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UTILIZATION OF LOW COST TECHNOLOGY: A CATALYST FOR REDUCING POSTHARVEST FISH LOSSES IN LAGOS STATE, NIGERIA

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ABSTRACT: *The need for the development of fish preservation and processing machinery and techniques for effective fish handling, harvesting, processing and storage can never be over-emphasized especially now that aquaculture production is on the increase in Nigeria. With Low Cost Technology (LCT), and better processing practices, fresh fish can be processed as desired without any significant loss of its quality. Hence, this study assessed utilization of low cost technology: a catalyst for reducing postharvest fish losses in Lagos State, Nigeria. Multi-stage sampling technique was used to select 353 fish processors as sample size for this study. Data obtained were analyzed with both descriptive and inferential statistics. Result of the study showed that majority (63.7%) of the respondents were between 31 – 50 years of age, predominantly female (93.8%), married (70.3%), had formal education (77.9%) and belonged to Fish Processors Association (74.2%). The average household size and experience in fish processing were 7 people and 19.2 years respectively. Estimated income from processed fish ranged from ₦20,000 – 40,000/week. Result also revealed that extended drum oven (90.9%) was predominant and often used by the respondents. However, red clay oven (58.6%), brick kiln (52.4%) and government model kiln (41.1%) are available but not used by the respondents. Respondents got training and capacity building on fish processing technique and preservation (83.0%), hazard prevention and safety training (79.0%), record keeping (71.4%) and quality fish sourcing (67.7%) mainly through their Fish Processors Association. Furthermore, major challenges undermining fish processing and utilization of LCT are lack of fund from the commercial banks (80.3%), poor road network (79.0%), lack of training by extension personnel (74.2%) and epileptic power supply (77.9%). In addition, result of chi-square indicated that significant relationship existed between socio-economic characteristics of the respondents and utilization of low cost technology ($\chi^2 = 12.91$, $p < 0.05$). Fish Processors Association ($\chi^2 = 16.05$, $p < 0.05$). Training and capacity building have significant association with utilization of low cost technology ($\chi^2 = 13.79$, $p < 0.05$). Constraints impeded the utilization of LCT and was positively significant ($t = 2.87$, $p = 0.004$). The study concluded that despite the advantages of LCT in reducing PHL and increasing income from processed fish it was not utilized by the respondents in the study area. It was therefore recommended that there should be more awareness and enlightenment on merits of LCT by the extension officers, fish experts and media to facilitate its adoption and utilization among fish processors in the study area.*

KEYWORD: Utilization, Low Cost Technology, Catalyst, Postharvest Losses, Fish

INTRODUCTION

Small-scale fish processing in developing countries play a vital role in contributing directly to food and livelihood security, poverty reduction, wealth creation, foreign exchange earnings

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and rural development. Fisheries make an important contribution to the animal protein supplies of many communities in both the industrialized and developing world (Al-Jufaili and Opara, 2006; FAO, 2010). The latest estimates indicate that artisanal fisheries contribute over half of the world's marine and inland fish catch of about 140 million tonnes, nearly all of which is used for direct human consumption (FAO, 2008). In Africa, over 60 percent of the fish supply to domestic and regional markets, as well as export-oriented processing units, is of artisanal origin. Small-scale fish processing support approximately 84 million people employed in jobs associated with fish processing, distribution and marketing in which women are predominant (FAO, 2008). In spite of these economic, social and nutritional benefits, concerns are raised about the sustainability of small-scale fish processing in maintaining their role of filling the gap between an ever-increasing demand for fish and dwindling supplies from wild capture fisheries. Fish is a very perishable commodity and hence susceptible to high postharvest losses (Akinola *et al*., 2006). Both physical (material) and quality losses are high in fisheries sector (FAO, 2008) and these translate into losses in nutritional contribution of fish to the total diet and health of populations (Getu *et al*., 2015). It also means that less fish is available to consumers, or consumers are supplied with low quality fish and fish products (Yvette, 2011). According to FAO, (2010) post-harvest fish loss control has long been a concern of development practitioners committed to improving the livelihoods of fishermen, processors and traders and the contribution fish makes to food security in developing countries.

