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Validation of the Perceived Self-efficacy Scale (PSE) Among Cassava Farmers in Tanzania

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Abstract

This paper validated the Perceived Self-Efficacy (PSE) scale as a measurement tool for farmers' self-efficacy. From the social cognitive theory, self-efficacy is the key determinant of many social-cognitive behaviours, including the adoption of farming technologies. In this paper, PSE was adopted and tested in a two-stage study among cassava farmers in Mara, Mwanza, and Kagera regions of Tanzania. In the first stage, 200 respondents in Serengeti District of Mara region were exposed to the 13 items of PSE scale, while in the second the adopted tool with 11 items was administered to a total of 360 participants in Mara, Mwanza, and Kagera regions. The Principle Component Analysis (PCA) was performed, which was later followed by the Monte Carlo Parallel analysis. Results indicate that the 11 items of the PSE were relevant in measuring farmers' self-efficacy. Further, the moderate discriminant validity ($r = 0.48$), and good internal consistency ($\alpha = 0.85$) of the adopted PSE were found. It was concluded that PSE is an effective instrument in assessing individual differences in perceived self-efficacy. The study recommends the adoption of PSE as an effective tool for measuring farmers' self-efficacy.

Keywords: *farmers, self-efficacy scale, perceived self-efficacy, Tanzania*

1. Introduction

This paper intends to discuss the validation process of the Perceive Self-efficacy (PSE) scale, which is an instrument that measures self-efficacy. The lack of an effective instrument to measure farmers' PSE among the population of farmers in Tanzania might limit researchers' efforts to describe and predict farmers' potential self-efficacy. Self-efficacy refers to people's beliefs in their capabilities to perform specific actions required to attain a desired outcome (Luszczynska & Schwarzer, 2005). It is not an action itself or an outcome of an action, but what one believes in one's ability. The discussion existing on the literatures regarding the nature of self-efficacy has directed its focus on dual issues. The first one relates to the structure of the PSE, as to whether it is a unidimensional or multi-dimensional construct. While some studies hold that self-efficacy forms only one global dimension (Scholz et al., 2002; Luszczynska & Schwarzer, 2005; Teo & Kam, 2015), some report the multi-dimensional nature of the construct (Chiu & Tsang, 2004; Zhou, 2015). The main source of the difference in these findings seems to emanate from the

nature of the samples used in the studies. While most studies supporting the unidimensional nature of self-efficacy have been conducted in Western cultures, most studies supporting the multi-dimensional structure of self-efficacy have been conducted with samples from non-western cultures, and specifically in Asian countries (Zhou, 2015). It is unclear whether studies in Tanzania would support the uni- or multi-dimensional nature of the self-efficacy construct.

The second issue relates to whether self-efficacy is task-specific or domain-specific. While to some authors self-efficacy refers to a broad and stable sense of personal competence to deal effectively with a variety of stressful situations (Schwarzer & Jerusalem, 1995; Sherer et al., 1982) so that people would judge how efficacious they are across various domains of functioning, to some it seems that in many applications perceived self-efficacy should be conceptualized in a situation-specific manner (Bandura, 1997). Another observation by the health action process approach (HAPA) (Schwarzer, 2016) seems to settle the dispute by coming up with the phase-specific self-efficacy belief. The belief holds that during the process of behaviour adoption, the adopter must master various tasks involved in the new behaviour; therefore, one must develop new beliefs about one's capability to successfully master the tasks. This implies that the level of self-efficacy develops with the increasing or decreasing demands of a stage of the target behaviour in question. For example, talking of the adoption of improved cassava processing technology, one might be confident in one's capability to involve oneself in cassava pre-processing tasks (the first stage in the adoption of improved cassava processing technology), but might not be very confident to handle some specific tasks in involving in processing tasks (the second stage of adoption of improved cassava processing technology), or in the utilization of the processed cassava products (the third stage of adoption of improved cassava processing technology).

This approach distinguishes three levels of self-efficacy required in the three stages of behaviour adoption: action self-efficacy, maintenance self-efficacy, and recovery self-efficacy (Schwarzer, 2016). According to Schwarzer (ibid.), at the action self-efficacy level, adoption has not yet occurred but the adopter develops an interest to adopt. Maintenance self-efficacy involves one's beliefs about one's capability to deal with the difficulties one faces in the implementation of the activities required during the adoption process. Recovery self-efficacy refers to one's beliefs on one's capability to recover from failure experiences, and continue on track after being disrupted. The self-efficacy levels might apply in farming technologies when a new farming technology is introduced and a farmer is called to adopt the technology. Here, a farmer faces the action self-efficacy period whereby s/he starts to develop optimistic beliefs and motivation to adopt the same. During this time when one has not yet adopted but thinks of engaging in the pre-adoption activities, farmers who are high in self-efficacy imagine on their capability to succeed, anticipate different strategies and outcomes, and initiate new behaviours that are likely to enable adoption of the introduced technology.

