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4. Conclusion:

This work has presented the levels of physico-chemical parameters such as temperature, pH, conductivity, Turbidity, Total Dissolved Solids, Alkanity, Total Hardness, Sulphates, Phosphates, Nitrates, Fluoride and Chloride contents in the well water samples collected from Arago northern Sudan. The results of this study are concluded in the following points. Values of Iron, Sulphate, Chloride, Nitrate, and Calcium are lower than WHO and SSMO. All water samples were found with alkaline trend and with higher values of turbidity than desirable value. Recommend that more analysis and treatment of waters.be carried out by researcher.

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3.12. Nitrate:

Nitrate is present in raw water and mainly it is a form of N_2 compound (of its oxidizing state). Nitrate is produced from chemical and fertilizer factories, matters of animals decline vegetables, domestic and industrial discharge, from, Figure12, the Nitrate was the less than the maximum range of (SSMO). Nitrates indicate the presence of fully oxidized organic matter. The mean values obtained for the three areas study were higher than that of WHO limits for drinking water. The implication of this is that the well water analyzed contains high level of oxidized organic matter which appears in the form of soluble anions such as nitrates. Although nitrates levels that affect infants do not pose a direct threat to older children and adults, they do indicate the possible presences of other more serious residential or agricultural contaminants such as bacteria or pesticides.

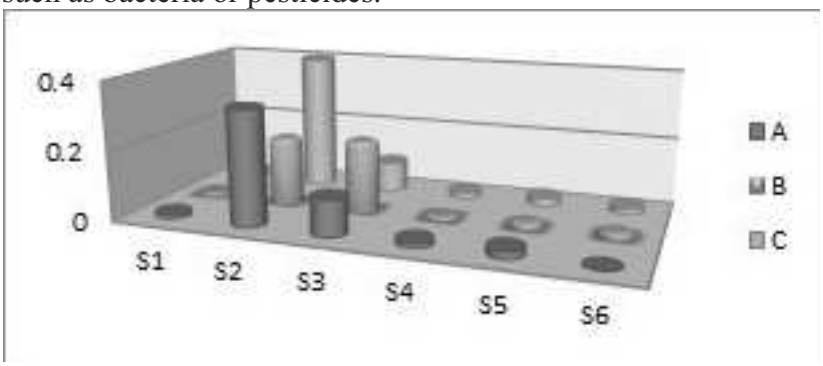

Figure12.Concentration of Nitrate (mg/l) level among various types of drinking water sources in Argo city

3.13. Bicarbonate (HCO^-_3):

The permissible value of Bicarbonate as recommended by WHO 50-400 mg/L. From, Figure13, the concentration of Bicarbonate in this study ranged from values (134mg -281mg, and these values within permissible limit.

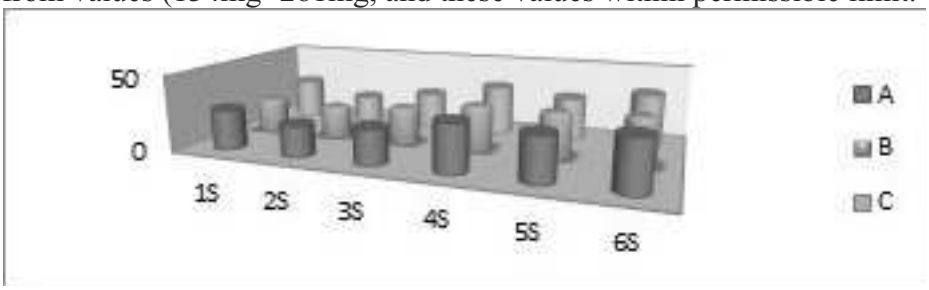

Figure13.Concentration of magnesium (mg/l) level among various types of drinking water sources in Argo city.

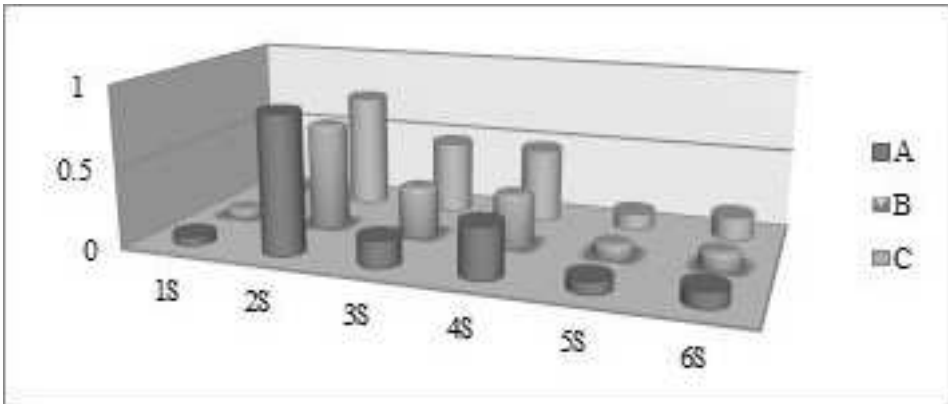

Figure10.Concentration of Iron (mg/l) level among various types of drinking water sources in Argo city

3.11. Fluoride:

The standard deviations and mean Fluoride concentrations for each of the three sampled locations were all higher than WHO maximum acceptable concentration (1.5 mg/L) for drinking water (WHO, 2006). The high concentration of Fluoride as recorded may be attributed to the presence of both organic and inorganic compounds containing Fluoride in water such as Hydrofluoric acid (HF), Sodium Fluoride (NaF) and Uranium Haxa Fluoric (UF6). Fluoride, although known to prevent early stage tooth decay, high level of its concentration in drinking water and food have been found to have serious health effects in humans and animals, like mottled teeth that occur in children. This and some other factors may be responsible for the mottled teeth seen in children in the three locations studied. Ground water is likely to have excessive concentration of Fluoride bearing rock formations exist. Industrial effluents also contribute fluoride compounds to water source (0.0-0.75). S. From table 2, Figure11 the values of F- in all area of the study within the range of (SSMO).

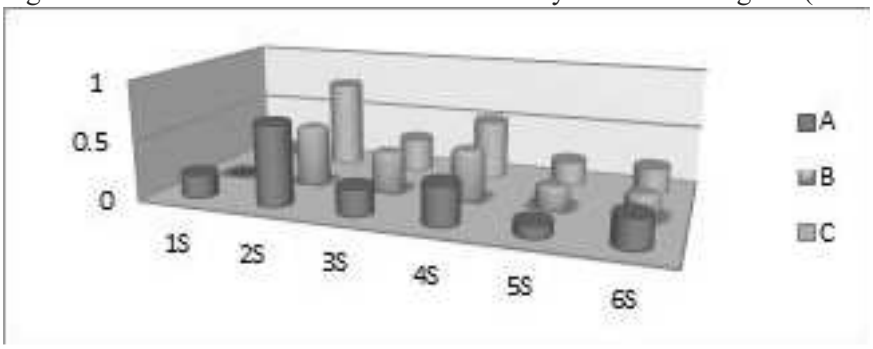

Figure11.Concentration of fluoride (mg/l) level among various types of drinking water sources in Argo city

3.9. Chloride:

The Chloride concentration can be used as an important parameter for detection of contamination by sewage. From table 2, Figure9 the Chloride concentration in this study ranged from 6.23– 22.5 mg/l. for samples these values are less than permissible range. Chlorides in natural waters such as well water result from the leaching of chloride containing rocks and soils with which the water comes in contact. The standard deviations and mean values obtained in the samples analyzed are within the limits set by WHO. Chlorides are the most stable components in water and its concentration is largely unaffected by most natural physio-chemical and biochemical processes. Hence the value of its concentration in water is a useful measure in water sample. Chloride concentration can range from <10 ppm to >2500 ppm in sea water.

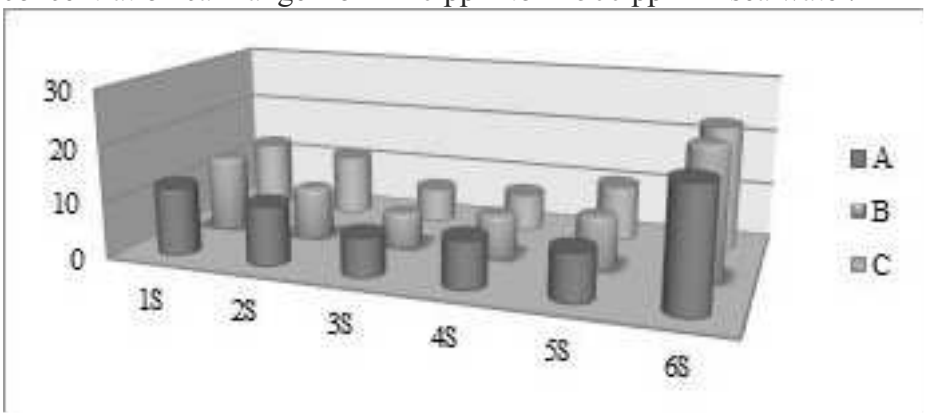

Figure9. Concentration of Cl-(mg/l) level among various types of drinking water sources in Argo city.

3.10. Iron:

Iron is the most abundant element by weight in the crust. From table 2, Figure10 the Iron concentration of all samples varied between 0.057 to 0.86 for samples. Which is less than the maximum value recommended by SSMO.

3.7. Calcium:

Calcium is an important nutrient for aquatic, organism and it is commonly present in all water bodies From table 2, Figure7 the calcium concentration varied from 23 to 81mg which were found less than permissible range. The decrease in amount of calcium may be due to its absorption by living organisms.