It has been estimated that 10 percent by weight of world fish catch is lost by poor handling, processing, storage and distribution. However, losses in small-scale fish processing are said to be particularly high and figures as high as 40 percent are sometimes reported (FAO, 2010). However, while post-harvest fish losses occur all over the world in all fisheries from point of production to final sale to the consumer, even in more structured fisheries (industrial sector) the type of loss can vary. A review of case studies on postharvest losses in several countries in Africa indicates high levels of losses both in quantity (material or physical losses) and quality (mostly due to downgrading) of fishery products (FAO, 2008). Poor quality fish constitutes an economic loss to fishermen, processors and fish traders. In tropical countries fish spoil quite rapidly within a few hours of landing, if not properly cooled. Fish losses caused by spoilage are estimated at 10 to 12 million tonnes per year, accounting for around 10 percent of the total production from capture fisheries and aquaculture (FAO, 2010). The most common causes of losses are due to inadequate handling and processing methods, lack of knowledge and skills amongst producers, as well as poor access to infrastructure, equipment and services such as water, ice, electricity, roads and credit are all fundamental (FAO, 2010). Other underlying causes of loss are also lack of or poor market information, weak and unsupportive policy and socio-cultural factors. Losses are associated with certain species of fish and processing method and these are often occurring during times of glut catches or the rainy season when traditional processing methods are less effective. The commonest methods and practices for traditional processing and preservation of fish products include salting, smoke-drying, sun-drying and fermentation. Recognition of the important problem fish loss poses is reflected in the FAO CCRF under Article 11.1 – Responsible fish utilization (FAO, 1998a cited in FAO, 2010), which places an emphasis on loss reduction. The most obvious means of increasing supply of fish, even without increased landings, is by reducing postharvest losses of what is presently caught. Consequently, there is a need for an integrated and innovative approach to the global effort of ensuring sustainable supply of quality fish for human consumption. This calls for upgrading of the traditional processing

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techniques that are prevailing in many part of Nigeria to modern ones. However, the modern technologies of advanced countries and large-scale fish merchants like cold room, electric oven and large deep freezer are not only expensive for the small-scale fish processors but are not sustainable due to epileptic power supply in Nigeria. In recent time, the coping strategies to control postharvest fish losses include the use of low-cost technology (hot smoking, deep frying and solar drying with the aid of galvanized kiln, oven, chorkor kiln among others) that is based on existing fish processing techniques, relatively cheap, use local resources and have relative advantage over traditional methods. This low cost technology has been widely used in African countries like Ghana, Uganda, and Zambia (Allou, 2012; Kabahenda *et al*., 2009). Understanding these essentials is therefore key to prioritizing and implementing effective fish losses reduction interventions and the potential benefits that will accrue in Nigeria. This could form the basis for effective and sustainable fish processing among the small-scale fish processors in Lagos State in particular and Nigeria at large. Consumers generally demand and pay more for good quality fish. This research therefore looked at utilization of low cost technology as a means of reducing post-harvest fish losses among small-scale fish processors in Lagos State, Nigeria with the view to promote fish quality, market acceptability and income generation from processed fish in the study area.

The specific objective is to:

i. describe the socio-economic characteristics of the small-scale fish processors in the study area

ii. identify the low cost fish processing technology available in the study area

iii. examine extent of utilization sustainability of low cost fish processing technology among small-scale fish processors in the study area

iv. assess the training and capacity building programmes rendered to the respondents on utilization of low cost technology in the study area

v. identify challenges to effective utilization of low cost technology in processing fish in the study area

Hypotheses of the study

H_{01}: There is no significant relationship between socio-economic characteristics of the respondents and utilization of low cost technology in the study area

H_{03}: There is no significant relationship between training and capacity building programmes rendered to the respondents and utilization of low cost technology in the study area

