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Antecedents of Transfer of Post-Harvest Handling Training among Small Scale Bean Grain Farmers in Uganda

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Implication: Enhancing the transfer of post-harvest handling of bean grain needs to pay attention to the unique capacity needs of men and women who are involved. Strategies that enhance motivation to transfer and self-efficacy need to be identified, while demographic differences among trainees should inform transfer strategies.

Application: Specific ways of improving planning for training and training transfer design for farmers is critical. One of these is to endeavor to be gender-responsive and ensuring the market viability of interventions to enhance motivation to transfer training.

Originality: The application of the LTSI in a specific training need of African farmers important in farming has been extended, as well as bringing out the gender and demographic factors unique to a context and their implications for transfer design.

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I. Introduction

In Sub Saharan Africa (SSA) despite the large contribution of agriculture to the region's Gross Domestic Product (GDP), agricultural productivity is generally lower than in other developing regions in the world (ACET, 2017). At the same time, agriculture's share in SSA countries' GDP has been declining with an increase in low value-added services, which are unlikely to provide the foundations for sustainable economic development. Linked to this, we find that SSA accounts for the majority of the world's extreme poverty, and most of this extreme poverty is located in rural areas amongst populations dependent on agriculture. This implies that agricultural innovation and transformation will be central to the goal of providing an adequate standard of living to rural populations in SSA countries (ACET, 2017). The development of new technologies, practices, and methods to increase agricultural productivity and enable smallholder farmers to participate and benefit from markets is a priority for sustainable development.

For smallholder farmers to contribute successfully to increased agricultural productivity, and to compete for domestic and global markets, they need training in the use of new technologies and practices. Training will not only improve personal competitiveness, but it is likely to result in improved standards of living and income leading to country-level economic growth. The major objective of any training is to improve personal performance at the workplace that can impact that workplace (Babkina, 2014). While training can have far-reaching positive impacts, it depends a lot on the extent of transfer of the trained knowledge and skills to the workplace. The extent of transfer depends on a system of factors that affect the extent to which the trainee will back to the job and workplace (Baldwin and Ford, 1988; Holton, Bates and Ruona, 2000).

Transfer of training can be defined as the generalization of skills, knowledge, and attitude from the training to the jobs (Iii, Chen, & Naquin, 2003). Studies have shown that trainees often fail to transfer their learning to the workplace. Identifying the extent of transfer and the factors that positively influence the transfer of the skills, knowledge, and attitude acquired from the training into improved work performance is critical at the farm work environment of smallholder farmers in Africa. The extent of transfer reveals the level to which trainees have applied what they have learned back to their job or work context. Additionally, the extent of transfer is influenced by a number of factors inherent in the trainee, the training strategy and the work environment.

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II. The Learning Transfer System Inventory: Conceptual and Analytical Approach

Holton *et al*., (2000) has argued that the factors that affect training transfer operate as a system. Together with his colleague Bates, they developed the Learning Transfer System Inventory (LTSI) to evaluate the effectiveness of the transfer of training. This would happen through identifying which factors can be responsible for the transfer of training irrespective of the type and place of training. Many studies have used the LTSI to measure the effectiveness of training in various areas and fields.(Kiwanuka, Miiro, Matsiko, & Nkalubo, 2020), used the LTSI to study the effects of trainee and training design characteristics on the transfer of agricultural training in Uganda among bean seed farmers. Soerensen, Stegeager, and Bates (2017) used the LTSI to study the students taking adult vocational training, professional academic programs, diploma, and master's degree training programs in Denmark. Antunes, Nascimento, and Bates (2018), and Velada, Caetano, Bates, and Holton (2009) used the LTSI among private organizations in Portugal. Sseguya, Bekunda, Muthoni, Flavian, and Masigo (2018); Zamani, Ataei, and Bates (2016), Muthoni and Miiro (2016), as well as Miiro, Mazur, and Matsiko (2012) used the LTSI in agricultural training targeting farmers. The LTSI has been used in the public and private sector entities in Ukraine ranging from health, University education, agricultural agencies, high schools, and business (Yamkovenko, Holton and Bates, 2007). It has been to evaluating training in banking in South Africa (Coetsee, Eiselen, & Basson, 2006); among private sector companies working in engineering, construction, financial services, health, telecommunications in German (Bates, Kauffeld, & Holton, 2007), in training related to policing and law enforcement (Hutchins, Nimon, Bates, & Holton, 2013); manufacturing, health, and non-profit international agencies among French-speakers in Belgium (Devos *et al*. 2007), health services in Ireland (Kirwan & Birchall, 2006), private and public sector organizations in Jordan (Khasawneh, Bates and Holton, 2006; Yaghi *et al*., 2007).