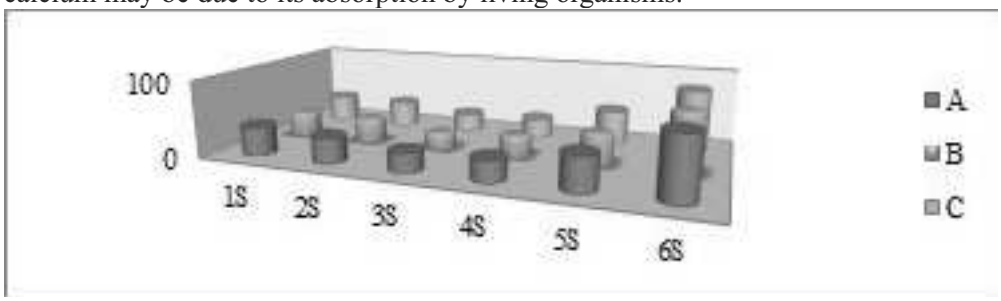

Figure3. Concentration of Ca^{+2}(mg/l) level among various types of drinking water sources in Argo city.

3.8. Sulphate:

The sources of sulphate in underground waters may be rocks, geological formation, from table 2, Figure8 the sulphate values of water samples varied between 0.33 to 8.6 mg, this values are less than the range of (SSMO). Sulphates are formed due to the decomposition of various sulphur containing substances present in water bodies. The sulphate ions (SO_4^{-2}) occur naturally in most water supplies and hence are also present in well waters. The values obtained for each of the three locations in this study are low compared with the WHO permissible limits, therefore are incapable of causing bad smells.

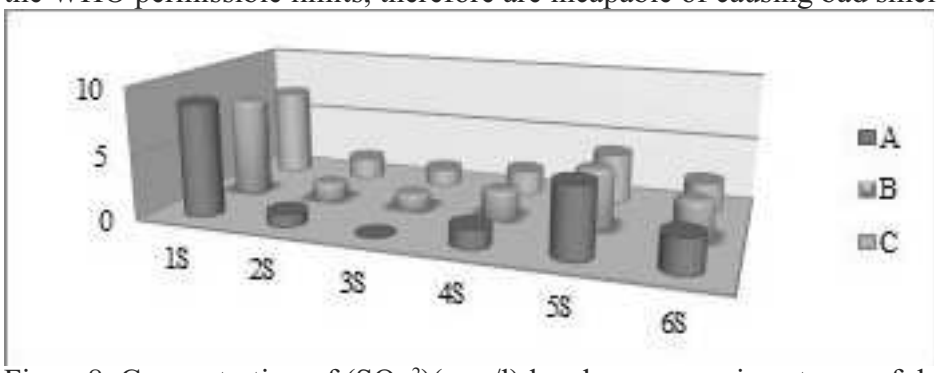

Figure8. Concentration of (SO_4^{-2})(mg/l) level among various types of drinking water sources in Argo city.

disinfectants, facilitate their growth and increase the chlorine demand (WHO, 1996).

3.3. Electrical conductivity (EC):

Electrical conductivity is capacity of water to convey electric current. It indicates the amount of total dissolved salts. From table 2, Figure3 EC values were observed in the range of 407 to 785 micromhos/cm. Electrical conductivity values obtained for each sample is in the permissible range reported by SSMO and WHO causing no objectionable to the consumer.

3.4. Total Alkalinity:

From table 2, figure3 the permissible value of alkalinity as recommended by WHO 500 mg/L as $CaCO_3$. The amount of alkalinity concentration of the water sample collected in from the study area ranged from 111 to 122 mg/L was found within permissible range.

3.5. Total Hardness (TH):

Total Hardness in water is due to the natural accumulation of salts from contact with soil and geological formations or it may enter from direct pollution by industrial effluents. Hardness of water mainly depends upon the amount of calcium or magnesium salts or both. From table 2, Figure.5 Total Hardness values of water samples varied between 180 to 240, indicating that these values within permissible range.

3.6. Total Dissolved Solids (TDS):

High concentrations of Total Dissolved Solids may cause adverse taste effects. From table 2, Figure6 TDS values varied rom 246 to 493 mg/L. The all investigated samples showed within the normal limit prescribed by WHO

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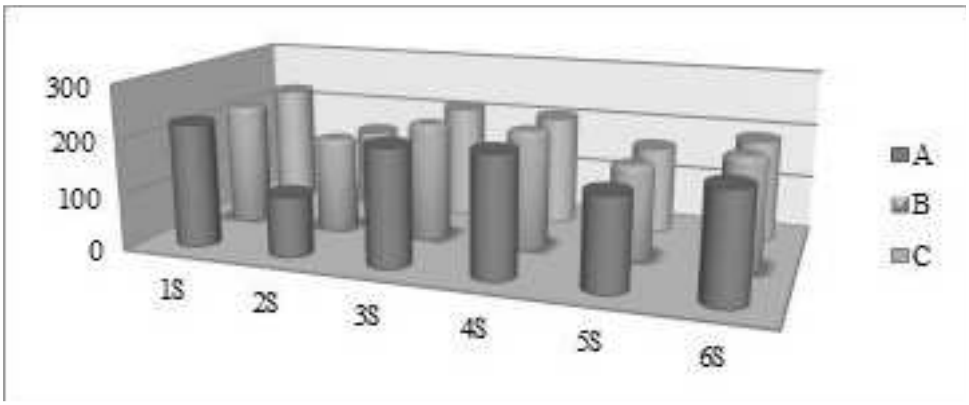

Figure6. Total Dissolved Solids mg/l(mg/l) level among various types of drinking water sources in Argo city

3.1.pH:

From table2, figure1the active hydrogen concentration (pH) is in the range of 6.6 to 7.2 indicating that, all samples are slightly alkaline and the pH values obtained for each sample is in the permissible range reported by SSMO causing no objectionable to the consumer. pH is one of the importance determining the corrosively of water because generally the lower pH, higher the level of corrosion (WHO,1996). Cautious attention to pH is necessary at all stages of water treatment before distribution to ensure satisfactory clarification and disinfection to minimize the corrosion of water. All the results were below the permissible limit prescribed by WHO (1984) as 8.5 mg/l. The highest pH was absorbed of sampling location while the lowest pH was detected at sampling location physico-chemical studies on ground water and surface water in and around katni city, Madhya Pradesh and observed the pH concentrations ranged from 6.9 to 8.1

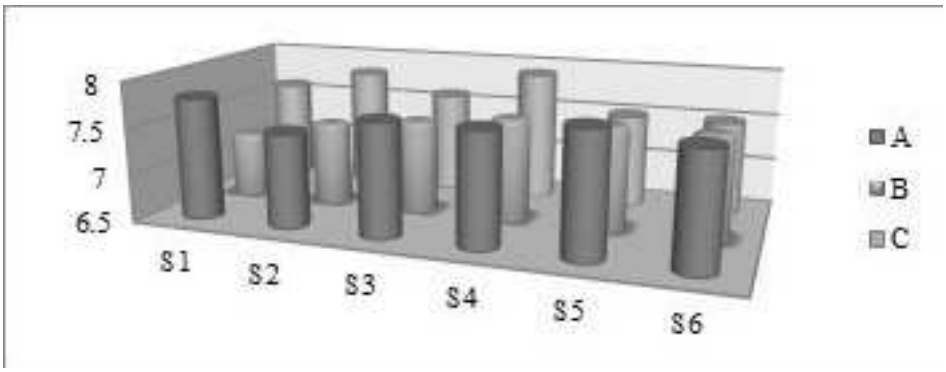

Figure1.PH values level among various types of drinking water sources in Argo city

3.2. Turbidity:

Turbidity makes water unfit for domestic purposes, food and beverage industries and many other industrial uses. WHO, guidelines for turbidity are < 5 NTU. All natural waters are turbid but generally surface than ground water. From table 2, Figure2 Turbidity values varied between 4.44 to 10.40 NTU for samples (S1&S6) respectively, and this indicating that Turbidity high in all sample accept (S2) than the normal limit prescribed by WHO. Turbidity depends on a number of factors such as the size, shape, and refractive index of the clay, colloidal particles and the micro-organisms. The consumption of high turbid water would be a health risk due to microorganism as the probable part in it. Further Turbidity can also protect the pathogens from the effects of

Table 2.Physical properties of water samples from the area of the study and WHO

Sample Location	pH values	Turbidity NTU	Electrical Conductivity (EC)	Alkalinity as $CaCO^{-}_{3}$ mg/l	Total Hardness as $CaCO_3$mg/l	T D S mg/l
WHO	6.5-8.5	5	1600	500-1000	500	1000
S1	7.1	4.44	528	112	228	366
S2	7.1	10.40	785	111	180	493
S3	7.2	8.47	464	122	210	300
S4	6.6	6.74	407	122	240	246
S5	7.4	7.38	481	122	220	285
S6	6.8	5.49	429	112	228	268

way 6035) at room temperature. pH was carried out at room temperature by portable pH meter (Jenway 370) after calibrated with pH 7 and 4 buffer. EC and TDS were carried out at 25C° by conductivity meter (Jenway 470) after calibration with calibration solution (HI-7031, Henna instrument Hungry). In order to prepare buffer solution (pH = 10) 16.9gm NH_4Cl (ScharlauChemie, AM 0270) was dissolved in 143 ml NH_4OH (Fisher Scientific, UK Limited). Add 1.25 gm Magnesium EDTA and dilute to 250 ml with demonized water. Calcium standard solution was prepared by dissolving 1.00gm $CaCO_3$ (ScharlauChemie, CA 0184) in 1L volumetric flask. 200ml demonized water and drop wise concentrated HCl until $CaCO_3$ dissolved. Boil for few 5 minutes to expel the CO_2. Cool and the make up the volume 1L. To prepare 0.01M EDTA solution 3.723gm $Na_2EDTA.\ H_2O$ (ScharlauChemie, AC 0963) was weighed and dissolved in distilled water followed made up to 1L. To prepare indicator powder mixed 0.5gm of erichrome black T (Fluka, 45600) in 100gm of NaCl. Total hardness was determined by taking 10ml of water sample and dilute to approximately 50ml with demonized water. Add 1 to 2 ml buffer solution (pH 10). Add 250 mg Sodium Cyanide (ScharlauChemie, SO 0190) and 200mg indicator powder, shake well. Titrate within 5 minutes with EDTA standard solution slowly with continuous stirring until reddish tinge disappeared. Titrate the calcium standard solution like sample and calculate the hardness as follow:

Hardness (ppm) = (ml titration for sample × mg $CaCO_3$ equivalent to 1 ml EDAT titrant/ ml of Sample) ×10

3. Results and Discussion:

The results of the present's study of ground water quality and assessment of parameters (physical and chemical) are present in Table 2. The samples from all the areas were colorless and odorless. Temperature is one of the most important factors in the aquatic environment [20]. It affects the physical and chemical properties of water and also affects the aquatic vegetation; the temperature of all samples in range varies from 46oC° to 47C°.