On the other hand, farmers with low action self-efficacy imagine their likelihood to fail, have self-doubts, and tend to procrastinate. The introduced technology might happen to be unexpectedly difficult. At this stage, farmers with high maintenance self-efficacy would

demonstrate beliefs in their capability to come up with better strategies, more efforts, and prolonged perseverance to overcome difficulties. Sometimes it happens that a farmer has failed to achieve the expected outcome in the adoption of the introduced technology, and yet s/he is convinced that the technology is still useful. Here, the need to resume the use of the technology is there ahead of the farmer. Such farmers with high recovery self-efficacy would demonstrate their beliefs on their capability to recover or return to the activities related to the technology and correct their failing spots of the same, while those with low recovery self-efficacy would give up the technology. Action self-efficacy tends to predict intentions, whereas maintenance self-efficacy tends to predict behaviours (Schwarzer, 2016).

Some researchers (Pedrazza et al., 2013) have been measuring self-efficacy to target specific tasks, while others have been measuring self-efficacy using instruments targeting general self-efficacy—such as the self-efficacy scale (Sherer et al., 1982), the general self-efficacy scale (Schwarzer & Jerusalem, 1995), and the new general self-efficacy scale (Chen et al., 2001)—that could work across domains. Though all these tools have been reported to have good internal consistency with all accepted psychometric qualities, Gangloff and Mazilescu (2017) adopted the self-efficacy scale (Sherer et al., 1982), and reduced its items from 23 to 13 to study a mixture of a population including managers, non-managerial employees and students.

This study adopted the 13 items perceived self-efficacy scale to measure self-efficacy among farmers in Tanzania for dual reasons. First, the selection of the 13 items by Gangloff and Mazilescu (2017) had considered the items relevant to general domains and their application to the population composed of more than one group (executives, employees, and students). This led to the assumption that the 13 items could fit farmers as well. Second, consideration was given to a few items of the scale that captured the construct validity of self-efficacy as explained in the social cognitive theory (Bandura, 1997), making the instrument relevant to the group of farmers who might not enjoy long concentrations in academic-related tasks (Holland, 1997; 2000). Since the scale was designed to measure self-efficacy in terms of an individual's beliefs in his/her capability to react, deal, and cope with the difficult situations toward a planned goal (Gangloff & Mazilescu, 2017), it was considered that it could flexibly be adopted to measure farmer's ability to deal and cope with difficulties associated with cassava farming practices, including the adoption of cassava processing technology.

1.1 Statement of the Problem

The lack of effective instruments to measure PSE among the population of farmers in Tanzania might limit research efforts to describe and predict farmers' potential self-efficacy. The role of self-efficacy in determining human behaviour has been found in dental flossing, seat belt use, physical activity, dust mask wearing, and dietary behaviours (Schwarzer et al., 2007; Schwarzer, 2016); self-examination (Luszczynska & Schwarzer 2005); dietary behaviours (Schwarzer & Renner 2000); and physical exercise (Scholz et al., 2005). Self-efficacy has also been found to determine training proficiency, human health, behavioural therapy, academic achievement, and job performance (Martocchio & Judge, 1997; Jerome & McAuley, 2013; Stajkovic, 1998; Gallagher et al., 2013; Parker et al., 2014). Kyaruzi (2019)

has also reported that student's mathematics self-efficacy and perceptions of feedback use together accounted for a statistically significant portion of variance in students' mathematics performance. Despite the existence of theoretically plausible assertions by the social cognitive theory that self-efficacy is the key determinant of human motivation and behaviour (Bandura, 1997), little is known as to whether the PSE scale could relevantly measure farmers' self-efficacy in Tanzania. It is for this reason that this study sought to validate the PSE scale among farmers in Tanzania.

1.2 Research Questions

The study was guided by the following questions:

(i) What is the psychometric structure of the PSE among the farmers' population in Tanzania?
(ii) What is the validity and reliability of PSE?
(iii) Could PSE categorise farmers' performance in perceived self-efficacy by age, sex, and level of education?
(iv) Could PSE have an influence on farmers' cassava farming practices?

2. Methodology

2.1 Area of Study, Design and Sampling

2.1.1 Area of Study

This was a cross-sectional survey study conducted in two stages. Stage 1 was a pilot study conducted among cassava farmers in Serengeti District in Mara region. Stage 2—the main study—was done in Biharamulo, Sengerema, and Serengeti districts in Kagera, Mwanza and Mara regions, respectively, in Tanzania. The selection of the districts was influenced by the presence of cassava processing units in operation, and the potential of the districts in cassava cultivation. Preliminary information (Grace et al., 2018) indicates that there are about 24 cassava processing units producing high quality cassava flour in the Lake Zone with an estimate of about 7150 smallholder farmers in the catchment area of the processing units (Table 1). Specifically, the districts were selected given their large unit-farmers' ratio relative to the rest of districts.

