

## Analysis of factors affecting for adoption of good agricultural practices in potato cultivation in Badulla district, Sri Lanka

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### ABSTRACT

*Potato (Solanum tuberosum L.) is an economically attractive crop and farmers tend to get a higher yield by adopting extensively wrong agricultural practices which are not recommended by the Department of Agriculture. From the selection of the seed tubers up to the post-harvest practices, it spends a higher cost which result no significant profit. In here, adoption of Good Agricultural Practices (GAPs) by potato farmers will be a sound solution to soil erosion problem in hill country and it will help to improve the productivity of potato industry in Sri Lanka. Therefore, the purpose of this study was to find out the adoption level of GAPs and socio economic factors affecting the adoption of GAPs by the potato farmers. The study drew a sample of 100 potato farmers from four different regions in Badulla district using stratified sampling technique and the collected data were analyzed using descriptive statistics and multiple linear regression analysis. According to the results, only 27% of farmers had adopted well to GAPs. Further, good level of adoption of GAPs had increased the potato yield and income had reduced the average cost. The results of the multiple linear regression revealed that adoption of GAPs was significantly affected by education level of the farmer, farmer experience, tenure status of the land, awareness on GAPs, unit cost and unit income of potato cultivation.*

**Key words:** Adoption level, good agricultural practices, multiple linear regression, potato cultivation, Sri Lanka.

### Introduction

Potato has been one of an economically attractive crop grown in hill country of Sri Lanka which Badulla district represents 72% of the total extent of cultivation in Sri Lanka. Kamalinie *et al.* (2008) have reported that although, a crop with high income generation capability, potato yield has been gradually declining and cost of cultivation has been increasing during last decades. From the selection of the seed tubers up to the post-harvest practices farmers follow inappropriate practices that cause both the economic losses and adverse effects to the environment. According to Zijlstra (1989), the seasonal average rate of soil loss in potato land, was 15 and 9 tons/ha/year in *Maha and Yala* seasons. Moreover, Abeygunasekara (2004) has reported that hill country shows the highest amount of soil erosion, about 58% of the potato-cultivated land found to be prone to severe soil erosion. The accelerated soil erosion causes significant impacts on on-farm as well as off farm activities. These include the reduction of top soil, crop yields and

farm income in the cultivated areas of watersheds, the reduction of irrigation capacity and hydropower generation in the low land areas and an increased incidence of flooding in rural and urban areas in the downstream (Illukpitiya and Gopalkrishnan, 2004).

Good Agricultural Practices (GAPs) are practices that address environmental, economic and social sustainability of on farm processes and result in safe and quality food and nonfood agricultural products (FAO, 2013). Therefore adoption of GAP by potato farmers will be a sound solution to soil erosion problem in hill country and it will help to improve the productivity of potato industry in Sri Lanka. Litaladio *et al.* (2009) have reported that the GAP concept can be associated with critical production decision factors and recommendations for potato-based systems in developing countries. There are no studies that help to identify the level of adoption of GAPs

by potato farmers and the influence of socio-economic factors on farmers' decision on those levels in Sri Lanka. Therefore this study aimed to find out the level of adoption of GAPs and to determine the socio-economic factors that influence the different adoption levels of GAPs by potato farmers.

### Methodology

Following Rathnayaka *et al.* (2014), the level of adoption (LADOPT) was derived to get values ranging from 0 to 100% depending on number of practices adopted by each farmer. Fifteen practices (Anonymous, 2008) were considered to calculate the adoption level of farmers.

$$\text{LADOPT} = \frac{\text{Number of recommended GAPs followed by farmers}}{\text{Total number of recommended GAPs (15)}} \times 100$$

### Empirical model

Empirical model was developed to determine the factors that effect on LADOPT in potato farming sector. Ten explanatory variables were identified through comprehensive literature review process.

$$\text{LADOPT} = \beta_0 + \beta_1 \text{ AGE} + \beta_2 \text{ GEN} + \beta_3 \text{ EDU} + \beta_4 \text{ FEXP} + \beta_5 \text{ EXTENT} + \beta_6 \text{ TSPEND} + \beta_7 \text{ OWNER} + \beta_8 \text{ AWARE} + \beta_9 \text{ UCOST} + \beta_{10} \text{ UIN} + \varepsilon_i$$