In the field of agriculture, transfer of training studies have been scarce (Kiwanuka 2020; Sseguya *et al*., 2018; Zamani, Ataei and Bates, 2016). Yamkovenko *et al*., 2007 study in Ukraine sampled from an agrarian University, and an agricultural academy involved in agricultural extension service. However, their sample was mixed with respondents from other organizations like hospitals, sales, and high schools. Specific studies on the transfer of training in agricultural aspects have been initiated in the last six years. Miiro *et al*. (2012) studied the transfer of governance-facilitation skills by leaders of farmers' marketing organizations in Uganda. Zamani *et al*., 2016, their study in Iran looked at the transfer of over six sustainable agriculture skill sets given to farmers ranging from crop agronomy to milk quality training. Miiro *et al*. (2012) focused on farmer leaders who had received governance-facilitation training while Zamani *et al*., (2016) focused on farmers from clusters that had received training in distinct sustainable agriculture skills. Muthoni and Miiro (2016) focused on the transfer of technical skills like breeding, grain systems and marketing, and on social areas such as gender, monitoring, and evaluation by agricultural scientists working under the auspices of an international agricultural research systems context in Africa. Sseguya *et al*. (2018), looked at the transfer of training of sustainable intensification in agriculture practices (improved crop varieties, good agricultural practices, household nutrition and handling food waste) by farmer trainers in Tanzania. Kiwanuka (2020) looked at the bean agronomic training among bean seed famers.

In terms of the extent of transfer of training in the field of agriculture training transfer levels are high. Zamani *et al*. (2016) registered an 80% transfer of sustainable intensification skills among farmers in Iran. Muthoni & Miiro (2016) who studied 'What influences the transfer of training in an African agricultural research network' registered an average of 75% transfer for each of the four training areas. Miiro et al., (2012) reported 67% transfer of governance-facilitation skills leaders of the farmer marketing organizations. While these rates are high, the factors that influence such outcomes have varied, and so are the implications on how enhancing the transfer of training skill investments. Training transfer studies on agricultural field practices are still few Kiwanuka (2020), Sseguya, *et al*. (2018), and Zamani *et al*. (2016). There is a need to extend research focused on agricultural training among farmers and its transfer in Africa. The level of transfer of training can differ depending on the sex of the trainee. Kingiri (2010) noted that there are unequal relations between men and women in households, men and women have varying challenges in agricultural production, varying opportunities and also play varying roles. These gender differences are bound to affect levels of uptake of agricultural interventions (Mudege, Mwanga, Mdege, Chevo, and Abidin, 2018). Mudege *et al*. (2018) observed fewer women involved in market-oriented sweet potato vine multiplication than the men. From the above literature we hypothesized the following:

H 1: There will be no difference in the transfer of bean grain post-harvest training between men and women farmers

The four training transfer studies in the field of agriculture have looked at actual transfer and explored the factors in the learning transfer system that influence actual transfer as opposed to intended transfer or predictive transfer (Hutchins *et al*., 2013; Zamani *et al*.,

2016). The most common methods of determining the factors that explain transfer of training have involved the use of hierarchical regression given that the influencing factors are categorized into trainee, training design and work environment-related factors (Bates, *et al*., 2007; Velada *et al*., 2007; Miiro *et al*., 2012; Hutchins, *et al*., 2013; Sseguya *et al*., 2018). Zamani *et al*. (2016) on the other hand used path analysis and looked at what influenced the direct transfer of training, and how the explanatory variables related to each other. Both Miiro *et al*. (2012) and Zamani *et al*. (2016) used the LTSI tool while Sseguya *et al*. (2018) used another tool. Respondents in two of the studies were farmer leaders/trainers (Miiro *et al*. 2012; Sseguya *et al*. 2018), while Zamani *et al*. (2016) dealt with farmers directly, with Muthoni and Miiro (2016) dealing with agricultural scientists.

