

Original Research Article

Analyzing the Impact of Agricultural Landownership on Poverty and Food Security in Sri Lanka A Household Level Econometric Analysis

ABSTRACT

Aims: This study examined the impact of agricultural landownership on poverty and food security in Sri Lanka. The current study enriches the literature by extending traditional two way poverty classification into four groups: Extremely Poor, Poor, Vulnerable Non-Poor and Non-Poor and quantifies the impact of agricultural landownership on each type of poverty. Similarly, the impact of agricultural landownership on food security is also estimated considering the four types of food security such as, Extremely Food Insecure, Food Insecure, Vulnerable to Food Insecure and Food Secure, based on Minimum Dietary Energy Requirements.

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Methodology: The analysis is based on the secondary data from the Household Income and Expenditure Survey (HIES) of Sri Lanka. Ordered Probit Models were estimated to examine the impacts of agricultural landownership on poverty and food security to accomplish the objectives of the study.

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Results: The results highlighted that the probability of being non-poor of the households with agriculture land is higher by 6.42% compared to the households without agricultural lands. Similarly, having agriculture land also reduces the probability of being extremely poor, poor and vulnerable to poverty by 0.1%, 2.2% and 4.1% respectively. In addition, the empirical findings indicated that ownership of agricultural land lessens the probability of being extremely food insecure (0.8%), food insecure (1.4%) and vulnerable to food insecure (0.7%). Moreover, the probability of being food secured of the households with agricultural lands is higher by 0.9% compared to the households without agricultural lands.

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Conclusion: Therefore, the study emphasizes the significance of agricultural landownership to mitigate the poverty and food insecurity which ultimately enhances the household wellbeing. Hence, the current study strongly recommends implementing appropriate policies to address land-right related issues faced by developing countries ensuring long term wellbeing of the households.

Keywords: Landownership, Poverty, Food Security, Minimum Dietary Energy Requirement, Ordered Probit Model

1. INTRODUCTION

01.1. Agriculture Land Ownership, Food (In) security and Poverty

Sri Lanka has been an agricultural country albeit the current economy is led by the service sector. However, agriculture sector is still crucial to the economy as it provides wide-range of

21 employment opportunities while also securing the country's food requirements.
 22 Nevertheless, uneven distribution of agriculture lands has also been hampering the
 23 productivity of the agriculture sector and has created adverse impacts particularly on low
 24 income households. Table 01 indicates ownership of agriculture land at national level
 25 along sectoral disparities. As Table 01 indicates, the higher agriculture land ownership at
 26 national level which is mainly explained by the agriculture land ownership at rural sector
 27 where 92.84% of households own agriculture lands. In contrast, estate sector reported the
 28 lowest ownership of agriculture land, reporting only 38.05% which is remarkably lower
 29 than the national average.

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30 **Table 01: Sectorial Ownership of Agriculture Land**

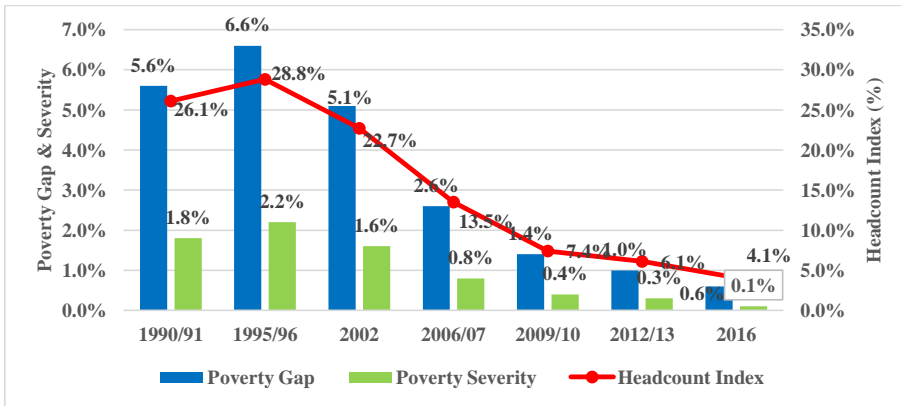
Sector	Ownership of Agriculture Land
National	88.15 %
Urban	77.98 %
Rural	92.84 %
Estate	38.05 %