Table 1: Processing Units in the Lake Zone and Farmers Surrounding the Units

Region	District	No. of Cassava Processing Units (Outstanding)	Ownership		No. of Surrounding Villages	Est. No. of Farmers Surrounding a Processing Unit	Unit-Farmers' Ratio
			Community Processing Group	SME			
Mara	Serengeti	1	0	1	6	300	1:300
	Rorya	1	1	0	4	200	1:100
Kagera	Biharamulo	7	1	6	4	4000	1:500
	Ngara	4	0	4	7	500	1:125
Mwanza	Mwanza	1	0	1	5	100	1:100
	Kwimba	1	1	0	3	150	1:150
	Sengerema	3	3	0	6	900	1:300
	Ukerewe	8	8	0	24	1000	1:125
Total		**24**	**14**	**12**	**59**	**7,150**	**1:298**

Source: Modified from Grace *et al*. (2018)

2.1.2 Design and Sampling

The study employed a cross-sectional quantitative design because the assessment of the psychometric structure of the scale calls for factor analysis and its requirements in the psychometric theory (Pallant, 2011; Tabacknick & Fidel, 2007). A single general questionnaire with sub-scales—including the PSE—was administered concurrently among the participants. Data were collected among farmers cultivating cassava in the areas where cassava processing machines have been installed. The target source of data was farmers who were processing their cassava in the processing units, and those cultivating cassava but process it using traditional processing methods. Farmers qualifying for the two criteria were identified and invited to participate in the study. Participants were exposed to the 13 items of the PSE in stage one, while participants responded to 11 items in stage two. In the first stage of the study, the Gangloff and Mazilescu's (2017) PSE scale was applied among cassava farmers. Some items were adopted to be more specific to cassava farming practices. The adoption involved changing some wordings in the items. The items whose words *were altered* and read as in the brackets [ ] are:

'*When unexpected problems arise, I am well able to deal with them'* ['When unexpected problems arise in cassava farming, I am well able to deal with them'];

'When I decide to do something, I immediately dedicate myself to it' ['When I decide to cultivate cassava, I immediately dedicate myself to it'];

'I feel able to deal with most of the problems that occur in my life' ['I feel able to deal with most of the problems related to cassava farming and processing'];

'I abandon things before finishing them' ['I abandon farming tasks such as cassava weeding before completing them'];

'When I set objectives that are important to me, I rarely reach them' ['When I set farming objectives that are important to me, I rarely reach them'];

'If I don't manage to do something the first time, I keep trying until I get there ['If I don't manage to implement cassava farming instructions given to me by extension officers the first time, I keep trying until I achieve them'];

'When I have to do something unpleasant, I put myself to it until I've completely finished it' ['I put myself to cassava farming until I completely harvest despite arising unpleasant challenges'];

'I avoid coping with difficulties' ['I avoid coping with difficulties related to cassava farming']; and

'If something seems too complicated, I don't even bother trying' ['If cassava farming instructions seems too complicated, I don't even bother trying'].

The target population was cassava farmers in areas surrounding the processing units in operation, with the assumption that these farmers were relevant sources of information given their exposure to the cassava processing technology. These farmers were found to be in two groups; first, cassava farmers processing using the improved processing methods; and second, cassava farmers processing using traditional methods. Due to the indefinite nature of this population in terms of numbers and scattering in various villages, it was necessary to undertake purposive sampling through invitation. Tabacknick and Fidel (2007) argue that in a study of a quantitative nature, random sampling is required except where the number of population cannot be estimated. Consenting farmers were included in the sample, leading to a sample size of about 360 participants.

In the first stage, 200 farmers—including 101(50.5%) males and 99(49.5%) females—responded to the PSE scale. Regarding age group representation, there were 67(33.5%) young age group (<= 35); 76(38%) middle age group (36–45); and 57(28.5%) old age (46+). About 37(18.5%) of the participants had no formal education, 77(38.5%) had primary education, and 86(43%) reported to have obtained secondary education or higher. In stage two of the study, 360 participants—including 181(50.3%) males and 179(49.7%) females—were involved in the study, out of whom 174(48.3%) were in the young age group, 84(23.3%) in middle age, and 102(28.3%) in old age group. The participants engaged in several economic activities such as 'only farming' 183(50.8%), 'farming and business' 36(10%), and 141(39.2%) reported doing 'farming and other economic activities', such as rearing cattle, poultry, casual labour in other farmers' farms, driving motor cycles, carpentry, selling charcoal and firewood, and bull-cart driving/dragging. Participants were then directed to read the statements in the PSE and indicate their experience in the beliefs about their ability to deal and cope with difficulties by putting a tick (✓) under the number column reflecting the intensity of their beliefs from 'never' to 'always'. The PSE was thus measured in a five-point continuum from 'never' (assigned a value of 1), 'only occasionally', 'sometimes', 'usually', and 'always' (assigned value of 5)

2.2 Data Analysis

Items 4, 5, 6, 8, 10, and 11, which were negatively worded, were reversed so that the higher the score, the higher the efficacy; and the lower the score, the lower the efficacy. This should be part of the scoring process before making calculations of both sub-scales and the total scale (Field, 2009; Pallant, 2011; Tabacknick & Fidel, 2007). It was assumed that there is no absolute absence of self-efficacy in all the items in the PSE, thus a continuum from low to high self-efficacy can be represented by the occurrence of some behaviours partly or fully reflecting self-efficacy. Therefore, the total score for each participant was obtained by adding up the scores of all the items in each sub-scale. Then the participant's total score in the PSE is a function of adding up the scores for each sub-scale. Interpretation of the scores in the PSE is based on the assumption that the total score in PSE represents a summary of a set of beliefs regarding specific tasks related to the studied behaviour. Thus, one might score low in a particular sub-scale, but score high in another depending on the component of self-efficacy measured (Schwarzer, 2016). It follows then that the categorization of self-efficacy in terms of absolute presence or absence would lead to a flaw of the PSE's construct validity.