(water). Pure water, such as distilled water has a negligible or very low C, nile sea water has a high EC. Rain water often dissolves airborne gasses and dust, and thus will have an EC higher relative to distilled water.EC is an important water quality measurement because it gives a good indicator for the amount of total dissolved solids (TDS) in the water. The aim of the study to investigate the physic-chemical properties of drinking water in the area of the Study, and to compare the results of this study with those recommended by world health organization (WHO).

2. Material and Methods:

2.1. Study Area:

Argo located on the western bank of the River Nile, as longitudinal strip parallel to the Nile, around (168) kilometers long. The area of the locality is about (18.550) square kilometers, between (16) longitude and (18) latitude north. It is bounded by Hlafa locality from the north and Merowe locality from the east, Donlga locality from the South, and Dongla locality from the west.

2.2. Samples Collection:

A total of 54 water samples were collected from different sources of drinking water of Argo city, north Sudan (Table1). The samples were collected from distribution pipe in plastic bottles (1.5 liter each), which were cleaned very well by the water several times. The collected samples were labeled with date and code.

Table .1 Sampling area descriptions

S_1	Al-Rahman
S_2	Al-Neel
S_3	Al-Nour
S_4	Wast
S_5	Argo-Alhudour
S_6	Argo-sharig

Immediately after sample collection, taste, pH, Electrical Conductivity and TDS were determined. The taste was tested by the panel of 10 laboratory analysts and co-workers only for acceptable/not acceptable. The Turbidity of water samples were directly determined by the portable turbid meter (Jen-

peanut [8]. Groundwater can be defined as the water located in the pore space of soil and rocks. Sometimes it is useful to distinct between sub-surface water, that is, closely associated with surface water and deep sub-surface water in aquifer (fossil water). Sub-surface ground water can be thought of in the same terms as sub-surface water inputs, outputs and storage [9]. Groundwater is the most important resource in Sudan [10]. In Sudan just few kilometers from the Nile groundwater aquifers provide the only permanent stocks of water. These aquifers guarantee the existence of almost 75% of the population and the live stocks [11]. Contaminants such as bacteria, viruses, heavy metals, nitrates and salt have polluted water supplies as a result of inadequate treatment and disposal of waste from humans and livestock, industrial discharges, and over-use of limited water resources. Over one billion people lack access to clean safe water worldwide [12]. Water pollution are mainly due to contamination by foreign matter such as microorganism, chemicals, industrial or other wastes or sewage which deteriorate the quality of the water and render it unfit for its intended uses. Ingestion of polluted water can result various health hazards. Disposal of sewage water into fresh water aquifers is the main cause of groundwater pollution [15]. Groundwater quality has become an important water resources issue due to rapid increase of population, rapid industrialization, unplanned urbanization and too much use of fertilizers and pesticides in a agriculture [17]. Each fresh water body has an individual pattern of physical and chemical characteristics which are determined largely by the climatic geomorphologic and geochemical conditions prevailing in the drainage basin and the underlying aquifer. Physical characteristics of water (temperature, color, taste, and odor) are determined by senses of temperature by touch, sight, smell and taste. Color, floating debris, turbidity and suspended solids by sight, and taste and odor by smell[19]. Temperature is one of the most important factors in the aquatic environment [20]. It affects the physical and chemical properties of water and also affects the aquatic vegetation, organisms and their biological activities [21].Cool water is generally more potable than warm water. High water temperature enhances the growth of microorganisms and may increase taste, odor, color and corrosion problems [22]. Turbidity in water is the reduction of transparency due to the presence of Particulate matter such as clay or slit, finely divided organic matter etc. These can cause light to be scattered or absorbed rather than transmitted in straight lines through the sample[22].Turbidity makes water unfit for domestic purposes, food and beverage industries and many other industrial uses. This is a measure of the ability of water to conduct, (carry) an electrical current. It is highly dependent on the amount of dissolved solids (mainlysalts) in solution

1. Introduction:

Water is extremely essential for survival of all living organisms life cannot exist on this planet without water. Approx 97.2% of water on earth is salty and only 2.8% is present as fresh water from which about 20% constitutes ground-water [1]. Groundwater is generally considered to be much cleaner than surface water. However, several factors such as discharge of industrial, agricultural and domestic wastes, land use practices, geological formation, rainfall patterns and infiltration rate affects the groundwater quality and once contamination of groundwater in aquifers occurs, it persists for hundreds of years because of very slow movement in them [2]. Water is one of the most important chemicals compounds known to man. It is essential in processes of digestion, circulation elimination and the regulation of body temperature. It is used as solvent for many substances [3]. Almost three fourth of the earth surface is covered by water. Most of this water is not suitable for human use. The demand for fresh water has increased with rapid growth of population, agriculture and industry. Fresh water is one of the most important resources crucial for the survival of all the living beings. It is even more important for the human being as they depend upon it for food production, industrial and waste disposal, as well as cultural requirement [5]. Human and ecological use of ground water depends upon ambient water quality. Human alteration of the landscape has an extensive influence on watershed hydrology [6]. The ground water analysis for physical and chemical properties is very important for public health studies. In this Study water samples were collected from Argo city northern Sudan. The classifications the current federal drinking water regulations define distinct and separate sources of water, surface and ground water. There are many sources of surface water; this includes rivers, streams, lakes and reservoirs. The common characteristics of surface water are that it contains few minerals, it is not very hard, it usually large in volume and its easily contaminated. Total bacterial contents are high therefore; proper treatment is required before human consumption [7]. Ground water is a life line for many rural and agricultural regions, and their associated cultures and populations around the globe and a corner structure of global food production. Ground water constitutes nearly half the world drinking water and much of the world irrigation water supply population growth, over exploitation, salinization, non-points sources pollution from agricultural activities including animal farming ranching and forestry activities, impacts to surface water and ground water quality and quantity conflicts at the urban-rural interface have reach global dimensions and threaten the health and livelihood of this

Physico-Chemical Properties of Drinking Water of Argo City, Northern Sudan

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Abstract:

In order to investigate the physico-chemical quality, 54 water samples were collected from Argo city, northern Sudan, during the period of May to September 2017. The parameters include pH, Turbidity, Total Dissolve Solids (TDS), Hardness and Electrical Conductivity (EC), anions (Chloride, Bicarbonate, Sulphate), and cations Calcium, Nitrate, Fluoride, Iron and compared with (WHO) and (SSMO) standards. The results of the study showed that pH values were between 6.6 to 7.2, hence, all samples are slightly alkaline because the phenolphthalein alkalinity was found equal to zero for all samples alkalinity of samples is caused by the presence of hydrogen carbonate only and no carbonate present, the Turbidity values for all samples were high than the normal limit prescribed by (WHO).The results of the (EC-TDS –HCO^-_3) values were found within the permissible values of (WHO) and (SSMO). The concentrations of Iron, Sulphate, Chloride, Nitrate, and Calcium are less than (SSMO) and (WHO). Fluoride concentrations were in all area of the study within the range of (WHO) and (SSMO).

Key words: physico-chemical, TDS, Hardness, Conductivity, Turbidity, SSMO.

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Conclusion:

-Horses consider as the dominant animal among adopters in West Kordofan and cows (oxen's) used only in South Kordofan.

- Extension in targeted area introduced to the farmers by unsuitable way. All extension services concentrated on distribution improved seeds beside farmer visit and ignored another side of extension.

-All the farmers owned local knowledge about animal traction from beer farmers

- Farmers received training on one side (how to use animal traction). All most of the farmers received training by peer farmers.

-Lack of veterinary care and vaccination affect in animal traction adoption. More than half of the farmers treat their animal by themselves\hiring, and take vaccine to their animal by irregular way.

-Farmers lack knowledge on animal housing, feeding, watering and hardness, farmers in targeted area used different types of tools mainly planter and plough by animal traction and hand tools.

-All of the farmers need different services and skills to adopt animal traction.

-The poor state of animal management resulted in low working speed, filed capacity and efficiency.

- Formal bodies play very poor and marginal role in technology adoption hence, farmers lack trust in their capacity and learn from their peer about the technology.

-Adoption rate of the technology can be improved by providing credit service, capacity building of the staff responsible for extension and training at the formal bodies dealing with the technology transfer and providing high quality of training sessions for optimal application of the technology.