31 Source: Calculated by authors based on HIES of Department of Census & Statistics of Sri
 32 Lanka

33 According to International Food Policy Research Institute (2016), each and every country is
 34 encountered with a number of issues related to food insecurity which costs 11% of GDP
 35 annually, especially in Africa and Asia. Conversely, a dollar which is invested on any
 36 malnutrition prevention program, adds extra 16\$ to the economy in return on the investment
 37 (International Food Policy Research Institute, 2016). Therefore, addressing the issue of food
 38 insecurity and ensuring food security are vital at both national and global levels. Thus,
 39 Sustainable Development Goals (SDGs) also incorporated this issue and the second goal of
 40 SDGs aims to end hunger by 2030 by ensuring food security and required nutrition levels.
 41 Food security is a broad concept which was defined as "food security exists when all people,
 42 at all times have physical, social and economic access to sufficient, safe and nutritious foods
 43 which satisfy their dietary needs and food preferences for an active and healthy life." (Food
 44 and Agriculture Organization - FAO, 1996). According to the Medical Research Institute
 45 (MRI) of Sri Lanka, a person who is unable to take 2030 Kcal per day is considered as food
 46 insecure in the context of Sri Lanka. However, the threshold proposed by the MRI may vary
 47 across the countries, time periods and also gender.

48 In terms of poverty, Sri Lanka has experienced declining poverty rates during last two
 49 decades. Figure 01 illustrates trends in poverty incidence, depth and severity for Sri Lanka
 50 during the period of 1990-2016. It is evident that the headcount index reached a peak
 51 (28.8%) in 1995/96 up from 26.1% in 1990/91. However, poverty then declined to 4.1% by
 52 2016. Similarly, other poverty measures such as the poverty gap and squared poverty gap
 53 indices also dropped significantly over the time. Specifically, the Poverty Gap Index (PGI)
 54 which measures the depth of poverty and the Squared Poverty Gap Index (SPGI) reflects
 55 severity of poverty declined by 6% and 2.1% respectively during this period. In 2002,
 56 approximately 3,841,000 people were in poverty. In 2016, this had decreased 843,913.
 57 Similarly, in 2016, 3.1% of total households which accounted for approximately 169,392
 58 households in Sri Lanka were estimated as poor households.

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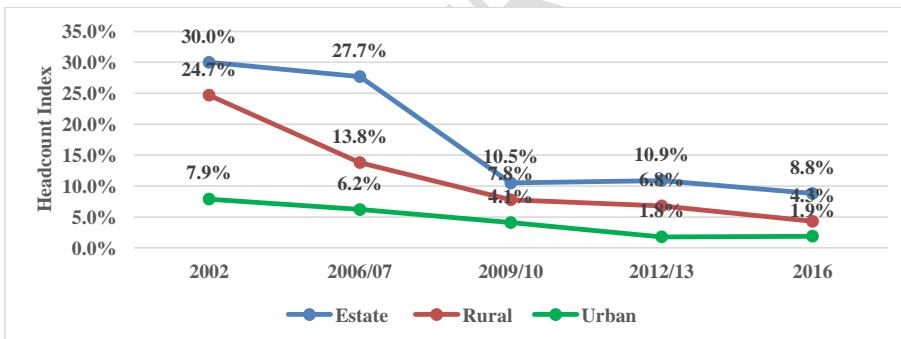


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60 **Figure 01: Poverty trends at national level of Sri Lanka during the period of 1990-2016**

61 Source: Created by authors based on HIES reports (Various years)

62 Though the poverty incidence at a national level has been significantly decreasing over the
 63 time, the declining across sectors has been uneven. Poverty disparities which exist across
 64 the sectors of urban, rural and estate are illustrated in Figure.02.



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66 **Figure 02: Sectoral poverty trends in Sri Lanka during the period of 2002-2016**

67 Source: Created by authors based on HIES reports (Various years)

68 Poverty levels in both estate and rural sectors have been significantly higher compared to
 69 poverty levels of national and urban sectors. The Figure 02 demonstrated that 30% and
 70 24.7% of people in estate and rural sectors respectively were below the poverty line in 2002
 71 while only 7.9% of urban people were poor. A more dramatic trend in poverty reduction in
 72 the estate sector can be seen after 2006/07. In fact, in the estate sector, poverty incidence
 73 had reduced by 17.2% within a three-year period (2006/07 – 2009/10). The sharp decline in
 74 income poverty in the estate sector was mainly driven by the increase of tea prices and
 75 higher real wages of estate workers. Tea production is the key output in the estate sector
 76 and the price of tea increased by 82% during the period of 2006-2009, resulting in high
 77 returns for the industry. Some of these profits were shared with the estate workers leading to

78 the evident dramatic drop of poverty. In addition, wage increases for estate workers in 2010
79 also helped the sharp decline in poverty in the estate sector, as the increased real wages
80 essentially ensured a better living standard for the workers.