The principle component analysis (PCA) was performed to validate the PSE. Though the PCA is usually used interchangeably with factor analysis (FA) by some researchers, Pallant (2011) proposes the use of PCA when one intends to validate existing instruments in a new context, which is the case in the present study. In PCA, the original variables are transformed into a smaller set of linear combinations, with all the variance in the variables being used. This reduces a set of variables into several items clustering together to form a factor—also known as a component or dimension—and indicates the relationship existing among the reduced factors (Tabachnick & Fidell, 2007). In stage one of the study, the PSE's 13 items were subjected to the PCA using the SPSS

version 21, while in stage two of data analysis the 11 items were analysed following the same process. From the analysis, both structure and the discriminant validity were obtained. The analysis was supplemented by the Chrobach's Alpha analysis for reliability indices where the internal consistency of the scale and its sub-scales were reported.

2.3 Consideration of Ethical Issues

This research was granted research clearance permits from the offices of the Vice Chancellor, Sokoine University of Agriculture, and from the offices of Regional Administrative Secretaries (RAS), and District Administrative Secretaries (DAS) of the relevant regions and districts. Respondents were requested for their informed consent to participate in the study. Lastly, the information provided by the respondents were kept confidential and was only used for the purpose of this academic study, and not for any other purposes.

3. Results

3.1 Stage 1 of the Study

The PCA analysis indicates that the Kaiser Meyer-Oklin was adequate at 0.78, which is above the recommended value of 0.6 (Kaiser, 1970). The Bartlett's test of sphericity was $p < .001$, which supported the factorability of the correlation matrix (Barttlet, 1954). Table 2 presents more results from the analysis.

Table 2: Total Variance Explained

Component	Total Variance Explained						
	Initial Eigenvalues			*Extraction Sums of Squared Loadings*			*Rotation Sums of Squared Loadings*
	Total	*% of Variance*	*Cumulative %*	*Total*	*% of Variance*	*Cumulative %*	
1	3.952	30.401	30.401	3.952	30.401	30.401	2.897
2	1.474	11.342	41.744	1.474	11.342	41.744	3.288
3	1.186	9.123	50.867	1.186	9.123	50.867	1.241
4	1.057	8.134	59.001	1.057	8.134	59.001	1.534
5	.928	7.140	66.142				
6	.865	6.653	72.795				
7	.832	6.398	79.193				
8	.622	4.784	83.977				
9	.527	4.052	88.030				
10	.512	3.942	91.971				
11	.455	3.500	95.472				
12	.333	2.562	98.034				
13	.256	1.966	100.000				

The initial PCA analysis found about four components with Eigen values greater than 1 as Table 2 indicates. The four components accounted for 30.40%, 11.34%, 9.12% and 8.13% of the total variance, respectively; and explained a total of 59.00% of the variance. However, the scree plot indicated an elbow point at the second component as Figure 1 vividly illustrates.

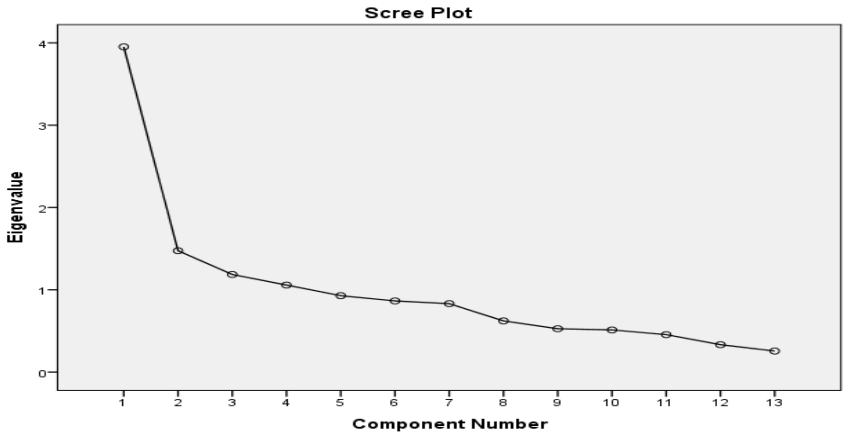

Figure 1: ***The Scree Plot for the Two Factors***

The Monte Carlo PCA for parallel analysis was then performed using the Watkins' Monte Carlo PA.exe. programme to screen the decision on the number of components. A systematic comparison between the actual PCA values and the criterion values from the parallel analysis supported the result from the scree plot. This is because 2 components from PCA had their eigenvalues greater than the corresponding criterion values for a randomly generated data matrix of the same size (13 variables × 200 respondents) from the parallel analysis. The first factor of the scale had its 7 items highly clustering together, while the second factor had 4 items highly clustering together as Table 3 indicates. One item (PSE1: '*When I make plans, I am certain I can implement them*') did not correlate with any of the items in the scale. Therefore, it was excluded in the next steps of the research and analysis. PSE10 ('*When I try to undertake something new, I give up quickly if I don't get there right away*') was also omitted because it fell below the coefficient of 0.4, which was the set-up criteria in the rotation.

