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Borich Needs Assessment Model for Assessing Rice Post-Harvest Value Addition Training Needs of Agricultural Extension Agents, Southern Region, Sierra Leone

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Abstract

The study investigated the rice post-harvest value addition competencies of Agricultural Extension Agents by the utilising the Borich Needs Assessment Model. The specific objectives sought to assess the personal characteristics of the agents, followed by their required training needs in rice post-harvest value addition. The study was done in the Southern Region of Sierra Leone which covers Bo, Bonthe, Moyamaba, and Pujehun districts. A descriptive quantitative research design that involved a survey method through a census of fifty Agricultural Extension Agents was used. Primary data were collected with a questionnaire from this population. The training needs of the agents that are required in rice post-harvest value addition technologies were analysed using the Mean Weighted Discrepancy Score (MWDS) formula of the Borich Needs Assessment model. The results were ranked and presented in tables. The results showed that the majority of the agents (84.0%) are males. Technologies such as milling paddy (MWDS=7.2769), and packaging and marketing of rice (MWDS=6.8672) ranked as the highest training needs of the agents. The study recommends an increase in the recruitment of female Agricultural Extension Agents and the provision of rice post-harvest value addition resources to improve rice quality after harvest.

1. Introduction

The training needs of agricultural extension agents (AEAs) in the Southern Region of Sierra Leone were investigated. Alliance for a Green Revolution in Africa (AGRA) (2017) asserted that despite agricultural liberalization policies dating back to the early 1980s, post-harvest activities have not significantly changed, and holistic approaches to resolving agricultural issues are still underutilized due to a general lack of understanding of the value chain. Most developing nations, including Sierra Leone, still lack adequate AEAs, strong links with research institutions, the technical and management expertise necessary to successfully transfer products to value chains, and good training opportunities for AEAs (Conteh, 2020). To effectively do their duties, AEAs must receive training to help them develop specialized skills (Saleh et al., 2016). Farmers will receive assistance and advisory services from the AEAs, who will be more knowledgeable employees. Although the extension unit in Sierra Leone serves a crucial role, the majority of farmers in this West African country only run small to medium-sized family farms that grow crops, breed animals, and generate livestock products like milk (Ibrahim, Ganawah, & Kamara 2021). To achieve a country's goals, a study by Shah, Asmuni, and Ismail (2016) noted that AEAs are essential in Malaysia to help farmers change their knowledge, abilities, and attitudes. As technologies and information management techniques advance, the training needs for AEAs change with time in rice post-harvest value addition (RPHVA) techniques specifically. Additionally, AEAs have many urgent needs. Consequently, in-service training must be ongoing and in line with the demands of AEAs if they are to increase the effectiveness of their work (Alibaygi & Zarafshani, 2008). The AEAs must also look for ways to overcome the obstacles that prevent other actors in the RPHVA chain from being as effective and productive as they could be and promote the growth of friendly connections between them (Ammani & Abdullahi, 2015). The problem, therefore, is that AEAs themselves have limited RPHVA resources and expertise which impede them to train and provide farmers with the required RPHVA needs. This study will therefore identify these gaps for AEAs to equip themselves in helping farmers to add value to rice after harvest.

The key objective of the study was to investigate the competencies of AEAs in RPHVA for the improvement in rice quality by smallholder farmers in the study area. The specific study objectives were to:

i. investigates the personal characteristics of AEAs in RPHVA

ii. assess the training needs of AEAs in RPHVA in the Southern region of Sierra Leone.