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Table 7: Effect of the farmers Operational Skills in the AT Adoption by Extension services

	Value	df	Asymp. .Sig (2-sided)	Exact Sig. (2-(sided	Exact Sig. (1-(sided
Pearson Chi-Square	53.258[a]	1	.000		
Continuity Correctionb	51.016	1	.000		
Likelihood Ratio	71.432	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	53.125	1	.000		
N of Valid Cases	400				

a.0 cells (0.0%) have expected count less than 5. The minimum expected count is 23.50.
b.Computed only for a 2x2 table

Table 7 showed that there was significant relation between extension services and animal traction adoption. This is due to the importance of extension for different process like (management of animal traction and training)

Table 8 effect of the farmers Operational Skills in the AT Adoption by training package

	Value	df	Asymp. .Sig (2-sided)	Exact Sig. (2-(sided	Exact Sig. (1-(sided
Pearson Chi-Square	4.433[a]	1	.035		
Continuity Correctionb	3.896	1	.048		
Likelihood Ratio	4.466	1	.035		
Fisher's Exact Test				.048	.024
Linear-by-Linear Association	4.422	1	.035		
N of Valid Cases	400				

a.0 cells (.0%) have expected count less than 5. The minimum expected count is 35.00.
b.Computed only for a 2x2 table

Table 8 stated that there was significant relation between training package and animal traction adoption. This is due to the importance of training in all agricultural operation (animal traction and hand tools).

Table 6 Frequency Distribution and Percentage of Farmers by Field Efficiency (%)

Categories	Frequency	percent
40 and less than 50%	12	6.0
50 and less than 60%	8	4.0
60 and less than 70%	40	20.0
70 and less than 80%	38	19.0
80 and less than 90%	58	29.0
90 to 97%	44	22.0
Total	200	100.0

L. Field Efficiency

Result in table 6 showed the field efficiency. Maximum respondent (29%) recorded high efficiencies (80 to less than 90%), while minimum respondent (4%) recorded (50 and less than 60%). The low ranges of field efficiency can possibly be attributed to the frequent stoppage time while ploughing. Stoppage from its side relates to the poor harnessing of both horses, oxen, camel and donkeys. Since field efficiency is taken as a product of net-working time to the total time of operation, any stoppage will result in lower value.

Table 5 Frequency Distribution and Percentage of Farmers by Field Capacity (ha/h)

Categories	Frequency	Percent
Less than 0.04 ha\h	30	15.0
0.04 – 0.010 ha\h	58	29.0
0.11 – 0.15 ha\h	44	22.0
0.16 – 0.20 ha\h	28	14.0
0.21 – 0.25 ha\h	10	5.0
0.26 – 0.30 ha\h	18	9.0
0.31 – 0.35 ha\h	8	4.0
More than 0.35 ha\h	4	2.0
Total	200	100.0

K. Field Capacity

Table 5 shows the field capacity, maximum respondent (29%) recorded field capacities from 0.04 to 0.10 ha/h, the minimum respondent (2%) recording high field capacities more than 35 ha/h. The low field capacities are probably a direct result of the poor harnessing, low capacity of the farmers both leading to frequent stoppage of animals. Comparable low field capacities were reported for draught horses with collar harness in Ethiopia by [18].

I. Harness: Result in table 4 shows that the Maximum respondent (21.5%) arnessed their animals using breast straps; while minimum respondent (7.5%) used double shoulder yolk, (50%) of the farmers do not use animal harness. Farmers do not realize that different types of harness can result in different work output, even for the same animal [18].

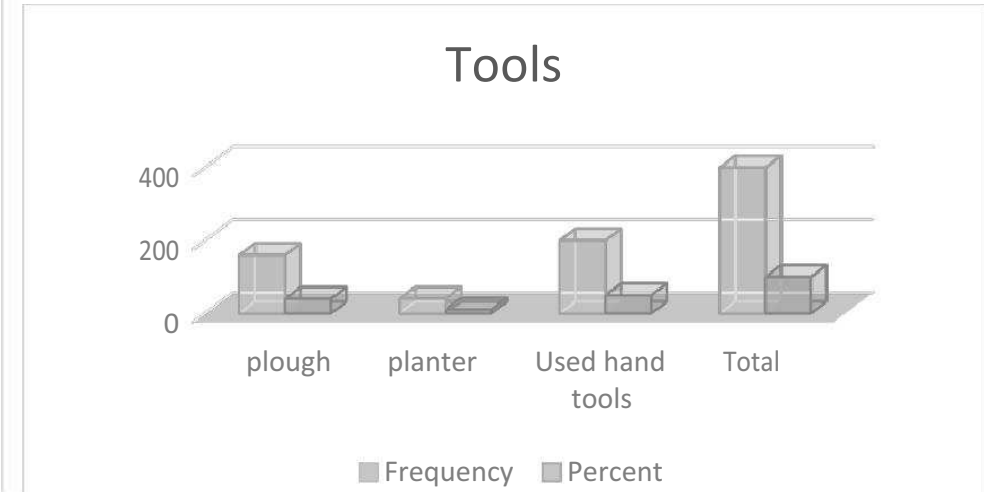

Figure. 6 Type of tools used by farmers

J. Tools: Figure 6 mentioned type of tools. The maximum respondent (50%) used hand tools, 40% used plough, while minimum respondent, (10%) of the farmers used planter. This marginal portion raises questions on the source of their information on using the five tine cultivator for ploughing and planter it is clear that the introduction of this implement had not been carefully advocated by the Administration of Agriculture or the cost excluded farmers from its use. Lack of knowledge on the plough and planter appeared clearly in farmers' responses regarding the procedure followed to check the plough and planter before and after work and at the end of the season.

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fodder and clover. The latter practice is probably during the rainy season only as access to fresh fodder is difficult in a semi-arid area where irrigated farming is not practiced. By concentrated feed farmers refer to oil seed cake and grains rather than to concentrated feed supplemented with feed additives. Free grazing is not an option to the farmers as it is possible only during the rainy season when animals are supposed to do most of the work leaving few time for grazing. Maximum of respondent (77%) fed their animals in the morning, evening, while the minimum respondent 1% fed their animals at work. Frequency of animal feeding is very important as it reflects the potential opportunity of animals benefiting from that feed. Changing feeding pattern at the beginning of the season get less benefits. Feed offered at the beginning of the season will not add to animals' capacity to work as the latter depends on the fat reserves the animals accumulate before work; therefore animals should be fed differently before they start working to provide them with the reserves required to work effectively and efficiently [11]. It was noticed that horses and donkeys are fed in the same manner; a practice that [17]. Considered mismanagement and stressed on that donkeys should not be fed like horses.

Watering:

The maximum respondents (95%) do not offer water to the animal during work, while the minimum respondents (5%) of the farmers offer water to their animals during the work.

Table (4) Frequency Distribution and Percentage of respondent by animal harness

Animal harness	**Frequency**	**Percent**
Collar and saddle	84	21.0
Breast straps	86	21.5
Double shoulder yolk	30	7.5
Not uses	200	50.0
Total	400	100.0

H. Management: Figure 5 mentioned animal management. Veterinary care; less than half of the farmers (44%) claimed that they veterinary care their animals, while the rest responded (66%) negatively to that. Inaccessibility to the service in an area with serious problem lack or rare of veterinary care. It is very important to have the animals examined by a veterinarian or a veterinary officer to avoid any possible loss of health and infection by diseases for sustainable utilization of the animal. Generally animal owners who have access to veterinary service are in a better economic situation compared with their peers who do not access the service regularly. In this case providing veterinary officers in the villages around the localities helps in solving the transportation issues and puts the service within reach to the farmers.

Lack of knowledge on the importance of veterinary care accompanied with difficulty in accessing the service forced, the maximum respondent (68%) of the farmers resort to yourself/hired remedies, while minimum respond (8%) buying the medication from the veterinary pharmacy as shown in It is obvious that farmers who take their animals to the veterinary service are the ones who live in the vicinity of the near locality center (EN-Nohoud and Adebibat).

Vaccination: All most of the farmers (94%) don't provide vaccine to their animals, while the rest responded positively to that. It is very important to vaccinate animals against the domesticated diseases in the area to protect them and maintain them in a good condition to perform work when it is mostly needed. This can potentially constitute serious hazards and limitations to the diffusion and adoption of this technology amongst farmers who are most in need for it to improve their farming practices for increased production and productivity allowing them to achieve food security.

Housing: The maximum respondent (64%) keeps their animals locally under tree, while minimum respondent (12%) locally/ at home under the roof.

Feeding: All most of the farmers (98%) fed their animals dry and concentrated feed, while the rest fed their animals on fresh 'green'

F. Extension: Figure 3 explains the extension type. Most of respondent (90%) don't received extension services, while only (10%) of respondent receive extension services. This implies that more attention should be paid to extension services in Kordofan States in order to make best use of this technology. The farmers received extension services by different type, maximum respondent (4%) received improved seeds, while the minimum respondent (2%) received training only.

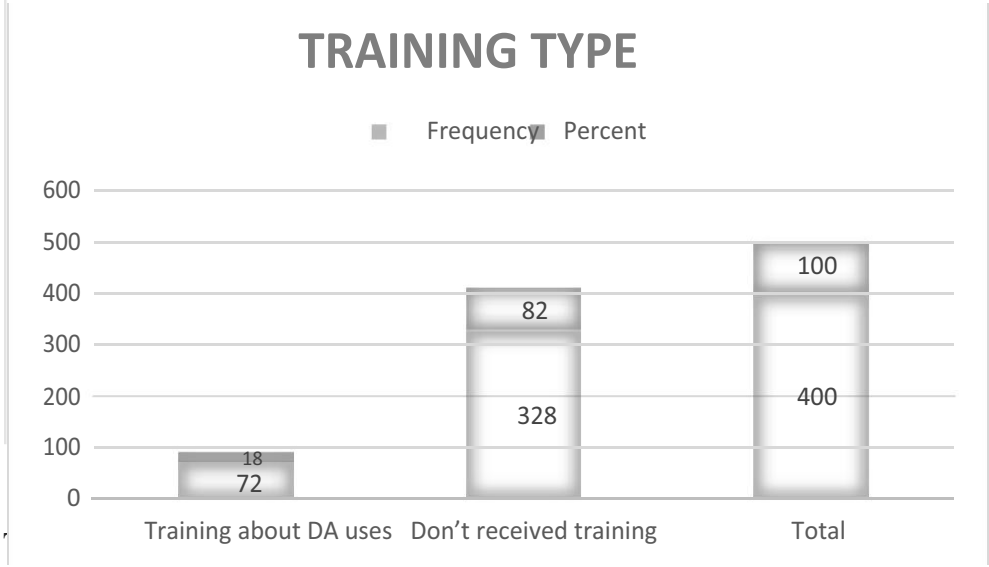

Figure.4 Training type

G. Training: Figure 4 shows that all the aforementioned results (82.0%) are a direct consequence of the lack of training, while as only (18%) of the farmers received training package. (72%) of them received training about uses of animal traction. Training service should be based on the available resources and the level of knowledge of farmers.