In agriculture-focused training transfer studies, the combination of factors that influenced transfer has differed from one study to another. In Sseguya *et al*. (2018) the combination of predictive factors that were significant in training transfer included 'motivation to learn', 'training design and delivery', and 'work environment' factors. In Muthoni and Miiro (2016) there was no significant contributor to the combination of factors that predicted the transfer of training. Only personal capacity to transfer in the initial block entry of trainee characteristics significantly contributed to transfer. In Miiro *et al*. (2012), 'personal capacity to transfer' in terms of having the mental, physical, knowledge and time to transfer, 'training design and delivery', 'supervisor encouragement' and 'feedback' were critical factors in influencing transfer. In Miiro *et al*. (2012), influencing factors were mainly from work environment while for Zamani *et al*. (2016), they represented trainee and work environment factors ('motivation to transfer', 'performance self-efficacy', 'supervisor support', 'performance-outcomes expectations', 'opportunity to use' and 'supervisor sanctions'). Different influencing factors seem to arise depending on the context, and this means interventions need to be targeted to the unique factors in that special context if the transfer of training is to be enhanced. Given the diversity of the agricultural sector within countries, across countries, the varied levels of capacity building whether governance, policy, managerial, research, business/marketing, extension and farmer level, and the varying skills set across the agricultural value chain, more studies on training transfer are still needed if definite interventions are to be identified.

While it is important to look at the whole system of factors known to affect training transfer (Holton *et al*., 2003), research that focuses on system factors is needed. For example by looking at what individual factors, or what training design factors influence training transfer. Cromwell and Kolb (2004) studied the work environment factors that affected the transfer of supervision skills. Lim (2000), had as one of the objectives identifying the trainee learning and training design factors that influenced the transfer of training albeit he used an open-ended approach of asking the respondents what in the training design supported or inhibited the transfer of training. Some studies have focused on aspects of trainee characteristics that affect the motivation of the trainees (Sahoo and Misra, 2019). Trainee characteristics, and training design and delivery factors that influence the transfer of training were the interest of this study. Work environment factors were presented in another context and expanded to capture the uniqueness of the farmers' work environment.

a) Trainee characteristics and training transfer

The research revealed that the physical, psychological and cognitive ability characteristics of an individual can influence training outcomes. Factors such as; 'Personal capacity to transfer', 'motivation to learn', 'readiness to learn' and 'performance self-efficacy' (See Table 2). According to Tziner *et al*. (2007), trainees who have a high 'performance self-efficacy', are more likely to transfer training than their counterparts with low levels. Trainees with high motivation, prior to training are more likely to transfer training than trainees with low or no motivation (Moreira *et al*., 2019; Pham & Le, 2019; Chiaburu and Marinova, 2005)., Based on these assertions we hypothesize that:

H 2: There will be no difference in the way each of the trainee characteristics contributes to the transfer of bean grain post-harvest training

b) Training design and delivery factors and transfer of training

Training design refers to strategies used to enhance learning and transfer of learning back to the job (Holton, Bates, & Ruona, 2000). Training design factors that influence training transfer include training design (Hutchins *et al*., 2013; Velada *et al*., 2007) and perceived content validity (Bates, Holton, and Hatala, 2012; Ataei and Zamani, 2015). Transfer literature suggests that content design (Bhatti *et al*., 2014; Lim and Morris, 2005) and instructional methods (Yelon, Sheppard, Sleight, & Ford, 1997) are the main categories of training design. Other factors like having general rules and principles to guide application when back to one's job can also affect transfer (Lim & Morris, 2006). Basing on the above assertions we believe it is a significant characteristic in the transfer of training process, thus we hypothesize the following:

H 3: There will be no difference in the way each of the training design factors contributes to the transfer of bean grain post-harvest training

c) Influence of demographic variables on partial LU-LTSI

It is important to note that even within the same training and training transfer context, the demographic

characteristics of the trainees will influence the way the transfer environment is perceived, affecting the level of transfer of training. Hardly any training transfer study in the field of agriculture has considered the demographic differences that create variation in the way respondents view the training transfer system. Will farmers of varied age, sex, education, socioeconomic status, and work experience view the transfer system of factors the same way, and if not what are the implications for training transfer strategizing? Antunes, Nascimento, and Bates (2018) in Portugal, Soerensen, Stegeager and Bates (2017) in Denmark, Velada, Caetano, Bates and Holton (2009) in Portugal, Khasawneh, Bates and Holton (2006) in Jordan, Chen (2006) in Taiwan, Yamnill and McLean (2005) in Thailand have all looked at demographic factors of respondents and how they influenced the way transfer factors were perceived. Trainees of various demographic levels are likely to view training transfer factors differently. Men, for example, tend to view 'performance-outcome expectations' whether positive or negative more positively than women. Respondents of higher age tend to have a lower expectation of 'peer support', 'performance outcomes', and 'coaching'. What demographic differences among agricultural training beneficiaries will influence the perception of the transfer of training factors and what should be done in resultant situations? Petty, Lim, and Zulauf, (2007), examined the gender difference in perception of transfer of related training between CD-ROM-based instruction and traditional based instruction and found no difference in gender. Chen *et al*. (2006), found a significant difference in perception of transfer system characteristics across gender.