Table 3: Pattern and Structure Matrices for PSE with Oblimin Rotation of Two Factor Solution of PSE Items

Item	Pattern Coefficients		Structure Coefficients		Communalities
	Components		*Components*		
	1	*2*	*1*	*2*	
PSE11	-.768		-.760		.086
PSE9	-.706		-.684		.551
PSE13	-.644		.659	.339	.170
PSE12	.625		-.654		.269
PSE5	.610		.594		.367
PSE4	.517		.519		.578
PSE3	-.409		-.412		.571
PSE2		.742		.742	.661
PSE8		-.597		-.661	.494
PSE6		.587		.642	.168
PSE7		.562		.620	.581
PSE10		-.361		-.328	.499
PSE1					.433
α	**.75**	**.77**			
Total scale		**α = .79**			

The two-factor solution improved the Kaiser-Meyer-Olkin measure of sampling adequacy from 0.78 to 0.81, assuring more factorability of the scale. The two factors are *perceived ability to deal with difficulty*, which shared 35.85% of the variance; and *perceived ability to deal with difficulty*, which shared 12.57% of the variance. The total PSE scale reached 48.42% of the shared variance. The *perceived ability to deal with difficulty* sub-scale reached good internal consistency of $\alpha = 0.74$; *perceived ability to cope with difficulty* sub-scale was $\alpha = 0.77$; and the reliability for the total PSE was good with internal consistency of $\alpha = 0.81$ as indicated in Table 4.

Table 4: The PSE Structure for Two Factor Solution (N = 200)

Item	Pattern Coefficients		Structure Coefficients		Communalities
	Components		*Components*		
	1	*2*	*1*	*2*	
When unexpected problems arise, I am well able to deal with them (PSE11)	-.824		-.810		.086
When I decide to do something, I immediately dedicate myself to it (PSE9)	-.760		-.719		.551
I feel able to deal with most of the problems that occur in my life. (PSE13)	-.517		-.600		.170
I give up easily (PSE12)	.484		.614		.269
I abandon things before finishing them (PSE5)	.682		.644		.367
When I set objectives that are important to me, I rarely reach them. (PSE4)	.425		.477		.578
If I don't manage to do something the first time, I keep trying until I get there (PSE3)	-.405				.571
One of my problems is that I cannot get to work when I should (PSE2)		-.747		-.815	.661
When I have to do something unpleasant, I put myself to it until I've completely finished it (PSE8)		.679		.741	.494
I avoid coping with difficulties (PSE6)		.715		.769	.168
If something seems too complicated, I don't even bother trying (PSE7)		.752		.666	.581
	$\alpha = .74$		**$\alpha = .77$**		
Total scale	**$\alpha = .81$**				

There was a weak moderate correlation ($r = 0.35$) between the *ability to deal with difficulty* sub-scale, and the *ability to cope with difficulty* sub-scale. This implies that each of the two sub-scales measured the same trait and at the same time could stand alone as sub-scales in the PSE scale (discriminant validity). Therefore, the PSE, considered as a two-factor scale with 11 items, measured in a five-point scale—from 'strongly agree' to 'strongly disagree'—was employed in the next main study.

3.2 Stage 2 of the Study

The analysis of the PSE at this stage of the study aimed at checking the reliability and validity of the PSE before testing the hypotheses of the main study. The 11 PSE items validated in the first stage of the study (pilot) were restated to fit the cassava farming context before they were administered among 360 participants. They were then subjected to the PCA analysis. The

Kaiser Meyer-Oklin was 0.86, and the Bartlett's test of sphericity was significant at $p < 0.001$, which supported the factorability of the correlation matrix (Barttlet, 1954). At this stage, the two-factor solution of the PSE was supported as the results in Table 5 show.

Table 5: Total Variance for Two Factor Solution Explained

Component	Total Variance Explained						
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	*% of Variance*	*Cumulative %*	*Total*	*% of Variance*	*Cumulative %*	*Total*
1	4.469	40.628	40.628	4.469	40.628	40.628	3.866
2	1.195	10.864	51.492	1.195	10.864	51.492	3.340
3	.867	7.885	59.377				
4	.820	7.451	66.828				
5	.805	7.323	74.151				
6	.702	6.385	80.535				
7	.549	4.992	85.528				
8	.501	4.553	90.080				
9	.442	4.019	94.099				
10	.371	3.370	97.469				
11	.278	2.531	100.000				

The findings at the initial loadings were in agreement with the scree plot, whose elbow point was similar at the second factor as Figure 2 illustrates.