1.1 Literature Review

Mechanization is becoming extremely relevant for smallholder farmers in RPHVA activities such as threshing, milling, packaging, transportation, storage, and marketing. As a result, high productivity systems are assisted by the use of sustainable mechanization in post-production processes, which results in more efficient labour consumption, on-time operations, and more efficient field and off-field activities (Bhattacharyya et al., 2021). Studies have shown that several factors, including post-harvest value addition technology, are related to the limited supply of rice. As an illustration, Kamara and Cooke, (2015) in Sierra Leone discovered that there are not many opportunities for value-added rice in Sierra Leone, especially for locally produced rice. The majority of the country's smallholder rice farmers harvest their rice by hand, and they do not have access to threshing, drying, milling, packaging, and storage technologies. Even though some farmers in Sierra Leone have access to better amenities at their Agricultural Business Centres (ABCs) in their farming localities, a different study by Kamara and Mansaray, (2015) demonstrates that the majority of farming activities, except milling operations, are still carried out traditionally by the farmers. Again, a study of extension competencies by Gadzirayi et al., (2020) in Zimbabwe outlined several competencies that were different from RPHVA competencies. The competencies according to the authors which ranked highly include; topography and survey topographyof weeds (MWDS= 6.63), animal diseases diagnosis (MWDS=4.40), plant and animal diseases diagnosis (MWDS=4,14), emerging issues in agriculture (MWDS=3.53) among others. The above findings expatiate the fact that RPHVA practices are limited in modern literature. So, the appeal by farmers in Sierra Leone for extension support in rice post-harvest value addition is appropriate. Furthermore, Kamanda, Momoh, Yila, and Motaung (2022) also observed in Sierra Leone that more than half of the sampled farmers (56.0%) refused to adopt any of the recommended rice post-harvest technologies, while less than one-third (31.0%) adopted only one and 13.0% adopted two.

Nonetheless, United Nations Industrial Development Organization (UNIDO), (2016) in particular, identified the RPHVA extension training needs of AEAs as harvesting, threshing, winnowing/cleaning, drying, storing, and milling technologies. In rural Ghana, a number of elements have been found to have an impact on smallholders' access to training, services, and information (Danso-Abbeam, et al. 2018). These factors include socioeconomic, demographic, and institutional traits that appeal to the need for extension training, such as sex, age, educational attainment, location, including extension interaction. For governments and organisations that cater for the training needs of smallholder farmers in developing countries, identifying the characteristics that influence smallholder farmers' participation in rice training programmes would be helpful as illustrated in extension training models.

The extension training model exemplifies how the training programme is constructed and organized locally to accomplish the unique objectives of the training (Donaldson, 2020). Therefore, the development of relevant and need-based training programmes for extension workers must begin with a training needs assessment (TNA) (Ferreira, 2013). To undertake an appropriate analysis of what needs to be trained, the recipient, and the kind of organisation, the training needs assessment is the initial stage in any training model development endeavours (Salas, et al., 2012). According to these authors, the desired objectives of this stage include expected learning outcomes, recommendations for the design and delivery of training, suggestions for evaluating training, and details regarding the organisational elements that may help or hinder training success. Therefore, training has a good impact on the behaviour of the trainees and their working abilities to improve performance and prepare them for future advantageous changes (Jehanzeb & Bashir, 2013). As a result, training develops fundamental knowledge of the subject matter. This information is essential, according to Bukchin and Kerret (2020), since farmers' adoption of technologies and, their level of expertise or competence in a particular technology, may be impacted by their context or surroundings. The context of the study acts as the main driving force behind agricultural development in low-income nations, and therefore this is crucial for the adoption of the production and processing technologies of enhanced agricultural goods (Mihretie, et al. 2022). The problem, therefore, is that AEAs in the study area have limited competencies in the use of advanced RPHVA technologies. This means that AEAs require advanced RPHVA technologies as their training needs which involve mechanisation that adds value to rice after harvest. For now, very little is known about the training needs of AEAs in rice post-harvest value addition in particular in Sierra Leone.

Apparently, in making training sustainable, training support is not an option for any training initiative. Therefore, "training support" refers to any tangible or practical aid required to facilitate training and its implementation for the development of knowledge and skills (Issahaku, 2014).

2. Materials and Methods

The study adopted a descriptive quantitative research design which caters for the use of a questionnaire as a quantitative research tool. According to Aggarwa and Ranganathan (2018), descriptive research is intended to characterise how one or more variables are distributed without consideration for any causal or other hypotheses. This form of research, regardless of its variants, is typically simple to carry out. According to Ponto (2015), survey research is the collection of responses in data form from a sample of persons to specific questions.