81 01.2. Objectives and the Structure of the Study

82 The study **attempts to** recognized how agriculture land ownership affects poverty and food
83 (in) security in Sri Lanka. More specifically, following two objectives **were** **are expected to be**
84 accomplished through the current study.

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85 01. Analyzing the impact of land ownership on different types of poverty such as
86 Extreme Poor, Poor, Vulnerable Non-poor and Non poor.

87 02. Examining the impacts of land ownership on different types of food insecurity
88 such as Extremely Food Insecure, Moderately Food Insecure, Vulnerable to Food
89 Insecure and Food Secure.

90 The next sections of the paper include literature review, methodology, results and discussion
91 followed by the conclusions and recommendations.

92

93 2. LITERATURE REVIEW

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95 Food insecurity is multifaceted itself and its consequences are also multidimensional (Abafita
96 & Kim, 2014). In 1974, the World Food Conference held in Rome highlighted the issues of
97 global food insecurity for the first time and thereafter, a growing discussion on food insecurity
98 at global, regional and national levels has been arisen. (Maxwel, 1996, Napoli et al. 2011).
99 According to FAO (1996), food (in) security has four main dimensions: availability, utilization,
100 stability and sustainability. Webb et al. (2006) highlighted that it is difficult to find a precise
101 measure for food insecurity due to this multifaceted nature of food (in) security. However,
102 Maxwell et al. (2008) summarized the commonly used measure such as households'
103 expenditure on foods, nutritional status, actual household food consumption level, dietary
104 requirement and diversity and household food insecurity access scale. Most of the empirical
105 analyses which used these measurements have ended up with mixed findings. An analysis
106 of food insecurity in Pakistan by Sultana & Kiani (2011) concluded that educational
107 attainments beyond intermediate level reduce food insecurity while dependency ratio
108 increases level of food insecurity at household level. Moreover, they confirmed that both
109 social capital and status of employment have no significant impact on food insecurity in
110 Pakistan. Kidane (2004) and Rose et al. (1998) have also stressed the importance of
111 education on food security in Ethiopia and USA respectively. More specifically, Kidane
112 (2004) has highlighted that even the primary level education significantly improves food
113 insecurity while ensuring higher income for households. Apart from that, size of households
114 and dependency ratio are also found to be positively related with food insecurity.
115 Ramakrishna & Demeke (2002) and Amaza (2006) observed that family size and dependency
116 ratio increase food insecurity in Ethiopia and Nigeria respectively. Social Safety Net
117 Programs (SSNP) such as food stamps, elderly and disability allowances are much common
118 in most of developing countries especially in order to reduce poverty. However, Subbarao et
119 al. (1997) found that these kinds of SSNPs reduce not only poverty, but food insecurity as
120 well. In addition to SSNPs, accumulated assets of households also play a crucial role in
121 reducing food insecurity. According to Demeke et al. (2011), assets and resource
122 endowment of households depend on human capital, physical capital, financial capital,
123 natural capital and social capital as well. Therefore, accumulated assets or recourse

124 endowment apparently reduces the level of food insecurity (Demeke et al.2011).
125 Particularly, Putnam (1995) elaborated the linkages between social capital and food
126 insecurity by considering social connections. As Putnam (1995) highlighted social
127 connections reduce the probability of being food insecure, since social connections allow
128 sharing staples and better nutritious habits among households. Apart from these
129 international studies, empirical analyses focus on food insecurity in Sri Lanka is relatively
130 low. Studies by Wickramasinghe (2008), De Silva (2007), Nanayakkara & Premaratne
131 (1987), Nanayakkara (1994) and Mayadunne & Romeshun (2013) have computed incidence
132 of food insecurity of Sri Lanka at national and district levels. However, none of these studies
133 have examined the determinants of food (in) security in Sri Lanka. Similarly, the link between
134 agriculture land ownership and food security has not been observed especially in the context
135 of Sri Lanka. Apart from that, these empirical works have not attempted to recognize
136 extremely food insecure households and the households who are vulnerable to food
137 insecure. Similarly, various studies by scholars such as Datt & Gunewardena (1997),
138 Gunewardena (2000) and World Bank (2002) have identified series of determinants of
139 poverty such as household size, number of dependents, living sector, employment of the
140 head of the household, age of the head of the household, education, receiving remittances
141 and disability. However, the impact of agriculture land ownership on poverty has not been
142 addressed sufficiently in the context of Sri Lanka. In addition to that, all the existing studies
143 on poverty **is are** based on conventional two-way poverty classification which ignore the
144 disparities within poor and non-poor groups. Consequently, examining the link between
145 agriculture land ownership, poverty and food insecurity is timely important.