H 4: There will be no difference in the way respondents of various gender, age, education, and working experience view the various LTSI factors

d) The Learning Transfer System Inventory conceptual Framework

To begin with, personal factors such as; age, farming experience and level of education are expected to influence the way trainee characteristics and training design is perceived. Depending on the perception, participants will hold on themselves, this will be the level perceived on the transfer of bean post-harvest handling. Trainee characteristics and training design factors of the LTSI finally will influence training transfer of bean agronomic and post-harvest handling.

The arrows indicate how factors influence each other to cause a transfer of training.

e) The Case of Post-harvest handling practices for bean grains

This study focused on a training offered by Community Enterprises Development Organization in Uganda. (CEDO). This was under a research project called pre-cooked beans for food, nutrition, and income(Aseete *et al*., 2018). Farmers were trained on various bean pos- harvest handling practices so that they can produce enough beans to supply the pre-cooked bean industry that aimed at addressing the growing demand of urban and peri-urban consumers (Aseete *et al*., 2018).

CEDO a social enterprise non-government organization engaged farmers in the growing of bean grain under a contract arrangement. It trained farmers in grain production activities, CEDO would buy the bean grain from the farmers at a price that was put in a contract. Farmers were expected to observe the quality standards such as having beans of the same varieties, well dried, clean, not damaged and free from pests. These standards demanded that farmers be trained in bean grain post-harvest handling practices.

The post-harvest practices training took on average 8 hours and covered principles and practices using a hands-on practical approach. Trainers of trainees, selected from different farmer groups, in different villages were trained by a subject specialist. The subject specialists were given smartphones, containing the subject content from which they would select, what to train others. The training which took place two weeks before harvesting included topics like proper drying, winnowing and good storage methods like triple bagging. Weekly radio program on bean farming covering post-harvest handling, was aired out, as information support to farmers. Arrangements were put in place to support farmers who faced any challenge during the production of a bean grain. The arrangements included contacting specialists like extension workers, and some farmers who provided technical backstopping.

III. Methodology

a) Research approach

The study was a quantitative cross-sectional survey design that permitted the determination of factors from the LTSI that influenced the perceived transfer of post-harvest training.

b) Instrumentation

The study adopted) LTSI questionnaire (Holton *et al*., 2000). The tool has been used by several studies; Kiwanuaka(2020); Ataei and Zamani (2015), Bates *et al*. (2007), Devoset al. (2007), and Kirwan and Birchall (2006).Bates, the co-developer of the instrument offered user permission to Dr. Richard Miiro the main -author in this article.

The LTSI was translated into a local dialect called 'Luganda',forming the 'Luganda' Learning transfer system inventory version (LU-LTSI). The LU-LTSI was translated initially from English to Luganda and from Luganda back to English.

The translated LTSI reliability was pretested with 30 farmers in the research population, and factor analyzed. Cronbach's alpha coefficient ranged between 0.7 and 0.8(Table 2). The Independent variable constructs in a local version were measured (Table 1).

Six items were used to measure the dependent variable. Each item was scored on a five-point Likert-type scales with responses ranging from, 1=strongly disagree to 5=strongly agree. The 6 items were;"I enjoy challenges related to bean grain post-harvest practices", "I like to share my ideas on bean grain post-harvest handling with others", "I use more of what I learned in the bean grain post-harvest training", "I am confident that I have progressed since the bean grain post-harvest course", "I am confident about applying the learning from bean grain post-harvest training to my garden", "I have higher expectations from my bean grain post-harvest learning performance since participating in the course". The reliability of these items in measuring transfer was α =0.877. The instrument also collected demographic data. To ensure construct validity, the tool was given to supervisors to assess sentence construction, language clarity and comprehensiveness of the questionnaire, visa-a-vie the set objective in terms of length, the comments were incorporated in the final draft.

c) Study area

The study was conducted in the central Uganda. The mean annual rainfall ranged between 1278 mm-1542 mm in two seasons. The mean daily temperature ranged between 15 °C - 28 °C. The districts had adequate precipitation and relatively fertile soil making agriculture feasible and a major livelihood strategy in the region.

d) Sampling procedure

Rakai and Lyantonde districts were purposively selected based on having the highest levels of bean grain production. Using a random sampling procedure.

e) Data analysis

Quantitative data analysis involved getting factors that gave an interpretable structure of the LTSI used in this study. SPSS for Windows Version16.0 software was used to analyze data.. Principal Axis Factoring (PAF) was used to extract the underlying factor structure of the instrument (Costello & Osbourne, 2005). The measure of sampling adequacy using the Kaiser-Meyer-olkin (KMO) was 0.85, which qualified the data for factor analysis (Coetsee et al., 2006). The Bartlet's test of sphericity was $P < 0.001$. Six factors were extracted explaining 46.9% of the common variance. Items with loadings of greater than 0.4 were selected (Leech, Barrett, & Morgan, 2014) (Table 1).