H_{04}: There is no significant relationship between the challenges and utilization of low cost technology in the study area

ISSN: 2059-1187(print), ISSN 2059-119(online)

RESEARCH METHODOLOGY

Description of the Study Area

This study was carried out in Lagos State, Nigeria. Lagos state comprises of twenty Local Government Areas. Lagos (meaning lakes) was created on May 27th, 1967. It has 57 local Government areas and was the capital of Nigeria until 1976. It is referred to as the 'centre of excellence'. The state covered a total of 3,939km^2 of land. It spans the Guinea coast of the Atlantic Ocean for over 180km, from the Republic of Benin on the west to its boundary with Ogun State in the east. It extends approximately from latitude $6^0$2North to $6^0$4 North and from longitude 2^0 45 East. Of it is about 787sq. Km and 22 per cent is water.

Sampling technique and sample size

Multi-stage sampling technique will be used to select the respondents as follow:

Stage 1: There are three geographical zones in Lagos State. The first stage was purposive selection of two zones out of three zones namely; Far Eastern and Western zones. These are coastal zones.

Stage 2: The second stage involved purposive selection of 5 major coastal areas in the two selected zones. The blocks selected are Magbon, Ajah, Epe-Eredo, Badagry and Ilaje.

Stage 3: This involved random selection of 2 fishing communities from each of the selected blocks. This gave rise to 10 fishing communities. These are Ifolu, Akodo, Oniyanrin, Ilaje, Ebute Chief, Epe, Badagry, Gberefu, Ilaje 1 & 2, and Kofigame.

Stage 4: This involved random selection of 15% fish processors from each of the selected fishing communities to give a total of 353 as sample size for this study.

Validity and Reliability test

The instrument used for the data collection was subjected to face validity by the experts in the field of Fisheries and Aquaculture and Agricultural Extension and Rural Development. Items found ambiguous were removed. Test re-test was carried out at interval of two weeks with twenty fish processors from Ogun-Water Side LGA, Ogun State who were not part of this study to ascertain the reliability of the instrument. The PPMC result of 0.87 was obtained hence, the instrument is reliable.

Measurement of variables

Ages, household size, years of experience, and income were measured at ratio level while sex, educational status, marital status and membership of association were measured at nominal level. Availability of low cost fish processing technology was measured as Yes (1), No (0) while extent of utilization of low cost fish processing technology was measured as Very often (3), often (2) and Not often (1). Respondents were asked to identify various training and capacity building programmes on low cost technology utilization (LCT) and the organizers of such trainings. Challenges to effective utilization of LCT were measured as serious constraints (3), less serious constraints (2) and not a constraint (1).

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Data analysis

Descriptive statistics such as frequency distribution, mean and standard deviation are used for the objectives while inferential statistics are used for the hypotheses.

