0.47
37	PTKWNF	2065051	2061319	-0.18	1970204	-4.59	1966493	-4.77
38	PTNF	4340250	4329946	-0.24	4262686	-1.79	4252359	-2.03
39	PRTDMT	27950167	29136515	4.24	30167133	7.93	31352129	12.17
40	PRT	42195417	43381765	2.81	44412383	5.25	45597378	8.06
41	PPGN	16989786	17048404	0.35	17163519	1.02	17222043	1.37
42	PNPGN	18133478	18698817	3.12	19342080	6.67	19906699	9.78
43	PENGRT	35123263	35747221	1.78	36505599	3.94	37128742	5.71
44	SPRT	7072153	7634544	7.95	7906784	11.80	8468637	19.75

The simulation results prove that farmer courage to take farming risk affect positively the behavior of farmers household on the production activities, labors allocation and household consumption expenditure, as well as to the economic welfare of farmer household. The rist taker behaviors or the farmer courage to take farming risks show that virginia tobacco farmers in Lombok island have a high entrepreneurial spirit. The braver farmers in taking the farming risk , the more likely that the economic of farmer household will increase.

4. Conclusions

It can be concluded that virginia tobacco farmer households in Lombok island are risk takers in making decision on the production and the labor allocation, but risk aversion in the decision-taking of consumption. The increase of production and price risks of virginia tobacco, both partially or simultaneously, gives positive influences to the behavior of farmer in the production, consumption and labor allocation, which in turn they will influence positively the income and economic welfare of the farmer households.

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