2.1 The Study Area

Sierra Leone has five geographic regions and the Southern Region is one of them. The region has a surface area of 19,694 km2 and a population of 1,438,572 people (Statistics Sierra Leone, 2015). There are four districts (Bo, Bonthe, Moyamba, and Pujehun). Bo, the country's second largest and second most populated city after Freetown, serves as its capital and administrative centre. The Mende ethnic group comprises the bulk of the region's population. Bo district has a population of 575,478, Bonthe has 200,781, Moyamba has 318,588, and Pujehun with 346,461 (Statistics Sierra Leone, 2015). The Western Area borders the Region in the far northwest, the Northern Region in the northeast, the Eastern Region in the east, and Grand Cape Mount County, Liberia in the southeast. The Southern Region has a vast diversity of traditional Sierra Leone flora evident from one region to the next, and the terrain is characterised by a mosaic of bush fallows. There is just one rainy season every year, and the region's climate is typically described as a wet tropical monsoon. The average annual rainfall is about 2,540 mm (Mansaray, et al. 2016). Despite the rivers' peak flow occurring in mid-September, the majority of this rain occurs between mid-April and mid-November, with August frequently being the wettest month. Around 1,460 mm of the yearly precipitation (1/2) finds its way to groundwater or runoff, causing stream and river flows (Mansaray et al.). Between the beginning of May and the end of November, rainfall influences streamflow. March and April have the lowest river discharge, which gradually rises in May. Groundwater levels do not start to rise significantly until late July. The Basement Granite and Acid Gneiss Terrain of Sierra Leone make up the region's geology. The lower terrace, middle terrace, upper terrace, and swamp facies are examples of potential gravel horizons. The rice post-harvest value addition situation in this region according to observation is very minimal, hence the need for this study.

2.2 Study Population

The totality of the AEAs assigned to the Southern Region of Sierra Leone are the target population for the study. They include; both the district and sub-district (chiefdom-level) levels of AEAs that formed the population of the study.

2.3 Sample size and data collection

The sample size for the study was fifty AEAs selected through a census from the four districts comprising District Agricultural Officers (DAOs), Block Extension Supervisors (BESs), and Field Extension Workers (FEWs). A questionnaire was administered to these respondents by my field enumerators. The respondents recorded their own responses in the research instruments for analysis.

2.4 Data Analysis

2.4.1 Descriptive statistics

The quantitative data collected from AEAs in the field were cleaned, edited, coded and analysed to eliminate any outliers that might have influenced the validity of the results. This was accomplished by carefully assessing the responses to the question for ambiguities and ensuring that the original thought of the participant was not altered needlessly with the aid of the Statistical Package for Social Science (IBM SPSS) version 25.0 software. The raw data were then processed and analysed. To define the personal characteristics of AEAs, descriptive statistics such as frequency counts, percentages, means, and standard deviations were computed.

2.4.2 The Use of the Borich Needs Assessment Model

To establish the training needs of the AEAs, the Borich needs assessment model was employed, which required computing the mean, standard deviation, and Mean Weighted Discrepancy Score (MWDS) of each item under each construct. The MWDS is a useful self-evaluative tool for determining the training needs of AEAs. As a result, the MWDS was generated to characterise the overall ranks of the competencies of the respondents (Knowledge and Skills). The importance and competencies of every technology to AEAs were measured on a 5-point Likert scale to come up with their total training needs in rice post-harvest value addition in the study area. The Likert scale ratings for measuring competence were: 1=Incapable, 2=Less capable, 3=Moderately capable, 4=Capable, and 5=Highly capable. Of the Importance scale were: 1=Unimportant, 2=Less important, 3=Moderately important, 4=Important, and 5=Very important.

As a result, Borich Needs Assessment Model is as follows:

MWDS = [(Iith - Cith) Xi/N]

MWDS = [(Importance - Competence) X Importance Mean] / N,

Where: I = importance rating for each item; C = competency rating for each item; Xi = Mean of the importance rating; N = the number of respondents. The training needs of AEAs were then prioritised using the MWDS (Alibaygi & Zarafshani, 2008b; Borich, 1980). The data collection instrument for this study (questionnaire) contained questions on the personal information comprising demographic and socio-economic characteristics of the AEAs. Additionally, their knowledge and skills were assessed with the help of the Borich needs assessment model to come up with their gaps in rice post-harvest value addition. This section described how the competencies of AEAs in rice post-harvest value addition were assessed.