RESULTS AND DISCUSSION

Socio-economic characteristics of the respondents

The mean age of respondents was 43.4 years with 10.2% of the respondents less than 30 years of age. Majority (63.7%) of the respondents were between 31 – 50 years of age while 26.1% were above 50 years of age. This indicates that the fish processors are economically active. The finding is in line with that of Oyediran *et al*. (2016) that fish processors in Lagos State are within age bracket 30 – 50 years and they are agile and economically active part of the population. More than ninety percent of the respondents are women while only very few (6.2%) are men revealing the dominance of women in the fish processing activities. Omoare *et al*. (2013) reported that women are predominant in fish processing and marketing activities in Ogun State, Nigeria. Oyediran *et al*. (2016) also stated women are highly involved in every aspect of fish processing and marketing in the rural areas which contribute to their economic empowerment, food security and poverty reduction. These activities comprise of fish handling (sorting, dressing, cutting, skinning, pre-cooking, blending, filleting, salting and pacing) and marketing of processed fish in form of frozen fish, salted fish, smoked fish, dried fish, fish fillets, fish row, pre-cooked fish, fish oil, and fish meal. The result also revealed that majority (70.3%) of the respondents was married while 15.9% and 10.2% were widowed and divorced respectively. Marriage confers some level of responsibility on individuals involved. Many (22.1%) of the respondents did not have formal education. More than seventy percent had primary school and secondary school education while only very (6.2%) had tertiary education. It implies that the fish processors are literate because they have some level of formal education. This result is in agreement Omoare *et al*. (2013) that educational level is a very important determinant in adoption of innovation. Also, the result showed that the mean household size was 7 members. Above sixty percent of the respondents have 6 – 10 people in their households while 27.5% had less than 5 people, and 11.0% had more than 11 people. This shows that the household size of the fish processors is relatively large. The result further showed that 44.2% of the respondents had spent less than 11 - 20 years in fish processing while 19.8% had spent between 21 - 30 years. The average year of fish processing experience was 19.2 years. This indicates that the fish processors are not new in fishing activities going by the number of years they have spent in it. The income realized from fish processing activities varies among the respondents and it is due to quantity of fish that is processed and patronage. The result showed that average income from fish processing was ₦28,127.40. About forty percent of the respondents realized less than ₦20,000 in a week while 28.1% got ₦21,000 – 30,000/week. Meanwhile, eleven percent obtained more than ₦40,000/week from the processed fish. Majority (74.2%) of the respondents belonged to fishing association while 25.8% did not join the association.

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Table 1: Distribution based on socio-economic characteristics of the respondents (n = 353)

Variable	Frequency	Percentage	Mean	Std. Dev.
Age (years)				
Less than 30	36	10.2		
31 – 40	123	34.8	43.4	10.9
41 – 50	102	28.9		
50 and above	92	26.1		
Sex				
Male	22	6.2		
Female	331	93.8		
Marital status				
Single	13	3.7		
Married	248	70.3		
Widow	56	15.9		
Divorced	36	10.1		
Educational status				
No formal education	78	22.1		
Primary school education	112	31.7		
Secondary school education	141	39.9		
Post-secondary education	22	6.2		
Household size (people)				
Less than 5	97	27.5		
6 – 10	217	61.5	7	3
11 and above	39	11.0		
Fish processing experience (years)				
Less than 10	74	21.0		
11 – 20	156	44.2	19.2	9.8
21 – 30	70	19.8		
31 and above	53	15.0		
Income (₦)				
Less than 20,000	153	43.3		
21,000 – 30,000	99	28.1	28,127.4	15,076.4
31,000 – 40,000	62	17.6		
41,000 and above	39	11.0		
Membership of Association				
Member	262	74.2		
Not a member	91	25.8		

Source: Field survey, 2017. Std. Dev. – Standard Deviation

Low cost fish processing technology

About ninety percent of the respondents have galvanized iron sheets oven and often used (43.3%) it for fish processing activities. This result disagrees with finding of Oyediran *et al.* (2016) that majority of the fish processors in Lagos State did not utilize galvanized smoking kiln and smoking chokor. But, black clay oven (62.9%) was not common in the study area and it was not often used (70.3%) by the respondents. Other available low cost technologies

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are red clay oven (58.6%), brick kiln (52.4%) and government model kiln (41.1%) but they are not often used by majority (67.1%) of the respondents. These findings conform to Bolorunduro and Faleye, (2003) cited in Oyediran *et al*. (2016) that adoption of fisheries technologies has been relatively low when compared with other agricultural technologies. However, extended drum oven (90.9%) was predominant and frequently used (49.0%) by the respondents. Rural women dominate the processing and marketing of fish in Nigeria using traditional methods and equipment in their trade (Fakoya *et al*., 2012).