Where,  $\beta_0$  to  $\beta_{10}$  = coefficient,  $\varepsilon_i$  = error terms

**Table 1: Description of variables of empirical model**

Variable	Description	Remarks
LADOPT	Level of adoption	Percentage
AGE	Age of the farmer	Years
GEN	Gender of the farmer	If male = 1, female = 0
EDU	Education level of the farmer	Scores
FEXP	Potato farming experience	Years
EXTENT	Extent of cultivation	Acres
TSPEND	Time spend on cultivation	If fulltime = 1, Part time = 0
OWNER	Tenure status of the land	If owner =1, Tenant =0
AWARE	Awareness on GAPs	If yes = 1, Otherwise = 0
UCOST	Cost per acre	Rupees per acre
UINCM	Income per acre	Rupees per acre

**Data collection and analysis**

The study was conducted in four major potato growing Divisional Secretariat Divisions in Badulla District named as Welimada, Uva Paranagama, Bandarawela and Haliela. A total of 100 farmers from four Divisional Secretariats were selected using stratified sampling technique. They were interviewed with a pre tested questionnaire. The data were analyzed using MINITAB 15 statistical software package. Descriptive statistical techniques were used in describing the sample characteristics. The Multiple Linear Regression was used to find out the determinants of adoption level.

adoption in-between 53.33% and 73.33%. Majority of the farmers were in moderate level of adoption (40%) while good and poor adopted farmers were in 27% and 33% respectively.

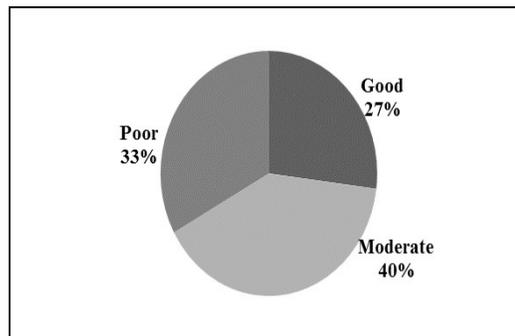


Figure 1: Levels of Adoption to GAPs by potato farmers

**Results and Discussion**

**Results of the descriptive analysis**

The level of adoption was divided into three main categories namely Good, Moderate and Poor based on the percentage of adoption of each farmer as shown in Figure 1. The category ‘Good’ implies where the level of adoption was more than 73.33% and the category ‘Poor’ implies where the level of adoption was less than 53.33%. The category ‘Moderate’ implies that the level of

Descriptive results showed a significant difference of average income with adoption level of GAPs. The farmers who adopted well to GAPs can generate a higher income when compared to the moderate and poor level of adoption. Similarly the farmers who adopted well to GAPs had very low average cost when compared to the moderate and poor level of adoption (Figure 2).

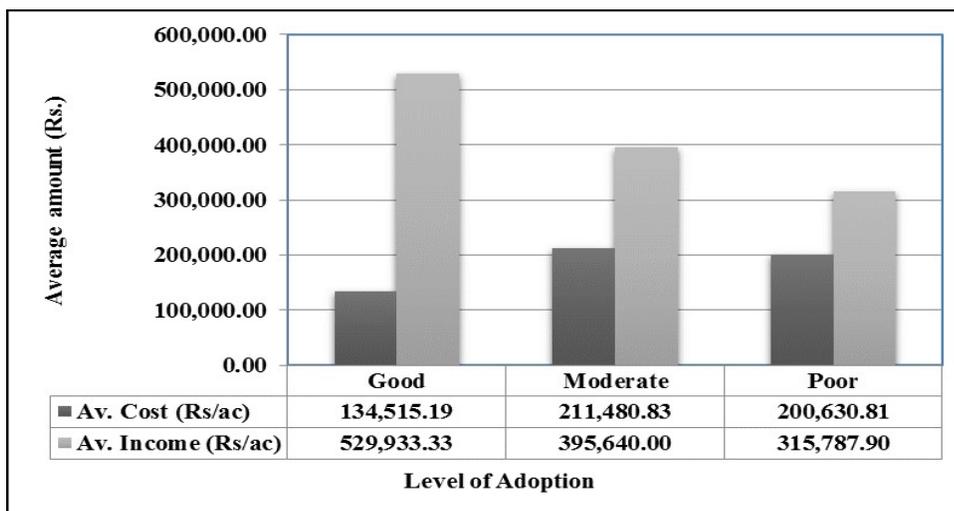


Figure 2: Average income and average cost according to the adoption level

As can be seen in Table 2, very few farmers were following the GAPs such as use of good seeds, performing soil tests once per 2 years, application

of recommended straight fertilizer amount, sloping agriculture land technology and storing of potatoes in a ventilating place etc.