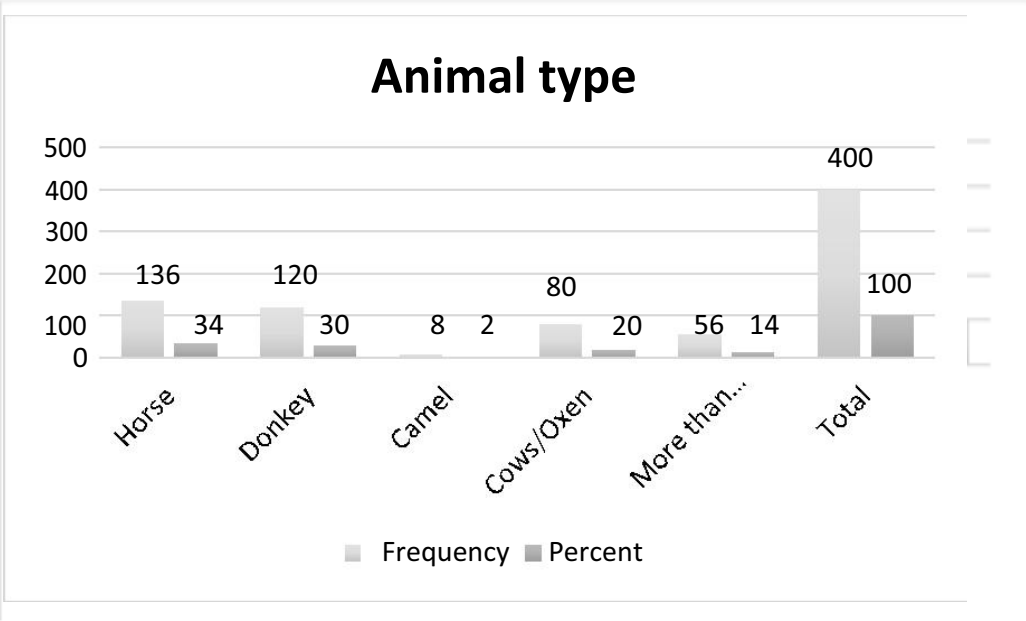

Figure. 2 Animal type

D.Animal type: Figure 2 illustrates animal type. Three animals are generally used to pull ploughs and planters, Horses dominated in West Kordofan area presented maximum respondent (34%), while cows/oxen used only in South kordofan presented by (20%) of respondent. All the animals also used in lifting water, agricultural operation and transport.

Table 3 Frequency Distribution and Percentage of respondent by crops type

Crops type	Frequency	Percent
Groundnuts	272	68.0
Groundnuts, Dura and Okra	16	4.0
All crops	28	7.0
Groundnuts and Dura	76	19.0
Sesame and Dura	8	2.0
Total	400	100.0

E. Crop types: Table 3 showed that groundnuts respondent a high percent (68%) as main crop grown in Kordofan states, while sesame and Dura respondent a minimum percent (2%) cultivated sesame and Dura.

Figure. 1 Sex respondent

B. Sex: Figure 1 shows `that (64%) of respondents are male, while (36%) are female. This indicates the female participation in agriculture process.

Table (2) Frequency Distribution and Percentage of respondent by education level

Age	**Frequency**	**Percent**
Education level Khalowa	80	20.0
Illiterate	36	9.0
Year of education be	220	55.0
fore university University	64	16.0
Total	400	100.0

C.Education level: Table 2 showed the maximum respondent of farmer's education level year of education before university presented by 55%, while the minimum of respondent (9%) are khalowa level. Education plays an important role in the adoption process. An educated and literate person is likely to adopt an innovation faster than an illiterate person.

Field Capacity:

The field capacity was determined using two stop watches and a tape meter. As the operator start working the two watches was set on and when reached the end of the plot and start turning one of the two watches were set off to measure the networking time, while the other one was still on to measure the total working time. The distance of travel was measured using the tape meter (m^2) and the number of passes taken to cover the plot was recorded. Implement rating and working a width was be recorded. Then effective field capacity (ha/h) was taken as the product of dividing the area worked (ha) by the total time (h) as follows:
Effective Field Capacity (F.C) =Area (ha)\ Total Time (h) Field efficiency =Net productive time\ Total time of operation
Source [15,16]

Results And Disussion

1. General information:

Table (1) Frequency Distribution and Percentage of respondent by age

Age	Frequency	Percent
15 to 25 year	88	22.0
26 to 35 year	124	21.0
36 to 45 year	84	31.0
46 to 55 year	104	26.0
Total	400	100.0

A. Age: Result in table 1 shows that the maximum respondent of farmer's age ranged between 26 to 35 year (31%) and these lead to majority of people in productive age depend on agriculture, while the farmers age ranged between 36 to 45 year present minimum respondent (21%).

3.Analyze the different work rates and efficiencies of animal traction in Kordofan Staes (field capacity and efficiency).

Materials And Methods Study area

The main study area was En-nuhoud locality, West Kordofan State and Aldebibat locality, South Kordofan. EN-Nhoud locality is located in the semi-arid savannah zone. The dominant system of agriculture in this area is the traditional rain-fed farming system which is known as a small holding farming, farmers that is mainly characterized by being subsistence oriented. The area is known by production of groundnuts as the main cash crop and well known for livestock production for milk and meat.

Aldebibat locality is located in the semi-arid savannah zone. The locality consists of five rural councils. Farmers in this area depend on rain-fed for agriculture, the main source of the water is underground wells, and most of the population depends on agriculture beside other activities. Different types of crops are grown in the area like (millet, groundnuts, karkady, sorghum, sesame and water melon and etc). Donkeys, camels, oxen and horses are used for agricultural work beside other purposes. The dominant system of agriculture in these areas is traditional rain-fed farming system.

Sampling:

This study was based on the cross-sectional survey design targeting farmers who operate on plots more than 1 ha. A sample of 400 farmers was selected from two localities following the systematic random sampling technique.

Data collection and analysis:

Data was collected using a formal survey questionnaire by direct interview for literacy. The sampling procedure was employed to select 200 farmers used hand tools (HT) and 200 farmers using animal traction (AT).The interview take 25 minute for one questionnaire (farmers who used animal traction) and 15 minute for the farmers who used hand tools. The data was analyzed using the Statistical Package for Social Science (SPSS) to produce frequencies table and chart, also chi-square test was used to measure the significance of relations between extension, training and adoption of animal traction in the study area.

tures are generally poor in quality and due to lack of control they are overgrazed. During the dry season the pastures do not produce enough fodder to maintain the animals. The identification of feeding and management strategies for draught animals in farming system requires information on the availability and the nutritive value of existing feed by draught animals and information on the nutrient requirement of draught animals for work. Also it is important to ensure that young animals are given ample feed and opportunity to grow to their maximum possible size before starting the work. The successful use of animals for draught purposes depends on how they are tamed, trained and harnessed. The animals have to be kept in the training to maintain their strength and skills [14].

1. Husbandry, working practices and field performance when using draught oxen in land preparation in Shambat, Nile Valley, Sudan (Alsamawal Khalil Makki) Journal of Agriculture Extension and Rural Development

2.The Effect of Using Animal Traction on Farm Efficiency and Household Labour Allocation on Smallholder Farm in Kenya: A case Of Kirinyaga District.

3.Relationship between management and field performance of draught animals used for land preparation. An example from South Kordofan State, Sudan Elsamawal Khalil Makki1 and Samia Abu-Elgasim Manzoo

4.Farming systems approach to improving draft animal power in sub-Saharan Africa by Forbes Muvirimi 1 and Jim Ellis-Jones 2

Research problem:

The researcher ignored the farmer, animal side in terms of management and usage patterns in relation to work rates using different types of implements. By conducting this research, hopefully planners, trainers, and decision makers will clearly be able to identify the gaps in animal traction technology in the area. This will help in a profitable and successful adoption of animal traction for implement of farmers' livelihood.

Objective:

1.To estimate the extent of farmer knowledge about Animal traction management Practices).

2.To find out the effectiveness of the extension methods used in adoption of animal traction

weight, provided it is in good health [7], so it is in the owner's interest to ensure that it does not get too thin during the dry season. Proper management with daily inspection, good handling and careful husbandry of the animals reduces health problems. Simple attention to animal condition, feeding and provision of adequate water is basic to maintain animals in a healthy state so that they can work well [8].The supply of satisfactory level of draught animal's power at the right time for crop production requires sound management of draught animals throughout the year. Relevant features of draught animal management include adequate feeding, health care and appropriate use of animals to ensure their sustained use on farm. Adequate feeding to meet the nutrient requirements of draught animals is major constraint facing farmers using animal power in Semi-arid area. Reasonable levels of animal productivity can be expected from natural pastures during the rainy season [9]. Number of days worked depends on cropping patterns, animal availability and land ownership. Management of working animals does not just depend on the requirements for work, but also on the other outputs that are expected in addition to work. Compared to other productive outputs from cattle, a 450kg ox doing days' work of 5-6 hr requires an energy intake equivalent to that needed to produce about 0.75kg live weight gain or about 5-6 L of milk. The work output of draught animal is influenced by several factors such as the type of implement used, the working depth and the operator as well as the environment and soil conditions [10]. Management is easier for these draught animals since the farmers only need not consider the work load and live weight of their animals. The same animals are often kept by one farmer for many years [11].