Table 2: Distribution based on Low cost fish processing technology

S/N	Low cost technology	Availability		Extent of Utilization		
		Yes	No	Very often	Often	Not often
1.	Galvanized iron sheets oven	315 (89.2)	38 (10.8)	103 (29.2)	153 (43.3)	97 (27.5)
2.	Black clay oven	131 (37.1)	222 (62.9)	18 (5.1)	87 (24.6)	248 (70.3)
3.	Red clay oven	207 (58.6)	146 (41.4)	12 (3.4)	104 (29.5)	237 (67.1)
4.	Brick kiln	185 (52.4)	168 (47.6)	47 (13.3)	85 (24.1)	221 (62.6)
5.	Government model kiln	146 (41.4)	207 (58.6)	87 (24.6)	54 (15.3)	212 (60.1)
6.	Extended drum oven	321 (90.9)	32 (9.1)	173 (49.0)	84 (23.8)	96 (27.2)

Source: Field survey, 2017

Figures in parenthesis are percentages

Training and capacity building programmes on low cost technology utilization (LCT)

Result of this study showed that Training and Capacity Building were rendered in the area of improved fish processing technique and preservation (83.0%), hazard prevention and safety training (79.0%), record keeping (71.4%) and quality fish sourcing (67.7%). Training were also offered on financing (64.6%), alternative energy source and conservation (64.3%), packaging of the fish (59.8%) and best marketing practices (62.6%). These training and capacity building were mostly organized (62.9%) by the Fish Processors Association with the collaboration of private bodies (41.4%) particularly micro-finance banks. The contribution of state government (3.4%), research institutes (1.7%) and extension agents (1.4%) to capacity building was however very low in the study area. These findings have shown that the government and research institutes have not been paying necessary attention to the issue of training and capacity building in the fisheries sector whereas Oyediran *et al*. (2013) opined that the challenges of meeting the rapidly growing food needs of the teaming population of Nigeria cannot be successfully overcome without significant and sustained investment in research and capacity building of Nigerian youth in catfish production. So, Lagos State and Federal Government of Nigeria are required to urgently train and empower fish processors on low-cost fish processing technologies.

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Table 3: Distribution based on Training and capacity building programmes on low cost technology utilization (LCT) (n = 353)

Training and capacity building	Rendered		Organizers				
	Yes	No	Research institutes	Extension Agents	Private bodies	Fish Processors Association	State Government
Training on improved fish processing technique and preservation	293 (83.0)	60 (17.0)	21 (5.9)	05 (1.4)	102 (28.9)	222 (62.9)	03 (0.8)
Hazard prevention and safety training	279 (79.0)	74 (21.0)	06 (1.7)	05 (1.4)	117 (33.1)	222 (62.9)	03 (0.8)
Record keeping	252 (71.4)	101 (28.6)	03 (0.8)	07 (2.0)	133 (37.7)	201 (56.9)	09 (2.5)
Quality fish sourcing	239 (67.7)	114 (32.3)	0 (0.0)	07 (2.0)	146 (41.4)	188 (53.3)	12 (3.4)
Financing	228 (64.6)	125 (35.4)	0 (0.0)	04 (1.1)	143 (40.5)	194 (55.0)	12 (3.4)
Alternative energy source and conservation	227 (64.3)	126 (35.7)	0 (0.0)	06 (1.7)	102 (28.9)	233 (66.0)	12 (3.4)
Packaging of the fish	211 (59.8)	142 (40.2)	0 (0.0)	13 (3.7)	97 (27.5)	234 (66.3)	09 (2.5)
Best marketing practices	221 (62.6)	132 (37.4)	0 (0.0)	13 (3.7)	85 (24.1)	246 (69.7)	09 (2.5)

Source: Field survey, 2017

Figures in parenthesis are percentages

Challenges to effective utilization of LCT

Fish processing is a very lucrative enterprise but there are several challenges that are hindering the full benefits to the women fisher folks. Lack of fund from the commercial banks (80.3%), poor road network (79.0%), lack of training by extension personnel (74.2%) and epileptic power supply (77.9%) were reported as most serious constraints to the effective utilization of low cost fish processing technologies. Scholars have made similar reports in their findings (Lawal and Idega, 2004; Bolorunduro and Adesehinwa, 2007; Daramola *et al*., 2008; Omoare *et al*., 2013; Oyediran *et al*., 2016) which show that these are lingering problems that are yet to be addressed by the government and stakeholders in the fisheries sector. Other major problems include high costs of fresh fish (66.9%), fuel wood (67.1%) and transportation (64.0%). Fluctuation of market price (65.4%) and multiple taxation and market charges (63.7%) were ranked 9th and 10th major constraints confronting fish processing and utilization of LCT in the study area.