3. Results and Discussion

3.1 Personal characteristics of AEAs

The findings in Table 1 indicate that, among the fifty (50) AEAs who took part in the RPHVA study, men made up the majority (84.0%). This shows that male AEAs predominate in the study region. This discovery is comparable to other studies done in Africa, including Ghana and Tanzania. Similar to this finding is one by Antwi-Agyei and Stringer, (2021) who found in Ghana that more than 93.8% of AEAs were men in their research to boost the efficiency of agricultural extension. The findings also reveal that the mean age of AEAs is 41.7 years (standard deviation of 9.3 years), with the majority (44.0%) of them falling between the ages of 30 and 39, followed by 26.0% of those who are 50 years or older, 24.0% of those who are in the 40 to 49 age range, and a small number (6.0%) who are between the ages of 20 and 29. According to the aforementioned findings, few young people work as AEAs in the research locations. These findings are consistent with that of Mustapha et al., (2022) in their study on ICT service delivery in Nigeria, who found that 77.1% of the AEAs had an average age of 41 years and were between the ages of 31 and 50 years. The bulk of the AEAs (86.0%) are married, with only 12.0% being single. In terms of academic qualification, the majority of respondents (48.0%) have a Diploma, while 28.0% have a certificate in agricultural general, 18.0% have a Bachelor's degree, and a minority (4.0%) have a Master's degree. This implies that all of the AEAs have received formal schooling.

In their research on the development of climate-smart agriculture in Nigeria, Olorunfemi, et al., (2020) discovered that the majority of the AEAs (92.5%) have a National Higher Diploma (NHD) or higher level of education. Furthermore, the AEAs have a mean age of 13.8 years of extension work experience (S.D.=10.5). In particular, 44.0% of AEAs have fewer than 10 years of extension job experience, 30.0% have 20-29 years of extension work experience, and 24% have 10-19 years of extension work experience. These findings are consistent with the findings of Olorunfemi et al. (2020), who discovered that AEAs in Nigeria have a comparable average work experience of 9.35 years. Other findings, however, have revealed substantially higher job experience of AEAs, such as the case in DIY, Indonesia, where 25 years was documented (Wulandari, 2015). The premise is that as AEAs get more field experience, they will be able to support farmers through a variety of extension training methods. The results also demonstrate that although 26.0% of the sampled AEAs attended post-qualification training just once, 24.0% and 18.0% attended training twice and four times, respectively, while 6.0% did not attend any capacity development training after getting their post-university certification.

Even though extension training is often costly, AEAs stated that the Ministry of Agriculture and Forestry, in collaboration with other NGOs, organises training for them (AEAs) in a variety of agricultural activities, including the rice value chain. According to the findings, the vast majority of respondents (86.0%) attend specific agricultural training courses to obtain the most reliable post-harvest technologies and marketing information. Few of them (4%) seek post-harvest and marketing information from friends, agricultural institutions, and media documents. These findings contrast with those of Oyegbami (2018), who found that in Nigeria that AEAs themselves (79.1%) are the primary sources of agricultural knowledge, followed by the media (37.5%), friends, and neighbours (53%). According to the findings on the travel distances made by AEAs to their clients, the average travel distance to operating regions is 20.9 km with a standard deviation of 7.33 km. To provide extension services to farmers, over half of the respondents (48.0%) travel a distance of 20–29 km, while 28.0% and 16.0% travel a distance of 10–19 km and 30 km or more, respectively. The fact that there are not enough AEAs to adequately serve the enormous number of farmers in their service regions is supported by this finding.

Table 1. Personal characteristics of Agricultural Extension Agents

Socio-demographic variables	Frequency (f)	Percentage(%)
Gender		
Male	42	84.0
Female	8	16.0
Age (completed years)	Mean=41.72, S.D.=9.33	
20-29	3	6.0
30-39	22	44.0
40-49	12	24.0
50+	13	26.0
Marital status		
Single	6	12.0
Married	43	86.0
Widowed	1	2.0
Qualification		
Certificate	14	28.0
Diploma	24	48.0
BSc/BA/Bed	9	18.0
Postgraduate Diploma	1	2.0
MSc/MA/Med	2	4.0
Years of experience	Mean=13.80, S.D.=10.53	
<10	22	44.0
10-19	12	24.0
20-29	15	30.0
30-39	1	2.0
Number of post-qualification capacity training	Mean=2, S.D.=1.74	
None	3	6.0
1	13	26.0
2	12	24.0
3	5	10.0
4	9	18.0
5+	8	16.0
A most reliable source of post-harvest and marketing information		
Attending a special agricultural training course	43	86.0
Reading agricultural bulletins and books	1	2.0
Dialogue with knowledgeable agricultural colleagues	2	4.0
Agricultural universities/colleges research institutes	2	4.0
Media document in CD format	2	4.0
Farthest distance to the operational area (km)	Mean=20.94, S.D.=7.33	
<10	4	8.0
10-19	14	28.0
20-29	24	48.0
30+	8	16.0