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147 Give adequate information to allow the experiment to be reproduced. Already published
148 methods should be mentioned with references. Significant modifications of published
149 methods and new methods should be described in detail. This section will include sub-
150 sections. Tables & figures should be placed inside the text. Tables and figures should be
151 presented as per their appearance in the text. It is suggested that the discussion about the
152 tables and figures should appear in the text before the appearance of the respective tables
153 and figures. No tables or figures should be given without discussion or reference inside the
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156 3. METHODOLOGY

157 03.1. Data

160 The current study **is was** entirely based on the data from Household Income and
161 Expenditure Survey (HIES) was conducted by the Department of Census and Statistics of
162 Sri Lanka in 2012/2013. This is the most updated and accurate household data series
163 available in Sri Lanka. HIES (2012/2013) covered the whole of Sri Lanka for the first time in
164 Sri Lanka and surveyed 20,536 households across 24 Districts located in nine provinces.
165 HIES data set is the key data source for calculating poverty estimates in Sri Lanka and
166 widely used for empirical analysis due to its wide coverage. Hence, data requirements of the
167 econometric model and descriptive analysis were collected from HIES (2012/2013).

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169 03.2. Analytical Tool and Calculation of Dependent Variables

170 The study applies Ordered Probit Model which was introduced by Aitchison and Silvey
171 (1957) as the main analytical tool in order to accomplish the objectives of the study. The
172 generalized nature of the Ordered Probit Model used to estimate the relationship between
173 poverty agriculture landownership can be expressed as follows.
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$$y_i^* = x_i\beta + u_i \dots \dots \dots (01)$$

Where y^* is a discrete variable which can take any value from 1- 4 which indicate the different poverty levels as follows:

- Extreme Poor** ($y_i^* = 1$): if the household's monthly expenditure is less than or equal to half of official poverty line¹. (HH expenditure \leq Rs. 7067)
- Poor** ($y_i^* = 2$): if the household's monthly expenditure lies between half of official poverty line and official poverty line. (Rs. 7067 < HH expenditure \leq Rs. 14134)
- Vulnerable Non-Poor** ($y_i^* = 3$): if the household's monthly expenditure lies between the official poverty line and 1.5 times the official poverty line. (Rs. 7067 < HH expenditure \leq Rs. 21201)
- Non-Poor** ($y_i^* = 4$): if the household's monthly expenditure is higher than 1.5 times the official poverty line. (HH expenditure > Rs. 21201)

Similarly, to achieve the second objective of the study, the second model was estimated assigning food security variable as the dependent variable. In fact, food security variable is also classified into four categories in order to avoid wide disparities within the traditional two-way categories such as 'food security' and 'food insecurity'.

$$y_i^* = x_i\beta + u_i \dots \dots \dots (02)$$

Where y^* is a discrete variable which can take any value 1- 4 which indicates the different levels of food insecurity as follows.

- Extreme Food Insecure:** The households' whose daily Calorie Consumption (CC) is less than or equal to half of the Recommended Calorie Consumption (RCC). (HH's CC \leq 0.5(RCC))
- Moderately Food Insecure:** The households' whose daily CC lies between half of the RCC and the RCC. (0.5(RCC) < HH's CC \leq RCC)
- Vulnerable to Food Insecure:** The households' whose daily CC lies between the RCC and 1.5 times the RCC. (RCC < HH's CC \leq 1.5(RCC))
- Food Secure:** The households' whose daily CC is higher than 1.5 times the RCC. (HH's CC > 1.5(RCC))

Both Ordered Probit models were estimated with marginal effects to provide more realistic interpretation.

¹ The used official poverty line is Rs. 3624 (HIES, 2012/13). However, the official poverty line for household was calculated by multiplying the official poverty line by average household size of 3.9 (HIES, 2012/13).