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Table 4: Challenges to effective utilization of LCT (n = 353)

S/N	Constraints	Serious constraint	Less serious constraint	Not a constraint	Mean	Std. Dev.	Rank
1.	Epileptic power supply	275 (77.9)	50 (14.2)	28 (7.9)	2.70	0.61	4th
2.	Poor road network	279 (79.0)	56 (15.9)	18 (5.1)	2.74	0.54	2nd
3.	Lack of fund from the commercial banks	283 (80.3)	58 (16.4)	12 (3.4)	2.77	0.50	1st
4.	Lack of training by extension personnel	262 (74.2)	89 (25.2)	02 (0.6)	2.73	0.45	3rd
5.	High cost of fresh fish due to flooding	236 (66.9)	109 (30.9)	08 (2.3)	2.65	0.52	5th
6.	Modern processing equipment are not affordable	220 (62.3)	120 (34.0)	13 (3.7)	2.58	0.56	8th
7.	High cost of fuel and fuel wood	237 (67.1)	94 (26.6)	22 (6.2)	2.61	0.60	6th
8.	High cost of transportation	226 (64.0)	108 (30.6)	19 (5.4)	2.59	0.59	7th
9.	Fluctuation of market price	231 (65.4)	89 (25.4)	33 (9.3)	2.56	0.66	9th
10.	Multiple taxation and market charges	225 (63.7)	86 (24.4)	42 (11.9)	2.52	0.70	10th

Source: Field survey, 2017

Figures in parenthesis are percentages

Test of Hypotheses

Relationship between socio-economic characteristics of the respondents and utilization of low cost technology

The result of chi-square analysis showed that significant relationship did not exist between the age ($\chi^2 = 5.30$), marital status ($\chi^2 = 6.09$), educational status ($\chi^2 = 5.06$), and utilization of low cost technologies at $p < 0.05$ level of significance. It shows that the age, marital status, and educational status have no direct influence on the utilization of low cost technology. However, sex ($\chi^2 = 5.29$), years of experience ($\chi^2 = 12.91$), household size ($\chi^2 = 6.06$), income ($\chi^2 = 19.21$), membership ($\chi^2 = 16.56$) and utilization of low cost technology at $p < 0.05$ level of significance. It implies that the sex, years of experience, household size, income, and membership have influence on the utilization of low cost technology. Hence, the null hypothesis that "*there is no significant relationship between socio-economic characteristics of the respondents and utilization of low cost technology in the study area*" is rejected.

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Table 5: Relationship between socio-economic characteristics of the respondents and utilization of low cost technology

Variable	χ^2	df	p-value	Decision
Age	5.30	3	0.15	Not Significant
Sex	5.29	1	0.02	Significant
Marital status	6.09	3	0.11	Not Significant
Educational status	5.06	3	0.17	Not Significant
Years of experience	12.91	3	0.01	Significant
Household size	6.06	2	0.04	Significant
Income	19.21	3	0.00	Significant
Membership	16.56	3	0.00	Significant

Source: Field survey, 2017

S - Significant at $p < 0.05$ level of significance
NS - Not Significant at $p > 0.05$ level of significance

Relationship between training and capacity building programmes rendered to the respondents and utilization of low cost technology