Source: Field Data, Kamanda (2021)

3.2 Training Needs of Agricultural Extension Agents

Using the Borich needs assessment model, the training needs for AEAs at rice post-harvest value addition statges were determined. The findings are shown in Table 2. The findings show that AEAs consider rice post-harvest value addition technologies to be "moderately important" to "important" (Means=3.91-4.27) to their post-harvest operations. Their competencies ranged from "moderately capable" to "capable" (Mean=2.55-3.50). The use of a combine harvester to harvest paddy (Mean = 4.64), drying paddy before it is threshed (Mean = 4.90), using barns and sacks or jute bags (Mean = 4.44), and using a moisture metre to test for moisture content (Mean = 4.38) are the most important post-harvest technologies for the AEAs. The AEAs regarded threshing paddy straws with sticks in bags to separate grains as the least important technology (Mean=3.33). The results show that the use of a power tiller to transport paddy after harvest (Mean=1.54), the use of a rice separator/net to filter broken grains from the paddy (Mean=1.60), and the use of specialized containers (Mean=1.94) are the post-harvest technologies in which the AEAs have the least competency. The study found that the Mean Weighted Discrepancy Score (MWDS) displays the prioritized competence areas of the required rice post-harvest value addition technologies when assessing the training needs of the AEAs using the Borich needs assessment model. The findings highlight the critical areas where AEAs must focus before adding value to rice at post-harvest stages, as indicated by the MWDS.

The relevance of the technologies is underscored by the fact that the training needs established for the AEAs in rice post-harvest value addition technologies vary generally from one value addition technology to another. For instance, packaging and marketing technologies are ranked second as crucial after milling technologies (MWDS=7.2769), which are ranked first overall. The threshing of rice (MWDS=1.7487) is the least preferred training need for AEAs. The use of a de-stoner to remove stones or pebbles from paddy rated highest among the different milling technologies (MWDS=12.001), whereas the use of a dehusking/dehulling machine to remove the rice's husk ranked the least (MWDS=1.3184). The usage of laminated zipped bags (MWDS=12.0984) was ranked as the leading packaging and marketing technology while using a phone to enhance marketing transactions (MWDS=2.6496) required the least degree of training. Following these are the uses of a rice separator/net to sieve broken grains to parboil paddy (MWDS=11.8916), a combine harvester to harvest paddy (MWDS=7.7024), a power tiller to dry paddy (MWDS=11.448), a mechanical dryer to test the moisture content of the paddy (MWDS=10.936), and a moisture metre (MWDS=6.8728) to accomplish this task.

The coned heap style to pack paddy scored at the top for heaping technologies (MWDS=2.9680), and heaping harvested paddy for no more than a day came in last (MWDS=0.9968). The use of a threshing machine (MWDS=4.0748) ranked as the threshing technology requiring the most training while maintaining grain moisture content at or below 14.0%.w.b (MWDS=3.9376) rated as the highest among the storage technologies. The milling of paddy technologies (MWDS=7.2769) was identified as the highest reprioritised rice post-harvest value-addition training need of AEAs of AEAs. These were followed by technologies for packaging and marketing paddy (MWDS=6.8672), parboiling paddy (MWDS=4.9634), harvesting paddy (MWDS=4.4945), transporting paddy (MWDS=3.9594), drying paddy (MWDS=3.8105), storing paddy (MWDS=2.8880), heaping paddy (MWDS=2.0530), and threshing paddy (MWDS=1.7487). The milling of paddy technologies (MWDS=7.2769) was identified as the highest reprioritized rice post-harvest value-addition training need of AEAs. These were followed by technologies for packaging and marketing paddy (MWDS=6.8672), parboiling paddy (MWDS=4.9634), harvesting paddy (MWDS=4.4945), transporting paddy (MWDS=3.9594), drying paddy (MWDS=3.8105), storing paddy (MWDS=2.8880), heaping paddy (MWDS=2.0530), and threshing paddy (MWDS=1.7487).