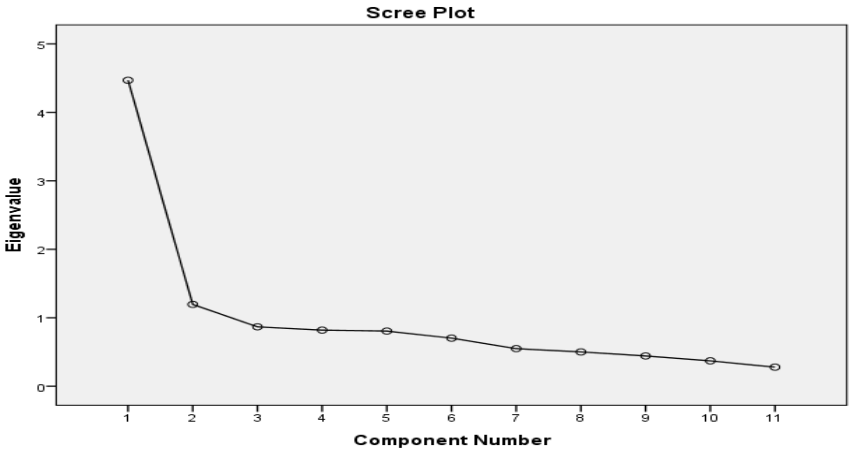

Figure 2: ***The Scree Plot for the Two Factors of the PSE***

The Monte Carlo PCA for parallel analysis was conducted for a fare decision whereby a systematic comparison between the actual PCA values and the criterion values from the parallel analysis indicated similar results because 2 components from the PCA indicated eigenvalues greater than the corresponding criterion values for a randomly generated data matrix of the same size (11 variables × 360 respondents) from parallel analysis. As

indicated in Table 5, with large sample and probably restatement of the items to fit the cassava farming context, the reliability of the scale was improved without altering the structure of the scale. *Perceived ability to deal with difficulty* shared 40.63% of the variance, while *perceived ability to cope with difficulty* shared 10.86% of the variance. The reliability of the PSE also improved as the *perceived ability to deal with difficulty* sub-scale reached good internal consistency of $\alpha = 0.79$;*perceived ability to cope with difficulty* sub-scale was $\alpha = 0.79$; and the reliability for the total PSE was good with internal consistency of $\alpha = 0.85$ as indicated in Table 6. Regarding the discriminant validity, there was a moderate correlation ($r = 0.48$) between the *perceived ability to deal with difficulty* sub-scale, and the *perceived ability to cope with difficulty* sub-scale. This means that each of the two sub-scales can singly measure the components of self-efficacy as sub-scales, and at the same time be part the total PSE measuring self-efficacy.

Table 6: Pattern and Structure Matrices for PSE with Oblimin Rotation of Two Factor Solution of PSE Items (N = 360)

	Pattern Coefficients		Structure Coefficients		Communalities
	Components		*Components*		
Item	*1*	*2*	*1*	*2*	*.702*
PSE11	-.903		-.826		.582
PSE9	-.803		-.758		.419
PSE13	-.589		-.640		.503
PSE12	.537		.667		.445
PSE5	.632		.664		.304
PSE4	.416		.518		.248
PSE3	-.490		-.497		.549
PSE2		.807		.726	.623
PSE8		-.669		-.768	.615
PSE6		.717		.777	.675
PSE7		.741		.811	
	$\alpha = .79$	$\alpha = .79$			
Total scale			**$\alpha = .849$**		

Therefore, PSE is a two-factors scale measured in a five-point continuum from 'never', 'only occasionally', 'sometimes', 'usually' and 'always'. The factors are intended to measure beliefs on one's ability to deal and cope with difficulty. Table 7 indicates the sub-scales, and the items for each sub-scale of the PSE.

Table 7: Items in the Sub-scales of the PSE

Item	Coefficient
Ability to deal with difficulty	
When unexpected problems arise in cassava farming, I am well able to deal with them	-.903
When I decide to cultivate cassava, I immediately dedicate myself to it	-.803
I feel able to deal with most of the problems related to cassava farming and processing	-.589
I give up easily when I face difficulties in cassava farming	.537
I abandon farming tasks such as cassava weeding before completing them	.632
When I set farming objectives that are important to me, I rarely reach them.	.416
If I don't manage to implement cassava farming instructions given to me by extension officers the first time, I keep trying until I achieve them	-.490

Ability to cope with difficulty	
One of my problems is that I cannot get to work when I should	.807
I put myself to cassava farming until I completely harvest despite arising unpleasant challenges	-.669
I avoid coping with difficulties related to cassava farming	.717
If cassava farming instructions seems too complicated, I don't even bother trying	.741

3.3 Performance in the PSE Scale by Demographics

According to FinScope Tanzania (2017), farmers in Tanzania are composed of the youth and the elderly. Farmers dedicated in farming activities whose ages are between 18 and 24 years are about 26% of all farmers; between 25 and 44 years are 45%; and 21% are in 45+ years within the productive age (18–64). The same report informs that farming is carried out by both educated and non-educated in terms of formal education [no formal education (15%), primary education (65%), secondary education (18%) and tertiary education (3)]. In addition, farming is usually done by both males and females; who also practice a combination of other economic activities that might supplement the economic status of the farming population. Thus, these demographics were considered relevant in testing PSE. Analysis reveals that the PSE scale was able to discriminate farmers by sex, age group, and education level in its two sub-scales. Table 8 presents performance distribution in the two sub-scales of PSE by farmers' demographics.