Independent t-Tests were conducted on all the practices to determine if a difference in score existed in the level of transfer training between men and women that had attended the bean grain post-harvest training.

A hierarchical multiple linear regression analysis was used to determine the combination of factors (trainee, and training design) that influenced the transfer of the training. It was appropriate because the LTSI has three sets of known factors that influence the transfer of training. Thus each set had to be entered as a block to capture the unique factors that contributed to training transfer. Multiple Analysis of Variance (MANOVA) was used to analyze how demographic variables affected perceptions of the LTSI factors. MANOVA was chosen over the univariate analysis of Variance ANOVA. Because, more than one dependent variable could be included simultaneously (Tabachnick & Fidell, 2008). Prior to analysis, data were tested against required assumptions including normality, homoscedasticity, and multicollinearity (Doane & Seward, 2011). Outliers were removed by eliminating z-values from raw data above -/+3.29 (Tabachnick and Fidell, 2008). Descriptive statistics were also used. Levene's F-test was tested (Hair, Black, Babin, Anderson, & Tatham, 2006). Cohen's d for effect size was used (Cohen, 1992)

IV. Results

a) Sample description

Respondents' age ranged from 18 to 82. Close to 72% of the population indicated being between 18 and 50 years old. Similarly, 13% were had no formal education, 55 % had primary education, 23% had secondary education and 9% indicated having post-secondary education. The average land size owned was 5.63(SD= 6.6). The average proportion of land used for bean growing was 2.0 (SD=1.5) acres. The average distance trekked to training centers was 2.6 (SD=2.45) kilometers and the longest distance traveled was 7 kilometers.

Table 1: Factor loading of rotated items

Item	PSE	PCV	MOT	RL	PCT	TD	Communality
Q 83	.768						.564
Q 84	.636						.540
Q 82	.626						.470
Q 85	.593						.466
Q 58		.792					.632
Q 59		.679					.566
Q 49.		.653					.539
Q 48		.613					.540

Q 47		.610					.519
Q 3			.809				.702
Q 5			.782				.622
Q 4			.761				.665
Q 10				.819			.635
Q 9				.778			.586
Q 13				.584			.491
Q 11.					.660		.394
Q 20					.620		.374
Q 12					.549		.346
Q 27					.508		.307
Q 26					.438		.344
Q 54						.556	.494
Q 52						.513	.485
Q 53						.512	.510
Eigen values	9.30	3.67	2.55	1.77	1.62	1.26	
% variance	21.62	8.54	5.92	4.12	3.78	2.92	

PSE =Performance self-efficacy, MOT= Motivation to transfer, PCT= Personal capacity for transfer, PCV =Perceived content validity, RL= Readiness to learn, TD =Training design

Table 2: LU-LTSI scale definitions sample items and cronbach's alphas coefficient

Variable	*Definition*	*Sample item*	*No. of I tem*	*α*
	Train characteristic factors			
Performance self-efficacy	Personal judgment about individual competency to perform defined tasks	I never doubt my ability to use newly learnt skills on the farm	4	0.8
Readiness to learn	The extent to which an individual knows expected outcomes of the training and Understands how the training Is prepared for him or her prior to participating in training	I knew what to expect from the training before it began	3	0.85
Motivation to transfer learning	The individual willingness and excitement to try out new learning to the farm and the belief that new skills will help him or her perform tasks better.	When I left training I couldn't wait to get back to work.	3	0.87
Personal capacity to transfer	Individual belief in overcoming obstacles like lack of time	I did not have time to try to use the knowledge from training	4	0.7
	Training design factors			
Perceived content validity	Individual judgement about the match between training content and job requirements	What was taught closely matched my farming requirement	5	0.8
Training design	Individual perception on how the training was designed to enable them apply what they learnt to the farm	The trainer(s) used lots of examples that showed me how I could use my learning on the farm	3	0.7

Adopted from Kiwanuka et al. (2020)