The findings are consistent with those of Saleh and Man (2017), who found that the most important training needs for AEAs in Iraq are post-harvest technologies for rice. The findings of Cahyono and Agunga (2016), who established that virtually all of the farmers in Indonesia favoured yearly in-service training as a prerequisite for their competencies, on the other hand, are mostly in conflict with these findings. On the contrary, the findings of Gadzirayi et al., (2020) in Zimbabwe show different extension competencies of AEAs from RPHVA competencies. The competencies the authors observed ranked as follows: topography and survey topography of weeds (MWDS= 6.63), animal diseases diagnosis (MWDS=4.40), plant and animal diseases diagnosis (MWDS=4,14), emerging issues in agriculture (MWDS=3.53) and lots more. Therefore, it is important to emphasise that AEAs prioritised four technologies. They include; operating a combine harvester to harvest paddy, power tillers to transport paddy, threshing machines to thresh paddy, and maintaining crop moisture levels at or below 14.0%. (w.b.).

Table 2. MWDS to determine the Training Needs of AEAs in RPHVA Technologies

Post-harvest value addition competence	Importance		Competence		MWDS	Rank
	Mean	S.D.	Mean	S.D.		
1. Milling of paddy technologies	4.27	0.55	2.58	0.63	7.2769	1
a. De-stoner to remove stones/pebbles from paddy	4.38	0.53	1.64	0.72	12.001	1
b. Machine to remove unfilled grain,	4.28	0.57	1.82	0.59	10.528	2
c. Mechanical miller to mill paddy	4.24	0.72	2.18	0.66	8.7344	3
d. Rice separator to grade broken rice	4.32	0.62	3.44	0.50	3.8016	4
e. Dehusking/dehulling machine to dehusk paddy	4.12	0.33	3.80	0.67	1.3184	5
2. Packaging and marketing of rice technologies	4.19	0.62	2.55	0.65	6.8672	2
a. Laminated and zipped bags to package rice	4.26	0.59	3.54	0.58	12.098	1
b. Labels/tags for traceability/identification of rice types	4.26	0.53	1.42	0.49	11.416	2
c. Weigh paddy on a scale to determine the selling weight	4.20	0.69	2.32	0.55	7.8960	3
d. Weigh rice on a scale to determine the selling weight	4.04	0.81	2.34	0.69	6.8680	4
e. Package rice at 8-13 percent moisture content	4.14	0.64	3.18	0.80	3.9744	5
f. Groups to market rice	4.28	0.45	1.58	0.70	3.1672	6
g. Phone to facilitate marketing negotiations	4.14	0.61	3.50	0.74	2.6496	7
3. Parboiling of paddy technologies	4.15	0.66	2.96	0.58	4.9634	3
a. Rice separator/net to sieve broken grains from paddy	4.34	0.62	1.60	0.49	11.891	1
b. Specialized parboiling container	4.26	0.69	1.94	0.59	9.8832	2
c. Soak paddy for about 18 hours in warm water	4.10	0.65	2.72	0.45	5.6580	3
d. Remove chaffs on paddy before soaking it	4.34	0.55	3.64	0.63	3.0380	4
e. Wash the paddy twice with clean water	3.58	0.78	2.74	0.49	3.0072	5
f. Remove unfilled/empty grains	4.36	0.63	3.74	0.63	2.7032	6
g. Jute bags to cover the container during steaming	4.10	0.61	3.62	0.57	1.9680	7
h. Steaming paddy for about 30-40 minutes	4.10	0.71	3.72	0.78	1.5580	8
4. Harvesting of paddy technologies	4.14	0.65	3.09	0.62	4.4945	4
a. Harvest paddy with a combine harvester	4.64	0.48	2.98	0.71	7.7024	1
b. Moisture meter to determine moisture content in paddy	4.36	0.48	2.70	0.46	7.2376	2
c. Planting calendar to determine harvesting date	4.42	0.49	3.20	0.93	5.3924	3
d. Harvest paddy by cutting straws 4-5cm above the ground level	3.66	0.87	2.62	0.60	3.8064	4
e. Harvest paddy with handheld sickles	3.92	0.72	3.10	0.64	3.2144	5
f. Harvest paddy with a knife to select panicle	3.86	0.88	3.96	0.40	-0.3860	6
g. Heap harvested paddy for not more than a day	3.56	0.73	3.28	1.01	0.9968	3
5. Transporting of paddy technologies	4.19	0.69	2.95	0.73	3.9594	5
a. Power tiller to transport paddy	4.24	0.62	1.54	0.67	11.448	1
b. Bags to transport paddy by humans	4.28	0.70	3.52	0.79	3.2528	2
c. Baskets to transport paddy by humans	4.06	0.77	3.78	0.74	1.1368	3
6. Drying of paddy technologies	4.21	064	3.12	0.59	3.8105	6
a. Mechanical dryer to dry paddy	4.34	0.59	1.82	0.69	10.936	1
b. Moisture meter to test for moisture content in the paddy	4.38	0.49	1.54	0.73	6.8728	2
c. Concrete/drying floor to dry paddy	4.18	0.72	3.72	0.61	1.9228	3
d. Solar energy to dry paddy by occasionally stirring it to dry	4.22	0.78	3.80	0.07	1.7724	4
e. Tarpaulin/plastic sheet to dry paddy	4.20	0.67	3.82	0.48	1.5960	5
f. Shed with fire underneath to dry paddy	3.96	0.60	4.02	0.94	-0.2376	6
7. Heaping of paddy technologies	4.01	0.63	3.50	0.82	2.0530	7
a. Coned heap style to pack paddy	4.24	0.52	3.54	0.65	2.9680	1
b. Heap paddy on tarpaulin	4.22	0.65	3.70	0.81	2.1944	2
8. Storage of rice/paddy technologies	4.20	0.74	3.51	0.68	2.8880	8
a. Keeping moisture content of grains at or below 14.0%.w.b	4.28	0.64	3.36	0.94	3.9376	1
b. Rice barns	4.44	0.57	3.54	0.65	3.7840	2
c. Clean storehouse three weeks before the arrival of fresh harvest	4.02	0.91	3.10	0.86	3.6984	3
d. Check the moisture content of the store by using a moisture meter	4.14	0.73	3.50	0.71	2.6496	4
e. Sacks or jute bags to store rice	4.44	0.73	3.90	0.46	2.3976	5
f. Stack bags of rice 20cm above the floor on wooden racks	4.20	0.63	3.64	0.59	2.3520	6