Table 8: Performance in the PSE by Farmers' Demographics

Performance by sex	**Responses**							
	Males				**Females**			
Sub-scale	**Low**		**High**		**Low**		**High**	
	f	%	*f*	%	*f*	%	*f*	%
Ability to Deal with Difficulty	120	49.0	61	57.8	125	51.0	54	57.2
Ability to Cope with Difficulty	106	48.2	74	53.2	114	51.8	65	46.8

Performance by age groups	***Young age group (<=35)***				***Middle age group (36-44)***				***Old age group (45+)***			
	Low		***High***		***Low***		***High***		***Low***		***High***	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Ability to Deal with Difficulty	120	49.0	54	47.0	7	2.9	5	4.3	118	48.2	56	48.7
Ability to Cope with Difficulty	105	47.7	69	49.6	5	2.3	6	4.3	110	50.0	64	46.0

Performance by education level	***No formal Education***				***Primary education***				***Secondary and above***			
	Low		***High***		***Low***		***High***		***Low***		***High***	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Ability to Deal with Difficulty	42	17.1	28	24.3	83	33.9	55	47.8	120	49.0	32	27.8
Ability to Cope with Difficulty	42	19.1	28	20.1	90	40.9	48	34.5	88	40.0	63	45.3

Table 8 indicates that the variation in farmers' ability to deal with difficulty was negligible across gender. This is because while 57.8% out of 181 male respondents reported ability to deal with difficulty, 57.2% out of 179 females reported the same. Despite the observed negligible variations in perceived self-efficacy sub-scales between young and old age groups, respondents in the middle age group (36–44 years) relatively reported low ability

to deal and cope with difficulties. Performance in both sub-scales varied with the level of education, whereby respondents with no formal education reported lower ability to deal and cope with difficulties than respondents with the rest of education levels.

3.3 Influence of Farmers' PSE on Some Selected Cassava Farming Practices

The influence of farmers' PSE on cassava farming practices was checked by assessing associations between PSE and three selected farming practices. These were: farmers' decision to plant either local or improved cassava varieties, farmers' attendance to trainings on cassava processing technology, and whether a farmer processed cassava using traditional or improved cassava processing technologies. Table 9 presents the results.

Table 9: The Association between Farmers' Perceived Self-efficacy and some Selected Cassava Farming Practices

Self-efficacy	Level	Farming Practices				Chi-square test			
		What kind of cassava variety have you planted in your cassava farms?							
		Local		*Improved*					
		f	*%*	*f*	*%*	X^2	*df*	*p*	*phi*
Ability to deal	High	77	31.4	168	68.6	3.67	1	.06	.10
with difficulty	Low	48	41.7	67	58.3				
Ability to cope	High	47		92		.10	1	.75	.02
with difficulty	Low	78	35.5	142	64.5				
		Have you ever attended any training on cassava processing using modern methods?							
		No		*Yes*					
		f	*%*	*f*	*%*	X^2	*df*	*p*	*phi*
Ability to deal	High	212	86.5	33	13.5	1.11	1	.29	.05
with difficulty	Low	104	90.4	11	9.6				
Ability to cope	High	191	86.8	29	13.2	.45	1	.50	.04
with difficulty	Low	124	89.2	15	10.8				
		Do you process your cassava in the nearby processing unit?							
		No		*Yes*					
		f	*%*	*f*	*%*	X^2	*df*	*p*	*phi*
Ability to deal	High	167	68.2	78	31.8	3.91	1	.048	.10
with difficulty	Low	90	78.3	25	21.7				
Ability to cope	High	164	74.5	56	25.5	2.91	1	.088	.10
with difficulty	Low	92	66.2	47	33.8				

Table 9 indicates that of the three selected cassava farming practices, there was a significant association ($X^2(1, n = 360) = 3.91, p = 0.05, phi = 10$) between farmers who reported low ability to deal with difficulty and their counterparts who reported high ability to deal with difficulty in attendance to training on cassava processing technology. However, the magnitude of association was just small ($phi = 0.10$). On the other hand, no significant differences were observed between perceived self-efficacy and other selected cassava farming practices.