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3. RESULTS AND DISCUSSION

04.1. Impact of Agricultural Land Ownership on Poverty

Ordered Probit Model was applied to examine the impact of having agricultural lands on poverty in Sri Lanka. Four aspects of poverty – “Extremely Poor”, “Poor”, “Vulnerable Non-Poor” and “Non-Poor” as explained in the methodology were incorporated into the Ordered Probit Model. In addition to the key variable – having agriculture land, series of other variables which affect poverty are also included into the model. The estimated results are summarized in Table 2 below. The most focused and objective oriented variable of the Ordered Probit Model is, ‘Agri Land’ and the estimated coefficients indicated that the probability of being extremely poor, poor and vulnerable non-poor for the household who have agricultural lands **is was** significantly lower than both the households who don’t have agricultural lands. Particularly, the probabilities of being extreme poor, poor and vulnerable non-poor for the household who have agricultural lands are lower by 0.1%, 2.2% and 4.1% respectively, compared to those who don’t have agricultural lands. Interestingly, the probabilities of being non-poor for the households who have agricultural land are higher by 6.42% compared to the households who don’t own agricultural lands. In fact, all of the estimated coefficients for the considered variable **are were** statistically significant at 1% level. Agriculture sector has been a crucial sector of the economy, despite its relative importance has been declining over time. In terms of the employed population by major economic sectors, agriculture sector accounts for approximately 27% of employed people, accommodating the second highest proportion of employed people. (Department of Census & Statistics, 2016). Apart from that, large proportion of people engages with informal-agriculture sector and also as self-employees. Under this scenario, ownership of agricultural land **is was** extremely important for them to sustain livelihood in a smooth manner. As the results highlight, the households having agricultural lands have lower probability of being poor compared to the households who don’t own agriculture lands. In fact, agricultural workers who don’t own agricultural land have to pay off the rental for rented lands in cash or in-kind. Consequently, a larger share of agricultural income is transferred to the land owners while the agricultural workers end up with remaining which **is** even not sufficient for their living till the next season. As this process continuous as a cycle, majority of landless households are suffering from poverty or are vulnerable to poverty. This is also consistent with Daniel (2017) who examined the link between rice farming and poverty in Asian countries including Sri Lanka.

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Table 02: Results of Ordered Probit Estimation on Poverty

Variables	Coefficients	Robust Standard Error	Marginal Effects (%)			
			Extreme Poor	Poor	Vulnerable Poor	Non-Poor
Age	0.012***	0.005	-0.01**	-0.11***	-0.23***	0.35***
Age Squared	0.000***	0.000	0.00***	1.34E-03***	2.7E-03***	-4.E-03***
HH Size	0.401***	0.010	0.20***	3.64***	7.48***	-11.27***
Sector (Estate)						
Urban	0.478***	0.060	-0.20***	-3.37***	-8.13***	11.63***
Rural	0.18***	0.056	-0.06***	-1.51***	-3.28***	4.85***
Gender (Female)						
Male	0.126***	0.036	-0.10***	-1.21***	-2.37***	3.63***

Ethnicity (Sinhala)						
SL Tamil	-0.26***	0.031	0.14***	2.80***	5.01***	-7.96***
IND Tamil	-0.006	0.062	0.01	0.05	0.10	-0.16
SL Moors	0.020	0.043	-0.01	-0.17	-0.36	0.55
Burgher	-0.144	0.264	0.07	1.46	2.75	-4.29
Civil Status						
Married	0.424***	0.067	-0.30***	-4.70***	-8.11***	1.31***
Widowed	0.434***	0.071	-0.10***	-3.10***	-7.43***	10.65***
Divorced	0.205	0.139	-0.06**	-1.57**	-3.62	5.25
Separated	0.248***	0.089	-0.10***	-1.85***	-4.35***	6.27***
Education (No Schooling)						
Primary	0.406***	0.046	-0.10***	-3.09***	-7.11***	10.31***
Secondary	0.923***	0.046	-0.6***	-9.69***	-16.64***	26.91***
Tertiary	1.628***	0.062	-0.2***	-6.72***	-18.80***	25.76***
Degree or	2.178***	0.178	-0.1***	-4.89***	-16.52***	21.56***
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Employment (Unemployed)						
Government	0.400***	0.068	-0.1***	-2.73***	-6.76***	9.59***
t	0.307***	0.087	-0.08	-2.19***	-5.28***	7.55***
Semi Gov.	-0.15***	0.035	0.06***	1.41***	2.80***	-4.26***
Private	0.682***	0.119	-0.10***	-3.61***	-10.19***	13.91***
Employer	0.028	0.035	-0.01	-0.25	-0.52	0.78
Self	-0.045	0.225	0.02	0.43	0.85	-1.30
Employ						
Fam. Work						
Agri Land (No Agri Land)						
Have Agri	0.215***	0.032	-0.10***	-2.21***	-4.10***	6.42***
L.						
Disability (Head of HH is a Disable)						
No	0.102***	0.024	-0.10***	-0.91***	-1.89***	2.85***
Disabilit.						
Remittances (No Remittances)						
Have	0.449***	0.045	-0.10***	-2.98***	-7.48***	10.56***
Remitt.						
Expen/Inco	0.061***	0.012	-0.10***	-0.55***	-1.14***	1.72***
me						
Ancillary parameters			Marginal Effects after			
Ordered Probit						
/cut1	0.4159	0.1562	0.0012	0.0436	0.1561	0.7989
/cut2	1.7578	0.1557				
/cut3	2.6168	0.1567				
Prob > chi ²	0.0000					
Pseudo R ²	0.2078					
Observation	20,536					
s						