g. Containers (wooden boxes, drums/kegs, etc.)	3.88	0.98	3.52	0.58	1.3968	7
9. Threshing of paddy technologies	3.91	0.74	3.35	0.75	1.7487	9
a. Threshing machine to thresh paddy	4.00	0.69	3.88	0.82	4.0748	1
b. Thresh paddy with feet on concrete/dying floor	4.12	0.59	3.38	0.95	3.0488	2
c. Thresh paddy the very day it is harvested	3.58	0.73	3.56	0.64	2.9376	3
d. Whip paddy straws with sticks to remove grains	3.88	0.69	3.88	0.85	1.2434	4
e. Dry wet paddy before it is threshed	4.90	0.80	3.36	0.64	1.0000	5
f. Threshing paddy with feet on tarpaulin	4.14	0.57	3.96	0.73	0.7452	6
g. Thresh paddy with feet on mud floor	3.34	0.92	2.12	0.69	0.4800	7
h. Beat paddy straws in bags to remove grains from panicles	3.33	0.92	2.12	0.69	0.4600	8

Source: Field Data, Kamanda (2021)

n=50. Means were calculated on a scale of 1-5
Note: Importance scale: 1=unimportant, 2=less important, 3=moderately important, 4=important, 5=very important.
Competence scale: 1=incapable, 2=less capable, 3=moderately capable, 4=capable, 5=highly capable.
Scale: 1=(≤1.45), 2=(1.46-2.45), 3=(2.46-3.45), 4=(3.46-4.45), 5=(≥4.46)
MWDS = MWDS**.**

4. Conclusion and Recommendation

Mid-career male AEAs in their productive age bracket mostly conduct extension services in rice post-harvest value addition (30-49 years). Most of them have diplomas or higher degrees and are highly experienced, but they lack the necessary technical backing to carry out their jobs and are thus demotivated. In the Southern Region of Sierra Leone, the agricultural extension service is characterised by a small number of AEAs with scarce resources, including subject matter specialists, finance, transportation, and other support systems including demonstration materials, meeting places, and storage facilities. Additionally, when it comes to rice post-harvest value addition, the AEAs are more proficient in conventional technologies than in high mechanisation and automation technologies. The study, therefore, suggests that the Ministry of Agriculture and Forestry (MAF) is to promote gender equity in hiring AEAs to increase the number of female extension workers as this may encourage more female smallholder farmers in Sierra Leone to participate in rice post-harvest value-addition activities. Additionally, MAF and other donor partners should cooperate to provide the resources required for AEAs, including suitable incentives, training and awards to boost employee morale and increase labour efficiency and effectiveness in rice post-harvest value addition in Sierra Leone.

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