4. Discussion

A comparison of the reliability indices indicates that Gangloff and Mazilescu (2017) report that their perceived self-efficacy scale indicated perfectly appropriate in terms of adequate reliability and a Cronbach's alpha of 0.86 on the total scale. Similar reliability indices have been found in this study ($\alpha = 0.85$ for the total PSE, and $\alpha = 0.79$ in each of the two sub-scales). The present study found that only 11 items were relevant as opposed to the 13 items presented by Gangloff and Mazilescu (2017). This might be explained by the nature of the sample (managers, non-manager employees, and students in the Gangloff and Mazilescu' study; versus a group of farmers in the present study). According to Duckworth and Anderson (1995), an item in the scale can fail to correlate with other items in a particular context because the respondents have not responded to it as expected. This is usually due to some reasons such as the lack of knowledge about the item, defensiveness, and the lack of ability to read or comprehend an item. Sometimes it might be because the respondents are not sure of what they feel or believe about the content of the item, or because the item pertains to one or more areas of life that the respondents have not experienced before (Bandura, 2001).

Despite its validity and reliability—which are the required psychometric qualities—the applicability of the PSE instrument to other contexts needs awareness of some facts regarding its development. The PSE's items have been adopted from the self-efficay scale (Sherer et al., 1982), whose original items were 23. Examples of the removed items, include: *'I avoid trying to learn new things when they seem too difficult for me,'* which was removed due to its direct relevance to education and learning settings; '*Failure just makes me try harder,'* which in the Gangloff and Mazilescu's study was considered as referring to finished activities; *'I feel insecure about my ability to do things,'* which these authors considered more personological than behavioural; and *'I am a self-reliant person,'* which was interpreted in the Gangloff and Mazilescu's study as referring to a feeling of autonomy. Thus, in a study whose concern is not so focused on a particular group, and where the themes carried out in the original items in the self-efficacy scale seem relevant (Sherer et al., 1982), one might find it reasonable to opt for the original scale. Another limitation that one can think of before generalizability is the level of technology in which the present PSE has been developed and tested. The level of cassava processing technology is still low to the extent that the common cassava processing machines are largely graters and pressers: drying is still dependent on sun using improved racks. The use of flash driers has just been introduced, but is still limited and found just in spots. Thus, with more advanced cassava processing technologies one might consider improving the items further to match the context.

The role of validation in research—and particularly in agricultural research—is strengthened by Abel et al. (1998) in their argument that reluctance to adopt new practices characterizes farmers because they lack the perceived need for change, the sub-culture they live in does not allow them to change, they do not know the risky returns, and the benefits expected of their adoption are not made clear to them. They further highlight factors such as uncertainty of being beneficiary of the technology, lack of assets, insufficient labour, or capital to manage the new practice or technology; inappropriateness of the technology; and processing, marketing, and transport constraints to motivate the rigid nature of farmers.

Thus, it is crucial to consider validating instruments in this group of population as these special characters might influence the research findings among them. However, these results indicate that PSE has managed to sound psychometrically relevant with few items omitted.

The PSE in this study has also indicated its ability to distinguish farmers in their one specific farming practice, which is deciding whether to process cassava using traditional or improved cassava processing technology. Most of the farmers who reported high ability to deal with difficulties than their counterparts who reported low ability to deal with difficulties, also reported processing cassava using improved cassava processing technologies. This might pave the way to researchers in Tanzania to conduct more studies linking farmers' self-efficacy with other farming practices. These results are in line with the argument by the social cognitive theory (Bandura, 1997; 2001), which stipulates that cognitive skills, preconceptions, and value preferences of observers determine what a person is more likely to adopt. Thus, the strength of the PSE in measuring self-efficacy of farmers paves way for measuring individual differences in PSE.

5. Limitations of the Study

This study was conducted in the Lake zone of Tanzania, whereas cassava farmers are found in other parts of the country as well. Though generalizability of these findings in other areas of the country and outside is possible, one needs to consider the issues of reliability and validity in the rest of the areas where this study was not carried out. Secondly, the level of cassava farming technology in the areas where the study was conducted is still low, making it important to consider the level of technology at which future studies might be conducted before one decides to apply the PSE scale. However, despite the mentioned limitations, this study has made an important contribution to the body of knowledge by putting in place an instrument that is much useful in describing, explaining, and predicting individual differences in self-efficacy among cassava farmers.

6. Conclusion and Recommendations

This paper intended to discuss the validation process of the perceived self-efficacy (PSE) scale as an instrument to measure self-efficacy among cassava farmers. This followed the lack of effective instrument to measure farmers' PSE among the population of cassava farmers in Tanzania. The instrument was found psychometrically effective to measure self-efficacy among the farming population. Therefore, we can conclude that PSE is an effective instrument in assessing individual differences in their ability to deal and cope with difficulties. However, even though this study found the tool effective, reliable, and valid for measuring self-efficacy among farmers, more research using the PSE scale is needed for its further validation among famers. Farmers can utilize it as a reflective tool to raise awareness on several aspects related to their self-efficacy in several aspects of their daily tasks. It is also recommended that more research be done to assess the influence of farmers' self-efficacy and more farming practices such as adoption of farming technologies arising among farmers.

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