Table 3: Independent t-Test for the transfer of post -harvest practices by gender

Variable				MEN		WOMEN	
	t-Test	P	Cohen's d	M	SD	M	SD
Use of tarpaulins to dry bean	t(186)=1.48	0.14	0.2	4.37	0.674	4.53	0.73
Winnowing beans before sale	t(250)=2.91	0.01	0.4	4.36	0.678	4.60	0.60
Use of Triple bagging storage method	t(221)=1.19	0.2	0.2	3.61	0.61	3.53	0.62

Note. *Only significant practices are in italics.* M=Mean, P= p-value, SD=standard deviation

b) Level of transfer of bean grain post-harvest training among men and women farmers

The extent of transfer of *bean grain post-harvest* training among men and women farmers were assessed. A statistically significant difference between the mean score of transfer of training for men (n=148, Mean=26.99,SD=3.27) and women (n=101, Mean=27.91, SD=3.01),t (247) =2.26, P=0.025 was obtained. The effect size was a medium effect (Cohen's d = 0.3). The 95% confidence interval in which the true mean lied was -1.73-to -0.12. The assumption of homogeneity of variance was tested and satisfied via Levene's F-test, F=1.41, P=0.24. Independent t-Test was associated with statistically significant effect, thus women transferred more than men.

Winnowing of beans before the sale found to have a statistically significant difference between the mean transfer of training score for men and women (n=151, Mean=26.80, SD=3.39) and women (n=101, Mean=28.01, SD=2.98), t (250) =2.91, P= 0.004. The effect size (Cohen's d = 0.4) was a medium effect.

c) Trainee characteristic factors influencing the transfer of bean grain post-harvest training.

H 2: There will be no difference in the way each of the trainee characteristics influences the transfer of bean grain post-harvest training

Using hierarchical regression modelling, the trainee characteristic factors were entered as a block to determine those which significantly influence the transfer of bean grain post-harvest training (Table 5). These significantly predicted transfer of bean grain post-harvest training (adj.R^2 = 0. 270; F (4, 217) = 21.384, P<0.001). 'Motivation for transfer' (β=0.397, p < 0.001), 'perceived self-efficacy' (β=0.167, p < 0.01) and 'readiness to learn' β=0.153, p < 0.01, significantly contributed to the model.

d) Training design and delivery factors influencing the transfer of bean grain post-harvest training

H 3: There will be no difference in the way each of the training design factors contributes to the transfer of bean grain post-harvest training

In the second step, training design factors ('perceived content validity' and 'training design') were entered as a block to give the final model. The combined and final model significantly predicted the transfer of bean grain post-harvest training (adj.R^2 = 0. 268, F= 14.867, p<0.01). Both trainee characteristics and training design factors explained 27% of the variance in the transfer of training. Trainee characteristic factors emerged as the strongest predictors of bean grain post-harvest training transfer. 'Motivation to transfer' (β=0.394, p< 0.01) and 'performance self-efficacy' (β=0.137, p< 0.05), significantly contributed to the model. None of the training design factors significantly contributed to the transfer of bean grain post-harvest training among the farmers in the final model (Table 5).

Table 4: Hierarchical regression for the transfer of post -harvest training

Dependent variable				
Transfer of post-harvest handling training				
	Model 1	Model 2	Tolerance for model 2	VIF for model 2
Performance self-efficacy	.167**	.137*	.795	1.257
Readiness to learn	.153**	.117	.852	1.174
Motivation to transfer	.397**	.394**	.838	1.194
Personal capacity to transfer	.094	.106	.974	1.027
Perceived content validity	-	.096	.803	1.246
Transfer design	-	.043	.766	1.305
R^2	.283	.293		
Adj.R^2	.270	.274		
F	21.384**	14.867**		
Performance self-efficacy	.167**	.137*	.795	1.257

**P <0.01 * P<0.05

Note VIF Variance inflation factor.

e) Influence of demographic variables on bean grain post-harvest transfer outcome

H 4: There will be no difference in the way respondents of various gender, age, education, and working experience view the various LTSI factors

Multivariate analysis of variance (MANOVA) was conducted to test whether farmer trainees of varying demographics age and education level differed in their perceptions of the factors that influenced the transfer of bean grain post-harvest training.