263 Source: Author's calculation based on HIES (2012/13) data from DCS, Sri Lanka.

264 In addition to the key factor focused in the study, age of the head of household non-linearly
265 (U Shaped) associates with each type of poverty. In fact, the more realistic story behind the
266 U shaped relationship is, younger or middle-aged households' heads reduce the poverty
267 level while relatively elder heads of household may account for higher poverty rates.

268 | Similarly, size of the household indicates that one extra household member increases the
 269 | probability of being extreme poor, poor and vulnerable non-poor by 0.2%, 3.6% and 7.4%
 270 | respectively, and reduces the probability of being non-poor by 11.27%. Male headed
 271 | households have had less probability of being poor compared to female headed households;
 272 | specifically, being a male headed household increases the probability of being non-poor by
 273 | 3.6% compared to female headed household counterparts. According to the civil status
 274 | variable, being a married household head rather than being a single, reduced the
 275 | probability of being extreme poor, poor and vulnerable non-poor by 0.3%, 4.7% and 8.1%
 276 | respectively. Apart from that, education has become one of the key factors of getting
 277 | households out of poverty, and the heads of household with primary, secondary, tertiary, and
 278 | degree or higher educational qualifications increase the probability of being non-poor by
 279 | 10.3%, 26.8%, 25.7% and 21.5% respectively, compared to the heads of the household with
 280 | no schooling. Moreover, employment in any sector (except in the private sector and family
 281 | work) compared unemployment, receiving remittances and household heads with no
 282 | disability, reduce the probability of being poor in each aspect, and increase the probability of
 283 | being non-poor.
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04.2. Impact of Agricultural Land Ownership on Food Security

289 | The table 03 indicates the determinants of food (in) security of Sri Lanka along with
 290 | estimated coefficient using Ordered Probit Regression. As elaborated in the methodology,
 291 | the food (in) security has categorised into four categories in order to conduct a detailed
 292 | analysis. As the results indicate, having agricultural lands also significantly affects reducing
 293 | food insecurity. The rural economy of Sri Lanka mainly depends on agriculture and hence
 294 | owning agricultural lands ensure availability of staple foods, particularly such as rice for
 295 | households' consumption. Consequently, the probabilities of being extremely and
 296 | moderately food insecure of the households having agriculture lands are lower by 0.18% and
 297 | 1.45%, compared to the households have no agriculture lands. Similarly, the probabilities of
 298 | being vulnerable for food insecurity and being food secure of the households having
 299 | agricultural lands is was lower by 0.69% and higher by 0.94% respectively compared to the
 300 | households who don't have agricultural lands. In fact, studies such as Gebre-Selassie (2005)
 301 | and Madeley (2000) have also confirmed that holding agricultural lands and livestock
 302 | essentially reduce food insecurity.
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Table 03: Results of Ordered Probit model Estimation on Food (in)security

Variables	Coefficients	Robust Standard Error	Marginal Effects (%)			
			Extremely Food Insecure	Moderately Food Insecure	Vulnerable to Food Insecure	Food Secure
HH Size	0.0008	0.0049	-0.0033	-0.0271	0.0126	0.0178
Assets Index	0.0057***	0.0015	-0.025***	-0.201***	0.0931***	0.1318***
Sector (Estate)						
Estate	0.0208	0.0334	-0.0860	-0.7278	0.3317	0.4821
Rural	0.0101	0.0189	-0.0429	-0.3557	0.1654	0.2332
Gender (Female)						
Male	0.0346**	0.0153	-0.1261**	-1.0470**	0.4854**	0.6877**