Draught animal husbandry should be as stress free as possible. If draught animals are handled frequently, stress caused by contact with human beings will be negligible. Animals should be groomed (washed brushed) and inspected and trimmed as necessary. [4]. Attention must be given specially to those areas of care of the feet of working animals. Another important area in a working donkey or mule is skin, which is in contact with the saddle or harness because their ability to work is dependent on fittings where sweat may accumulate [12]. [13]makes the important point that little benefit will be gained from better feeding, training and improved harnessing and implement design, if health is neglected. Care is required to prevent stress and subsequent loss of health to ensure the animal can carry out timely work. The animals rely mostly on grazing of natural pastures that are communally owned. These pas-

long time throughout Africa, Asia, and Latin America. There are considerable differences in level of development and types of the technology as well as differences between the areas in which it has been introduced. In the last three decades, animal traction technology has been adopted in different rural development projects in Sudan, as an intermediate alternative to the very traditional and modern technologies. The idea mainly aimed at introducing simple, efficient, low–cost appropriate technology to increase the agricultural productivity, and the cultivated area as well as to promote off-farm activities in the rural areas.

Some animal traction extension programs sell trained animals of custom or contract training. In fact, farmers may be more knowledgeable about particularities of local breed or individual animal than the instructor; in many cases the teaching can go both ways. Also, instructors who become involved in animal training should always remember that their goal is to include farmers in every operation and make them do the training. Farmers quickly become confident trainers when they are shown tools and techniques that give them sure controls over the animals [5].

Many countries have agricultural extension services of some kind in which locally -based extension workers or agents visit farmers and advise them on new plants species, pests and diseases of crops, and the use of fertilizers and pesticides. Extension agents understand the need for farmers to produce more for the national economy and are expected to help farmers increase their production to meet both the family's needs and those of the national government. Social or cultural practices and traditions may dictate the types and number of crops grown, the cropping method, and even when crops are planted or harvested. Farmers using traditional tools and techniques for many years know how much work is required for a certain harvest. Extension agents provide the support necessary to encourage the farmer and reduce risks of failure from improper use of new systems. Extension program can provide education and equipment, and health care for the animals. The success of an animal traction program may depend upon the availability of these services to farmers [5].

The management of draught animals should include efficient management of the power itself, both when it is required in seasonal tasks and over the rest of the year so that the resource is not wasted [6].The draught power output of any animal is largely a function of its live

مستخلص:

اجريت هذه الدراسة فى محليتي النهود والدبيبات بولايتي غرب وجنوب كردفان خلال شهرى يونيو و يوليو 2015 بغرض دراسة أثر الإرشاد، التدريب والإدارة علي تبني تقانة حيوانات الجر وسط المزارعين. تم اختيارعينة عشوائية منتظمة من 400 مزارع من قرى مختلفة حول منطقتي النهود والدبيبات. استخدم في جمع بيانات الدراسة إستمارتين لمجموعتين من المزارعين حيث وزعت استمارة الإستبيان على 200 مزراع من الذين يستخدمون الآلات اليدوية و 200 مزراع من الذين يستخدمون حيوانات الجر، تم تحليل بيانات الدراسة باستخدام برنامج الحزمة االحصائية (SPSS) لحساب التوزيع التكراري و النسب المئوية لمتغيرات الدراسة كما تم حساب مربع كاي علي مستوى معنوية 0.05 لقياس العلاقة المعنوية بين)الإرشاد والتدريب(لافراد العينة و تبني الحيوان.

أظهرت النتائج أن الإرشاد في المنطقة المستهدفة قدم إلى المزارعين بطريقة غير علمية.(اهتم الإرشاد بتوزيع البذور المحسنة بجانب زيارة المزارع) وتجاهل العمليات الأخري. تلقى المزارعين نوع واحد من التدريب وهو كيفية استخدام حيوانات الجر. المستوي التعليمي لأكثر من نصف المزارعين هو التعليم قبل الجامعي. الخيول هي الأكثر استخداما في الزراعة بالمحاريث في غرب كردفان، بينما تستخدم الأبقار/ الثيران فقط في جنوب كردفان. معظم المزارعين 70% يمتلكون أراضى. 40% من المزارعين يستخدمون المحراث لحراثة الأرض بينما 50% يستخدمون الآلات اليدوية. معظم المزارعين يتلقون التدريب من قبل المزارعين ألأقران. يؤثر نقص الرعاية البيطرية علي تبني حيوانات الجر. وضحت النتائج أن أكثر من نصف المزارعين يعالجون حيواناتهم بأنفسهم بواسطة علاج محلي، والتطعيم بطريقة غير منتظمة، ويفتقر المزارعون إلى المعرفة المتعلقة بحفظ الحيوان داخل حظيرة خاصة به، وطريقة التغذية، وزمن تقديم الماء للحيوان. استخدم المزارعون في المنطقة المستهدفة أنواع مختلفة من أدوات الزراعة كالمحراث والزراعة عن طريق حيوانات الجر والأدوات اليدوية. أظهرت نتائج مربع كاي علاقة معنوية عالية بين الإرشاد والتدريب وتبني تقانة حيوان الجر.

Introduction:

Animal traction was first started in Asia thousands of years ago. It was introduced into sub-Saharan Africa through European settler farmers, early development program and migration of workers within the region during the colonial period [1]. Animal traction is the use of draught animals for tillage, seeding and other activities [2, 3] also described animal traction as the employment of animals for draught activities. Animals play a major role in smallholder semi-arid crop/livestock farming system. Agriculture under this system increasingly relies on draught animal power for most farm activities. The technology continues to make significant contribution to many rural and urban economies [4].Animal traction (as intermediate technology) has been widely spread since a

Effect of Extension, Training and Management on Farmer's Adoption of Animals Traction in Sudan (Westand South Kordofan States)

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Abstract

This study was conducted in two localities En-nuhoud and Aldebibat in West and South Kordofan States, during June - July 2015 to explore Effect of extension, training and management on farmers' adoption animals' traction technology. A systematic random sampling technique was used to select a sample of 400 farmers from different villages (cluster) around En-nuhoud and Aldebibat areas. The study used two types of questionnaire distributed for two groups of farmers 200 farmers used hand tools (HT) and 200 farmers used animal traction (AT) technology. The data was analyzed using Statistical Package Program for Social Sciences (SPSS) to calculate frequencies distribution and percentages of variables, also chi-square was calculated at level of 0.05 to measure the significance of the relation between extension, training and the adoption of animal traction technology. The results showed that extension in targeted area introduced to the farmers by poor way. All extension services concentrated on distribution of improved seeds beside farmer visit only. Farmers received training on one site (how to use animal traction). More than half of respondent 55% education levels are level year and education before university.

Horses are dominant in West Kordofan and Cows\Oxen used only on South Kordofan presented by 20% of respondent. Most of farmers 70% owned land, 40% of the farmers used plough for plowing, 50% used hand tools. Most of the farmers received training by peer farmers. Lack of veterinary care and vaccination affect animals' traction adoption. More than half of the farmers treated their animal by themselves\hired, and take vaccine to their animal by irregular way. Farmers lack knowledge on animal housing, feeding, watering. Farmers in targeted area used different types of tools planter and plough by animal traction and hand tools. The results showed that there were different between extension, training and animal traction adoption

Key words: animals traction technology, agricultural extension, animal management, Training.

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Conclusion

Since the general aim of this study is to measure the concentration of natural radioactivity in soil samples in Kassala town and the special objective is to determine the activity concentration of the elements ^{226}Ra, ^{232}Th and ^{40}K ,using gamma-ray spectrometry and calculate the absorbed dose rate, annual effective dose and estimate the radiological hazard from the soil of the town according to the standard. The average concentration of all elements in the study is less than the average worldwide except the element ^{40}K(being higher).

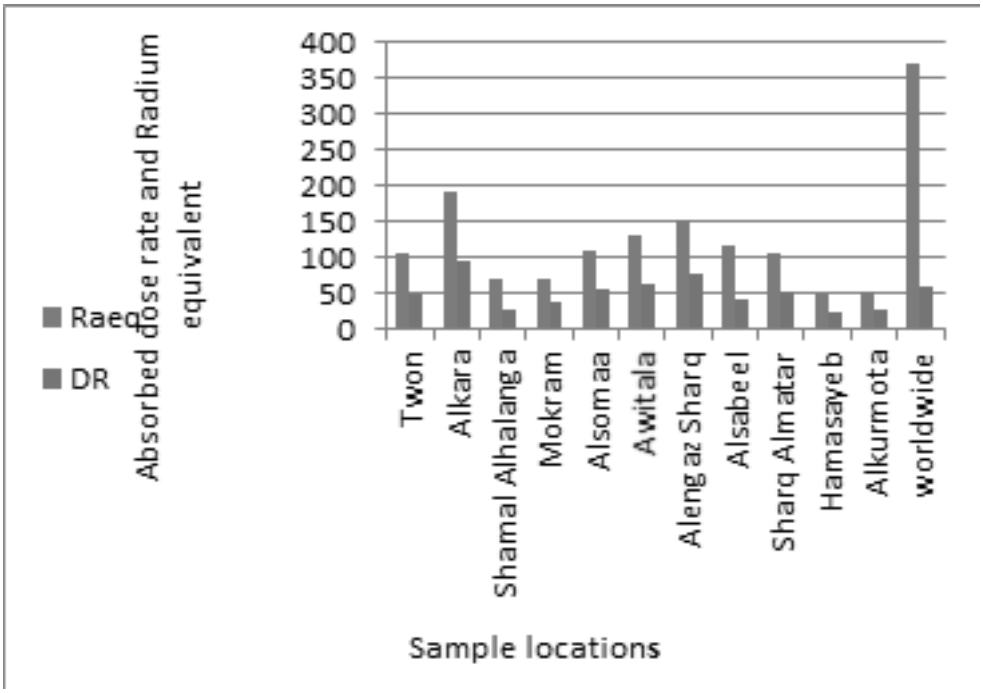
The mean absorbed dose rate was calculated and compared with the corresponding worldwide average(which is found to be less than the worldwide average.