Education level: MANOVA showed a significant difference across the education levels (Wilk's ∧ =0.893, F = (18, 879) = 1.97, P =0.009, partial η2 =0.039). In the between-subjects, ANOVA showed only one of the

six factors was significant across the education level. The factor was 'personal capacity to transfer' (F: 3,296 = 6.38, P < .001). The strength of association was small partial η2 =0.061 (Table 6). Post hoc examination indicated that respondents with primary education and below rated 'Personal capacity to transfer' higher than did respondents with no formal education. Similarly, respondents with secondary education and above rated 'Personal capacity to transfer' training higher than those with primary education and below.

Table 5: Univariate comparisons of training design and trainee characteristics factors by education level

Dependent Variable	*Education level Means*						
Partial LU-LTSI	*Over all*	*No formal education*	*Primary*	*Secondary*	*Post-secondary*	*F*	*Sig.*
Performance self-efficacy	17.48	16.88	17.87	17.78	17.39	2.03	0.11
Perceived content validity	22.11	22.40	22.84	21.99	21.19	1.01	0.39
Personal capacity to transfer	*14.35*	*12.50*	*12.96*	*15.79*	*16.15*	*6.38*	*0.00*
Training design	13.74	13.60	13.91	13.81	13.62	0.68	0.56
Readiness to learn,	9.99	9.23	10.28	9.81	10.65	0.96	0.41
Motivation to transfer	14.32	14.25	14.47	14.24	14.31	1.46	0.30

Age levels: MANOVA showed no significant difference between the different categories of age groups when considered jointly on the variables of LU-LTSI (Wilk's ∧ =.935, F = (12, 586) = 1.65, P > 0.05, partial η2 = 0.033). In the between-subjects, ANOVA showed a significant difference between the age groups on the factor of 'readiness to learn' (F = (2, 297) =5.77, P < 0.01). The strength of association was very low partial η2 = 0.037 (Table 7). Post hoc comparison across age groups showed that, respondents aged 18 to 38 rated 'readiness to learn' higher than did those aged between thirty-nine and fifty-nine and those older than fifty-nine.

Table 6: Univariate comparisons of training design and trainee characteristics factors by Age groups

	Age (years) means					
Dependent Variable	Over all	18 - 38	39-59	*60 and above*	*F*	Sig.
Performance self-efficacy	17.69	17.94	17.46	17.67	1.37	0.26
Perceived content validity	20.14	14.29	21.86	24.27	2.01	0.14
Personal capacity to transfer	13.72	13.68	14.00	13.47	0.16	0.85
Training design	13.89	13.90	13.70	14.03	1.05	0.35
Readiness to learn,	*10.20*	*10.94*	*9.27*	*10.40*	*5.77*	*0.00*
Motivation to transfer	14.38	14.29	14.43	14.43	0.83	0.43

V. Discussion

This paper addresses a relevant concern on why lessons from most pieces of training in most smallholder farming communities with a focus on improving uptake and scaling of innovations or new practices, are often not taken up in practice in spite of the fact that the pieces of training are initiated based on needs assessments. The results of this study shed light in this direction by highlighting what needs to be taken into consideration and reveals the differences in the level of training transfer between men and women, insights on a combination of trainee characteristics, training design, and trainees' perception of the transfer system.

The extent of skills transfer across gender

This study addressed the question of whether men and women differed with respect to the extent of training transfer of bean grain post-harvest practices. Results indicated that generally, the transfer of training was high with women having higher training transfer than men. This is in line with findings Kiwanuaka (2020) who found out that women, were having a significantly higher training transfer than men. Job & Fajuyigbe (2014), found out that women farmers involved in upland rice growing were more efficient In using technology than men farmers. The possible explanation is that most of the women are often in charge of post-harvest activities of bean grain this means the training they received just reinforced their abilities making it easy for them to transfer in the same line the crop is used as source and women in African cultures are in charge of preparing food for the family hence the high rate of transfer.

Influence of trainee characteristics and training design factors

The result of this study revealed that 'motivation to transfer' was key to the transfer of post-harvest training. This is in agreement with the findings of Kim, Park & Kang, (2019),

Hutchins et al. (2013), Suhepi, (2018) and Zamani *et al*. (2016), who found out that, 'motivation to transfer' had a direct influence on transfer outcome. Since the training took place in the context of commercial bean grain production with a ready buyer of the grain farmers were to produce under a contract arrangement. This might have served as a motivation for those involved in the post-harvest training. Given the role of motivation to transfer in the transfer of training, effort should be made to improve farmers' motivation to ensure better training outcomes.