The result of chi-square analysis indicated that significant association did not exist between some training and capacity building programmes. Training on improved fish processing technique and preservation ($\chi^2 = 3.28$), hazard prevention and safety training ($\chi^2 = 0.01$), record keeping ($\chi^2 = 1.20$) and alternative energy source and conservation ($\chi^2 = 1.05$) have no significant relationship with utilization of low cost technology because most of the programmes are organized by the fish processing association for the respondents and do not lead to adoption of the LCT. Meanwhile, training on quality fish sourcing ($\chi^2 = 13.79$), financing ($\chi^2 = 1.05$), packaging ($\chi^2 = 7.01$), and marketing ($\chi^2 = 10.87$) were significant to utilization LCT at $p < 0.05$ level of significance. The reason for significant association is that the trainings are rendered by micro-finance banks to the fish processors. Thus, the null hypothesis "*there is no significant relationship between training and capacity building programmes rendered to the respondents and utilization of low cost technology*" is rejected.

Table 6: Relationship between training and capacity building programmes rendered to the respondents and utilization of low cost technology

Training and capacity building programmes	df	χ^2	p-value	Decision
Training on improved fish processing technique and preservation	1	3.28	0.07	NS
Hazard prevention and safety training	1	0.01	0.93	NS
Record keeping	1	1.20	0.27	NS
Quality fish sourcing	1	13.79	0.00	S
Financing	1	9.30	0.02	S
Alternative energy source and conservation	1	1.05	0.31	NS
Packaging of the fish	1	7.01	0.01	S
Best marketing practices	1	10.87	0.00	S

Source: Field survey, 2017
S - Significant at $p < 0.05$ level of significance
NS - Not Significant at $p > 0.05$ level of significance

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Relationship between the constraints and utilization of low cost technology

The R-Square indicated that 20% of the variation in the utilization of low cost technology was due to explanatory variable used in the model. The significant F-statistic affirmed that the null hypothesis (H_{01}) in the sample remained rejected at 1% level of significance. That is, null hypothesis (H_{01}) that, "there is no significant relationship between the constraints and utilization of low cost technology in the study area" is rejected. The coefficient of constraints was significant at 1% level of significance and positively signed (t = 2.87, p = 0.004). This shows that the more severe the constraints the more reluctant the fish processors would feel to adopt the low cost technology. It indicates that the serious constraints prevented the fish processors from utilizing LCT in their fish processing activities.

Table 7: Relationship between the constraints and utilization of low cost technology

Variables	**Unstandardized Coefficient**		**Standardized Coefficient**	**t**	**Significance**
	β	**Std. Error**	**Beta**		
Constant	7.22	1.02		7.08	0.000
Constraints	0.110	0.038	0.152	2.87	0.004*
F – statistics	8.25				
R^2	23.0				
Adjusted R^2	20.0				
Prob(F-Statistics)	0.004				

Source: Field survey, 2017

*= Significant at 0.01 level

CONCLUSION AND RECOMMENDATIONS

Conclusion

The study concluded that extended drum oven and galvanized iron sheets oven are the common fish processing ovens used by the respondents. Meanwhile, low cost fish processing technologies that available are red clay oven, brick kiln, black clay oven and government model kiln but not utilized. Fish Processors Association and private bodies organized training and capacity building for the respondents on improved fish processing technique and preservation, hazard prevention and safety training, record keeping, quality fish sourcing and financing. The most serious constraints to fish processing and utilization of LCT are lack of fund from the commercial banks, poor road network, lack of training by extension personnel and epileptic power supply. There is significant relationship between socio-economic characteristics of the respondents and utilization of Low Cost Technology (LTC)

RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made in order to facilitate adoption of LCT and to minimize postharvest fish losses in the study area:

ISSN: 2059-1187(print), ISSN 2059-119(online)

1. there should be more awareness and enlightenment on LCT by the extension officers, fish experts and media;
2. the fish processors and their association should be involved in the designing and construction of LCT so that they will actively participate and adopt the technology;
3. training on capacity building should be organized for the fish processors by the Donors, NGOs and government to equip and empower the women fisher-folks in their fish processing activities;
4. provision of rural infrastructural facilities to the coastal areas should be given attention by the Government;
5. commercial banks should make loans affordable and accessible to the fish processors.

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