The annual effective dose was estimated and found to be(outdoor) and (indoor), while are less than the worldwide and the radiation hazard index was found to be less than “1”

Kg) and lowest in the plant area(2.6Bq/Kg).From table (4) 226Ra is highest in plant area(27.2Bq/Kg) and lowest in residential area(12.7Bq/Kg). 40K is highest in plant area(1320Bq/Kg) and lowest in residential area(442Bq/Kg). ^{232}Th is highest in plant area(30Bq/Kg) and lowest in open area(1.9Bq/Kg).From table(5)226Ra is highest in plant area(36Bq/Kg) and lowest in residential area(10.9Bq/Kg). ^{40}K highest in residential area(977Bq/Kg)and lowest in open area(452Bq/Kg). ^{232}Th is highest in plant area(47.9Bq/Kg) and lowest in residential area(30.3Bq/Kg).From table(6) ^{226}Ra is highest in open area(31.7Bq/Kg), and lowest in residential area(14.6Bq/Kg). 40K is highest in plant area(1550Bq/Kg) and lowest in residential area(633Bq/Kg). ^{232}Th is highest in open area(32.9Bq/Kg) and lowest in plant area(25.2Bq/Kg).From table (7) ^{226}Ra is highest in one open areaS21(30.9 Bq/Kg), lowest in residential area (8.8 Bq/Kg). 40K, highest in open areaS22 (468Bq/Kg), lowest, residential area (380 Bq/Kg). 232Th, highest in open area S2(45.7Bq/Kg), lowest in residential area(18.6 Bq/Kg).From table (8)226Ra, highest in residential(17.2Bq/Kg), lowest in open(12.6Bq/Kg). 40K, is highest in residential(810Bq/Kg), lowest in open(482Bq/Kg). ^{232}Th, highest in plant(28.9Bq/Kg), lowest in open(23.3Bq/Kg).From table (9) the area of the two samples S26 and S27, is an open area with the activity concentration of ^{226}Ra in S26(14.7Bq/Kg), in S27(6.7Bq/Kg). For40K, the corresponding values are (550Bq/Kg) and (320Bq/Kg) respectively. For ^{232}Th the values are (2.7Bq/Kg) and (5.1Bq/Kg). From table (10) ^{226}Ra is highest in plant(37Bq/Kg), lowest in both open and residential areas (0Bq/Kg). ^{40}K, is highest in plant (850Bq/Kg), lowest in residential(214Bq/Kg). 232Th, is highest in plant (4.4Bq/Kg), lowest in residential (1.3Bq/Kg).From the above discussion it concluded that the background of the area of the samples, whether being there is no relationship between the activity concentration according to the area in all locations.

From the discussion of the results of all locations showed that the average concentration of ^{40}K is higher than the average concentrations of the other two elements.

In general, the average annual effective dose from this study is found to be, 0.06mSv/Y, 0.25mSv/y outdoor and indoor respectively, these values when compared with the corresponding average values worldwide 0.07mSv/y outdoor and 0.41mSv/y indoor[, there are found to be less .From this study it is found that the average external radiation hazard index for Kassala town is 0.29 which is less than “1



Figure(2):The absorbed dose rate and radium equivalent for the different locations ,the town and worldwide

Discussion

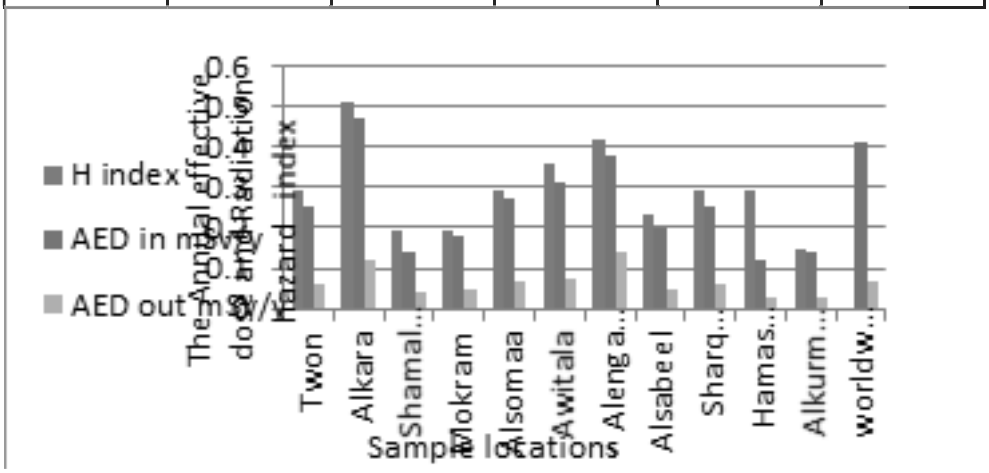
From table (1) it can be seen that there are some differences in the activity concentrations for the studied elements between three results for each element. These results are taken from three types of areas, for example sample S_1, S_4 ,S_7 S_{10}, S_{13} ,S_{16} ,S_{19} ,S_{22} ,S_{25} andS_{28} are from residential area, S_2 , S_5 ,S_8 ,S_{11} ,S_{14} ,S_{17} S_{20} ,S_{23} , andS_{29} are from an area with plants and S_3 ,S_6 S_9 ,S_{12} ,S_{15} ,S_{18} ,S_{21} ,S_{24} ,S_{26} and S_{27} are from an open area. From this table it is found that 226Ra, is highest in plant area(37Bq/Kg), while it lowest in the open area(14.7Bq/Kg),for ^{40}K, highest in residential area (1880Bq/Kg) and lowest in open area(1140Bq/Kg),for 232Th, is highest in the plant area(59Bq/Kg) and lowest in the open area(13Bq/Kg). From table (2) 226Ra is highest in the plant area (17.8Bq/Kg) and lowest in the open area(6.7Bq/Kg). 40K is highest in the plant area(600Bq/Kg) and lowest in the open area(320Bq/Kg). ^{232}Th is highest in plant area(5.1Bq/Kg) and lowest in the residential area(2.7Bq/Kg).From table (3)^{226}Ra is highest in open area(23.3Bq/Kg) and lowest in plant area(13.7Bq/Kg). 40K is highest in plant area(730Bq/Kg) and lowest in residential area. 232Th is highest in the open area(4.9Bq/

Table(21):Absorbed dose rate, annual effective dose (indoor/ outdoor), radiation hazard index and radium equivalent(Alkurmota)

Sample code	D_R (nGy/h)	H_E out mSv/y	H_E in mSv/y	$Raeq_{eq}$/Kg	H_{index}
S_{28}	18.89	0.02	0.09	35.39	0.09
S_{29}	55.19	0.07	0.27	108.74	0.29
S_{30}	9.71	0.01	0.05	18.34	0.05
Average	27.93	0.03	0.14	54.16	0.14

Table(22): Absorbed dose rate, annual effective dose (indoor/ outdoor) , radiation hazard index and radium equivalent for the Town

Sample code	D_R (nGy/h)	H_E out mSv/y	H_E in mSv/y	$Raeq_{eq}$/Kg	H_{index}
Average	50.75	0.06	0.25	107.82	0.29
Max	112.36	0.14	0.42	231.48	0.59
Mini	9.71	0.01	0.05	18.34	0.05



Figure(1):The annual effective dose and Radiation hazard index for the different locations , the town and worldwide

Table(18):Absorbed dose rate, annual effective dose (indoor/ outdoor), radiation hazard index and radium equivalent, (Alsabeel)

Sample code	D_R (nGy/h)	H_E out mSv/y	H_E in mSv/y	$Raeq_{eq}$/Kg	H_{index}
S_{19}	31.15	0.04	0.15	64.66	0.17
S_{20}	34.18	0.04	0.17	70.96	0.19
S_{21}	60.73	0.07	0.29	131.06	0.35
S_{22}	38.37	0.05	0.19	196.65	0.22
Mean	41.11	0.05	0.2	115.83	0.23

Table(19):Absorbed dose rate, annual effective dose (indoor/ outdoor), radiation hazard index and radium equivalent, (SharqAlmatar)

Sample code	D_R (nGy/h)	H_E out mSv/y	H_E in mSv/y	$Raeq_{eq}$/Kg	H_{index}
S_{23}	55.98	0.07	0.27	0.31	114.78
S_{24}	39.99	0.05	0.19	0.22	83.03
S_{25}	59.12	0.07	0.29	0.33	120.75
Average	51.69	0.06	0.25	0.29	106.19

Table (20):Absorbed dose rate, annual effective dose (indoor/ outdoor), radiation hazard index and radium equivalent, (Hamasayeb)

Sample code	D_R (nGy/h)	H_E out mSv/y	H_E in mSv/y	$Raeq_{eq}$/Kg	H_{index}
S_{26}	31.36	0.04	0.15	60.91	0.47
S_{27}	19.52	0.02	0.095	38.63	0.10
Average	25.44	0.03	0.12	49.77	0.29

Table(16):Absorbed dose rate, annual effective dose (indoor/outdoor), radiation hazard index and radium equivalent, (Awitala)

Sample code	D_R (nGy/h)	H_E out mSv/y	H_E in mSv/y	$Raeq_{eq}$/Kg	H_{index}
S_{13}	64.08	0.079	0.31	129.46	0.35
S_{14}	64.95	0.079	0.32	140.3	0.38
S_{15}	59.21	0.073	0.29	127.51	0.34
Average	62.75	0.077	0.31	132.42	0.36