The results revealed that 'personal self-efficacy' positively influenced training transfer. The finding is consistent with the findings of Zamani *et al*. (2016), Suhepi (2018) and (Velada, Caetano, Michel, Lyons, & Kavanagh, 2007) who found that self-efficacy predicted learning transfer. This finding suggests that self-efficacy was critical if one was to transfer the post-harvest handling skills. This was because those trainee farmers who perceived themselves with higher self-efficacy indicated to have transferred post-harvest training to their farms more.

Effect of demographic variables on partial LU-LTSI

On the demographic influences on the perceptions of the transfer factors, respondents with secondary education and above rated 'personal capacity to transfer' training higher than those with primary education and below. Primary level education rated 'personal capacity to transfer' higher than did respondents with no formal education. Education played an important role in the trainee's understanding of the training and therefore, their perceived capacity to transfer the training. It appears that the post-harvest practices including proper drying, winnowing and good storage methods like triple bagging made more sense and where understandable to farmers who had more education. Implying the importance of education in grasping the aspects that were trained. These findings differ from Antunes *et al*. (2018), Velada *et al*. (2009) who found the more educated trainees had negative perceptions as compared to the less educated. Khasawneh *et al*. (2006) reported lower levels of education have higher levels of motivation to transfer. Velada *et al*. (2009), argued that educated peopletended not to see the value-added in training and were often critical of training goals, designs, and content. It seems since farmers in this study were in farming as a business, continuous learning was important to the advantage of the more educated than not. Farmers who were between 18 to 38 years old rated 'readiness to learn' higher than those aged between thirty-nine and fifty-nine, and those older than fifty-nine. Antunes, *et al*. (2018) also found that younger trainees perceived certain transfer factors more highly and positively. While 'readiness to learn' was not specifically rated highly in their study, young people tend to rate 'performance outcome' whether negative or positive and 'content validity' and 'performance coaching' positively and thus helpful for transferring learning. Unlike the older ones who have gained career stability and value efforts to transfer less. The same arguments work for 'readiness to learn' (Antunes, *et al*., 2018). Younger farmers who were likely to building farming as a business career can have greater readiness to learn, because of the opportunities of making more income.

VI. Creativity

The applicability of LTSI among smallholder farmers in Uganda has been verified, attention to gender differences in the levels of transfer has been made. Demographic factors (age and education) role in influencing farmer trainee perception of transfer system factors among farmers has been highlighted. While most studies have found trainees of higher education apathetic to transfer efforts and not so interested in the outcomes, the study has found out that having an education was useful for farmers to transfer the training. 'Motivation to transfer' and 'performance self-efficacy' were the factors that influenced the transfer of bean grain post-harvest handling training among farmers under the commercial contract based bean grain marketing arrangement. The LTSI has proven its usefulness in assessing whether training is being applied and what can be done to enhance transfer in unique situations. Given that there are countless training targeting farmers and value chain actors, the LTSI is now available as a tool to establish what will make things work irrespective of the context.

VII. Limitation

This study was collected by the self-reporting of the farmers which can be subjective to recall bias and this greatly depends on memory. Respondents generally find it problematic, to remember incidents that happened in the past. Sometimes respondents have the attendance of placing themselves in favorable ways regardless of their actual thoughts and feelings (De Rijdt *et al*. 2013). Measuring actual transfer can improve the findings.

VIII. Conclusions and Recommendations

Training transfer is gendered, and the study showed that women farmers transferred post-harvest handling skills more than men. 'Motivation to transfer' and 'performance self-efficacy' strongly predicted the

transfer of bean grain post-harvest training among the farmers. Age and education level revealed varying perceptions of the transfer system factors among farmers. The young farmers rated 'readiness to learn' higher than the older farmers, while having a higher level of education was important in one's personal capacity to transfer of post-harvest training.

The findings point to some important practical recommendations. The findings suggest that farmers should be highly motivated to transfer the result of the training into the work. Because the farmers are motivated to transfer then transfer will be in line with the purpose of the training. However, if the trainees are not motivated and just came because they were supposed to attend to meet the invitation from the change agent .then the transfer will be low therefore, the facilitator should be able to motivate the farmers and show them how the training is related to their work and how they will apply it on their farms.

Facilitators should also pay more attention to ensuring farmer's self-efficacy this can be achieved by giving more practical examples during the training session, to help the farmers understand how these training outcomes are related to their work. Thus the use of real-life examples and day to day work can build trainees sense of confidence and motivate them to transfer the training to their work

Lastly, it is critical in training and training transfer design to pay attention to the demographic differences of the trainees, and design ways to get the most out of training that suits the demographics of the trainees. This should also guide the selection of who should benefit from training. Policymakers should establish guidelines for training farmers that embrace the critical factors identified in this study.

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