**Table 2: Percentage of adopters to the recommended GAPs (N = 100)**

Criteria	GAP	Percentage of Adopters (%)
Selection of seeds	1. Selection of quality seeds	50
Soil Health	2. Soil test once per 2 year	33
	3. Application of recommended straight fertilizer	26
Soil Erosion	4. Application of decomposed rice straw	52
	5. Application of cow dung and cattle manure	97
	6. Hedging and Ditching	100
	7. Contour farming, terracing	86
Water Conservation	8. SALT (Sloping Agricultural Land Technology)	15
	9. Irrigation method and frequency	64
Pest Management	10. Crop rotation	100
	11. Use of certified seed tubers	93
Post Harvest	12. Integrated Pest Management (IPM)	28
	13. Storing potatoes in a ventilating place	19
	14. Not irrigation before harvesting	69
	15. Sorting and grading before enter to the market	72

**Results of the regression analysis**

The results of the regression analysis (Table 03) revealed that the adoption of recommended GAPs on potato cultivation was significantly determined by the education level, experience of potato cultivation, ownership of the land,

awareness of the GAPs, cost of production per season at 5% probability level and income per season of the farmers at 1% probability level. This model explains up to 82.1% of variation of adoption level of GAPs of potato farmers by all the independent variables.

**Table 3: Result of the multiple linear regression analysis**

Variable	Coefficient	Standard Error Coef.	Sig. Value
Constant	20.981	7.740	0.008
AGE	-0.1087	0.1158	0.351
GEN	1.512	2.426	0.535
EDU	2.2023	0.9302	0.020**
FEXP	0.2664	0.1129	0.020**
EXTENT	3.416	2.498	0.175
TSPEND	-2.869	2.466	0.248
OWNER	3.641	1.826	0.049**
AWARE	4.748	2.041	0.022**
UCOST	-0.00004253	0.00001535	0.007**
UINCM	0.00008653	0.00000933	0.000***

\*\* denotes significant at 5% level, \*\*\* denotes significant at 1% level, R-Sq = 83.9%  
R-Sq (adj) = 82.1% Probability > F = 0.000

**Determinants of GAP adoption****Education level of the farmer**

Formal education is an effective variable to capture environmental awareness of farmers who are basically literate. It was an important tool governing the adoption of farmer.

**Experience in potato cultivation**

Farmers who have been involved in agricultural activities on their land for a long time may have better personal knowledge of the impact of soil erosion on productivity. Also with long term experience, farmers come to know the best practice.

### Tenure status of the land

The farmers are more likely to adopt GAPs on their own resources by putting great efforts to get direct long term benefit. There was a strong motivation in human beings to invest more in their own resources as they could directly enjoy the net benefit of those investments.

### Cost per acre

When the cost of production was high, farmers were not much interested in investing on GAPs. The long term benefits that can be obtained through the adoption of GAPs was neglected by farmers when there was high cost of production.

### Income per acre

Normally it was expected that when the farmer is getting higher income they much more likely to adopt correct practices.

### Awareness on GAPs

Awareness was an important tool governing the adoption of farmer. Most of the farmers were not aware about GAPs on potato farming and as a result the cost of production increased.

### Conclusion

According to the study, potato farmers in Badulla district have not paid much concern yet on GAPs. Majority of the farmers (40%) were in moderate level of adoption while good and poor adopted farmers were in 27% and 33% respectively. The result revealed that the adoption of recommended GAPs on potato cultivation was significantly determined by the education level, experience of potato cultivation, awareness of the GAPs, cost of production per season, income per season and land ownership of the farmers.

Since the adoption level to GAPs is not at a satisfactory level, it is essential to establish a strong advisory service to bring knowledge and technology to them. If government could mandate farmers to follow GAPs, this tragedy can be minimized. Incentive appreciations can be given to farmers who are well adopted to GAPs, which will make interest in late adopters and laggards mind to follow GAPs.

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