Education (No Schooling)						
Primary	0.0135	0.0401	-0.0564	-0.4723	0.2174	0.3113
Secondary	-0.0721*	0.0393	-0.3015*	-2.5237*	1.1603*	1.6649*
Tertiary	-0.1007**	0.0454	-0.4594**	-3.5146**	1.7465**	2.2275**
Degree or <	-0.1077*	0.0650	-0.5058	-3.7493*	1.9115	2.3437*
Employment (Unemployed)						
Government	0.0994**	0.0346	-0.3832**	-3.4812**	1.4758**	2.3885**
Semi Gov.	0.1109**	0.0469	-0.4190**	-3.8811**	1.6115**	2.6890**
Private	-0.0060	0.0219	0.0252	0.2091	-0.0972	-0.1372
Employer	0.0544	0.0567	-0.2171	-1.9067	0.8379	1.2859
Self-Employ	0.0633*	0.0226	-0.2584**	-2.2166**	0.9962**	1.4788**
Fam. Work	-0.0750	0.1581	0.3423	2.6178	-1.3025	-1.6576
Agri Land (No Agri Land)						
Have Agri L.	0.0415*	0.0222	-0.1797**	-1.4499**	-0.6896**	0.9401*
Ancillary parameters			Marginal Effects after Ordered			
Probit						
/cut1	-1.6159	0.1379	0.0012`	0.0436	0.1561	0.7989
/cut2	0.3207	0.1367				
/cut3	1.5539	0.1371				
Prob > chi ²	0.0000					
Pseudo R ²	0.0019					
Observations	20539					

Source: Author based on HIES (2012/13)

In addition to the key variable, several other factors also affect food (in) security as discussed below. Despite size of household is was not a significant factor of food insecurity in Sri Lanka, the impact of level of assets on food insecurity is significant at 1% level. More specifically, 1% increase in asset index would reduces the probability of being extremely food insecure, moderately food insecure by 0.025% and 0.201% respectively. Asset index is a composite index which accounts for all household level assets including domestic equipment, electronic appliance and agricultural equipment as well. Further, similar result has been found by Abafita & Kim (2014) in the context of Ethiopia. Apart from that, male-headed households are were more food secure than that of female-headed. According to Table 03, male-headed households have 0.69% of higher probability of falling into food secure category compared to female-headed households. Similarly, the probabilities of falling into extremely food insecure and moderately food insecure of male-headed households are also lower by 0.13% and 1.05% compared to female-headed households. In fact, male-headed households have better access to nutritious food as their income levels are higher than that of female-headed. It is apparent that higher educational attainments seem to be the most crucial household factor of ensuring food security. In general, all education levels reduce the probability of being extremely and moderately food insecure while increasing the probability of being food secure compared to no schooling category. However, only the education levels such as secondary, tertiary and degree and above show statistically significant relationship with each type of food insecurity. Empirical works by Sultana & Kiani (2011), Kidane (2004) and Rose et al. (1998) have also found similar impact of education on food (in) security in the context of Pakistan, Ethiopia and USA respectively.

05. Conclusions and Recommendation

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333 The current study used the HIES data to examine the impact of agriculture land ownership
334 on both poverty and food security in Sri Lanka. The study goes beyond the conventional
335 empirical studies as the current study recognizes four-way poverty and food (in) security
336 classifications based on national poverty line and daily dietary requirement proposed by MRI
337 of Sri Lanka respectively. The analyses elaborates that having agricultural lands
338 considerably reduces the probability of being extreme poor, poor and vulnerable non-poor
339 while increasing the probability of being non-poor. Similarly, owning agricultural lands also
340 reduces the probability of being extremely food insecure, food insecure and vulnerable to
341 food insecure while increasing the probability of falling into food secure category. In addition
342 to the key variable - ownership of agricultural land, other factors such as educational
343 qualification of the head of household, gender, employment status, living sector, civil status
344 and receiving remittances also significantly affected both poverty and food insecurity in Sri
345 Lanka. However, land-right related issues are common among the rural and estate sector
346 and also among the lower income groups. Therefore, it is has been strongly recommended
347 that to imposing necessary polices to secure the land-rights of the public while providing
348 agricultural lands for the respective groups should be put in place.

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351 References

352 Abafita J, Kim KR. Determinants of household food security in rural Ethiopia: An empirical
353 analysis. Journal of Rural Development. 2014; 37(2): 129-157

354 Aitchison J, Silvey SD. The generalization of probit analysis to the case of multiple
355 responses. Biometrika, 44. 1957; (1/2), 131-140.

356 Amaza SP. Determinants and Measurements of Food Insecurity in Nigeria: Some Empirical
357 Policy Guide. International Association of Agricultural Economists Conference, Gold Coast,
358 Australia Daniel. 2006.

359 Datt G, Gunewardena D. Some Aspects of Poverty in Sri Lanka, 1985-90. World Bank
360 Publications. 1997

361 Demeke AB, Keil A, Zeller M. (2011). Using panel data to estimate the effect of rainfall
362 shocks on smallholders' food security and vulnerability in rural Ethiopia. Climate Change.
363 2011;108(1-2). 185-206

364 Department of Census & Statistics. Poverty Indicators 2016. Department of Census &
365 Statistics, Sri Lanka. 2016.

366 De Silva RP. Food Insecurity and Vulnerability Assessment for Sri Lanka. FIVIMS
367 Secretariat, Colombo. 2007.

368 Food and Agriculture Organization. Rome Declaration on World Food Security and World
369 Food Summit Plan of Action, FAO, Rome. 1996.

370 Gebre-Selassie S.amuel. Poverty and food security in Ethiopia: Some evidences from Wollo.
371 2nd International Conference on the Ethiopian Economy. EEA, Addis Ababa. 2005.

- 372 Gunewardena D. Consumption poverty in Sri Lanka, 1985-1996: A profile of poverty based
373 on household survey data. 2000.
- 374 HIES. Household Income and Expenditure Survey. Department of Census & Statistics, Sri
375 Lanka. 2012/13
- 376 International Food Policy Research Institute. 2016 Global Food Policy Report. Washington,
377 DC: International Food Policy Research Institute. 2016.
- 378 Kidane H. Causes of Food Insecurity in Koredegaga Peasant Association, Oromiya Zone,
379 Ethiopia. Shaping the Future of African Agriculture for Development: Proceedings of
380 Inaugural Symposium, Kenya. 2004.
- 381 Madeley J. Hungary for trade: How the poor pay for free trade, Cox and Wyman. Cumbria,
382 UK.2000.
- 383 Mayadunne G, Romeshun K. Estimation of Prevalence of Food Insecurity in Sri Lanka. Sri
384 Lanka Journal of Applied Statistics. 2013; (14)1
- 385 Maxwell DG Measuring food insecurity: the frequency and severity of "coping strategies".
386 Food Policy. 1996. 21(3). 291-303.
- 387 Maxwell DG, Caldwell R. Langworthy, M. Measuring food insecurity: Can an indicator based
388 on localized coping behaviors be used to compare across context? Food Policy. 2008; 33(6).
389 533-540.
- 390 Nanayakkara AGW. An analysis of poverty in Sri Lanka. Sri Lanka Journal of Social
391 Sciences. 1994; 17.49-78.
- 392 Nanayakkara AGW, Premaratne HAG. Food Consumption and Nutritional Levels. In Korale
393 R.M.B. (Ed) Income Distribution and Poverty in Sri Lanka, Department of Census and
394 Statistics, Colombo. 1987.
- 395 Napoli M, De Muro P, Mazziotta M. Towards a food insecurity multidimensional index. 2011.
- 396 Putnam R. Bowling Alone: America's Declining Social Capital. Journal of Economic Plan.
397 1995; 22: 256-267.
- 398 Ramakrishna G, Demeke A. An empirical analysis of food insecurity in Ethiopia: The case of
399 North Wollo. Africa Development. 2002; 27(1-2)
- 400 Rose D, Gunderson C, Oliveria V. Socio-Economic Determinants of Food Insecurity in
401 United States: Evidence from SIPP and CSFII Datasets, Food and Rural Economic Division,
402 United States. 1998.
- 403 Sibrian R. Indicators on Food Deprivation and Income Deprivation at National and Sub-
404 national levels: Methodological Issues. 4th International Conference on Agriculture Statistics.
405 China. 2007.
- 406 Subbarao K, Bonnerjee A, Braithwaite J, Carvalho S, Ezemenari D, Graham C, Thompson
407 A. Safety Net Programs and Poverty Reduction: Lessons from Cross-Country Experience.
408 Directions in Development. The World Bank, Washington, D.C. 1997.

- 409 Sultana A, Kiani A. Determinants of food security at household level in Pakistan. African
410 Journal of Business Management. 2011; 5(34): 12972-12979
- 411 Webb P, Coates J, Frongillo EA, Rogers BL, Swindale A, Bilinsky P. Measuring household
412 food insecurity: why it's so important and yet so difficult to do? The Journal of Nutrition.
413 2006; 126(5). 1404S-1408S.
- 414 Wickramasinghe W. Sub-National Food Insecurity and Vulnerability Assessment for Policy
415 Interventions in Sri Lanka: Vulnerability Matrix Approach, Hector Kobbekaduwa Agrarian
416 Research and Training Institute, Colombo (Unpublished). 2008.
- 417 World Bank. Sri Lanka: Poverty Assessment. Report 22535-CE. Washington, DC: Poverty
418 Reduction and Economic Management Sector Unit, South Asia Region, World Bank. 2002.

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