Table(17):Absorbed dose rate, annual effective dose (indoor/ outdoor), radiation hazard index and radium equivalent, (AlengazSharq)

Sample code	D_R (nGy/h)	H_E out mSv/y	H_E in mSv/y	$Raeq_{eq}$/Kg	H_{index}
S_{16}	86.64	0.11	0.42	174.99	0.47
S_{17}	91.41	0.11	0.45	180.39	0.49
S_{18}	51.62	0.06	0.25	107.1	0.29
Mean	76.56	0.09	0.37	154.16	0.42

Table(13):Absorbed dose rate, annual effective dose (indoor/ outdoor), radiation hazard index and radium equivalent, (Shamal Alhalanga)

Sample code	D_R (nGy/h)	H_E out mSv/y	H_E in mSv/y	$Raeq_{eq}$/Kg	H_{index}
S_4	19.51	0.02	0.095	38.63	0.10
S_5	31.36	0.04	0.15	64.01	0.17
S_6	36.08	0.04	0.18	11108.71	0.29
Average	28.98	0.03	0.14	70.45	0.19

Table(14):Absorbed dose rate, annual effective dose (indoor/ outdoor), radiation hazard index and radium equivalent, (Mokram Sharq)

Sample code	D_R (nGy/h)	H_E out mSv/y	H_E in mSv/y	$Raeq_{eq}$/Kg	H_{index}
S_7	39.17	0.05	0.19	75.17	0.20
S_8	28.61	0.04	0.14	56.11	0.15
S_9	42.91	0.05	0.21	84.21	0.23
Average	36.9	0.05	0.18	71.83	0.19

Table(15) absorbed dose rate, annual effective dose (indoor/ outdoor), radiation hazard index and radium equivalent, (Alsomaa)

Sample code	D_R (nGy/h)	H_E out mSv/y	H_E in mSv/y	$Raeq_{eq}$/Kg	H_{index}
S_{10}	48.52	0.06	0.24	93.06	0.25
S_{11}	33.12	0.04	0.16	67.61	0.18
S_{12}	85.73	0.11	0.42	171.74	0.46
Average	55.79	0.07	0.27	110.80	0.29

Table(10):The Activity concentration(Bq/kg),(Alkurmota)

Sample code	^{226}Ra	^{40}K	^{232}Th
S_{28}	N.D	430	1.60
S_{29}	37	850	4.4
S_{30}	N.D	214	1.30
Average	12.33	498	2.43

***ND :Not detected**

Table(11):The Activity concentration(Bq/kg),Overall the Town

The element	^{226}Ra	^{40}K	^{232}Th
Average	18.19	732.37	19.56
MAX	37	1880	59
MINI	6.70	320	1.30

Table(12): Absorbed dose rate, annual effective dose (indoor/ outdoor), radiation hazard index and radium equivalent, (Alkara)

Sample code	D_R (nGy/h)	H_E out mSv/y	H_E in mSv/y	$Raeq_{eq}$/Kg	H_{index}
S_1	110.98	0.14	0.54	219.09	0.59
S_2	112.36	0.14	0.55	231.48	0.63
S_3	62.18	0.076	0.31	121.07	0.33
Average	95.17	0.12	0.47	190.53	0.52

Table(7):The Activity concentration(Bq/kg), (Alsabeel)

Sample code	^{226}Ra	^{40}K	^{232}Th
S_{19}	8.80	380	18.60
S_{20}	9.9	416	20.3
S_{21}	30.90	452	45.70
S_{22}	11	468	22.8
Average	15.15	429	26.85

Table(8):The Activity concentration(Bq/kg),(Sharq Almatar)

Sample code	^{226}Ra	^{40}K	^{232}Th
S_{23}	15.70	750	28.90
S_{24}	12.60	482	23.30
S_{25}	17.20	810	28.8
Average	15.17	680.67	27

Table(9):The Activity concentration(Bq/kg) (Hamasayeb)

Sample code	^{226}Ra	^{40}K	^{232}Th
S_{26}	14.70	550	2.70
S_{27}	6.70	320	5.10
Average	10.70	435	3.90

Table(4):The Activity concentration(Bq/kg), (Alsomaa)

Sample code	^{226}Ra	^{40}K	^{232}Th
S_{10}	19.50	920	1.90
S_{11}	12.70	442	14.60
S_{12}	27.20	1320	30
Average	19.80	894	15.50

Table(5):The Activity concentration(Bq/kg), (Awitala)

Sample code	^{226}Ra	^{40}K	^{232}Th
S_{13}	10.90	977	30.30
S_{14}	36.00	465	47.90
S_{15}	30.50	452	43.50
Average	25.80	631.33	40.57

Table(6):The Activity concentration(Bq/kg), (Alengaz Sharq)

Sample code	^{226}Ra	^{40}K	^{232}Th
S_{16}	31.70	1250	32.90
S_{17}	25	1550	25.20
S_{18}	14.60	633	30.60
Average	23.77	1144.33	29.57

Table(1): The Activity concentration(Bq/kg), (Alkara)

Sample code	^{226}Ra	^{40}K	^{232}Th
S_1	30	1880	31
S_2	37	1430	59
S_3	14.70	1140	13
Average	27.23	1483.33	34.33

Table(2):The Activity concentration(Bq/kg), (Shamal Alhalanga)

Sample code	^{226}Ra	^{40}K	^{232}Th
S_4	6.70	320	5.10
S_5	14.70	550	2.70
S_6	17.80	600	4.70
Average	13.07	490	4.17

Table(3):The Activity concentration(Bq/kg), (Mokram Sharq)

Sample code	^{226}Ra	^{40}K	^{232}Th
S_7	13.70	750	2.60
S_8	15.20	470	3.30
S_9	23.30	700	4.90
Average	17.40	640	3.60

Gamma-Ray Spectrometry:

In the measurement of these samples, we used High Purity Germanium (HpGe) detector with sensitive material type P.

Calculations:

The activity concentrations of the natural radio nuclides in the measured samples (AS) should be computed using the following relation

AS (Bq•kg-1) = Ca/ε Pr Ms eq [1]

Where Ca is the net gamma counting rate (counts per second), ε the detector efficiency of the specific γ-ray, Pr the absolute transition probability of Gamma-decay and Ms the mass of the sample (kg).

Absorbed Dose Rate

From the above equation the absorbed dose is given by:

DR = 0.462 ARa + 0.604 ATh + 0.0417 AK(nGy/h) eq [2]

Where the numerical values 0.462, 0.621 and 0.417 are the dose conversion factors for converting activity concentrations of 226Ra, 232Th and 40K into doses.

The Annual Effective Dose Equivalent (H_E)

From the above equations the annual effective doe are given by:

HE, Outdoor = DR × 1.226 × 10−3 (mSv/y) eq [3]

HE, Indoor = DR × 4.905 × 10−3 (mSv/y) eq [4]

Radiation Hazards indexes

From the above equations the radiation hazard index is given by:

Raeq = ARa + 1.43ATh + 0.077AK,(Bq/Kg) eq [5]

Where, Raeq Radium equivalent activity ,ARa, ATh and AK are the specific activities of $^{22}6Ra$, ^{232}Th and ^{40}K in $Bq.kg^{-1}$ respectively.

$Hex = (A_{Ra}/370) + (A_{Th}/259) + (A_K/4810) \leq 1$ eq [6]

Results And Discussion:

Results:

The activity concentration for all samples from the different town locations were obtained directly from the detector. The following tables show these results . The average activity concentration for each element in all locations and the overall average for the town were calculated .

Figure : Sample locations in Kassala Town

Introduction:

Radiation is energy in the form of waves or streams of particles, there are many kinds of radiation all around us, when people hear the word radiation, they often think of atomic energy, nuclear power and radioactivity, but radiation has many other forms, Sound and visible light are familiar forms of radiation; other types include ultraviolet radiate (that produces a suntan), infrared radiation (a form of heat energy), and radio and television signal[1]. Some atoms are naturally stable while others are unstable. Atoms with unstable nuclei which spontaneously transform, releasing energy in the form of radiation are known as radio nuclides. This energy can interact with other atoms and ionize them. Ionization is the process by which atoms become positively or negatively charged by gaining or losing electrons[2].There are two forms of radiation non-ionizing and ionizing which will be discussed in Non-ionizing radiation has less energy than ionizing radiation; it does not possess enough energy to produce ions. Examples of non-ionizing radiation are visible light, infrared, radio waves, microwaves, and sunlight. Ionizing radiation is capable of knocking electrons out of their orbits around atoms, upsetting the electron/proton balance and giving the atom a positive charge. Electrically charged molecules and atoms are called ions. Ionizing radiation includes the radiation that comes from both natural and man-made radioactive materials. Alpha radiation , Beta radiation and gamma radiation Canadian Nuclear Safety Commission, Catalogue ,2012) [1].

Materials and Methods:

The Study Area

Kassala Town is located to the eastern part of the Sudan, in Kassala State. The state lies between latitudes 14˚ 45\ and 17˚ 15\ N, and longitudes of 34˚ 40\ and 37˚ E, in an area of 42330 km^2. Kassala Town is the capital of the state. The town is located at latitude at a 15o 27\ N and longitude 36o 24\ E and at a distance of 625 km from Khartoum.

Sample Collection and preparation:

In order to measure radioactivity in soil, thirty samples of soil were collected from ten locations. Each soil sample was collected from a large area covering the town geographically. The ten locations were chosen in away to cover the town as follows: North , South , West , East , North east, North west, South east , South west, Centre and the extreme far North west. From each location three samples were taken. One sample is from residential area , another sample is from open area and the third sample is from an area of natural plants. The GPS device was used to determine the geographical position of each point of the samples. The samples were collected soil surface (about 0–10 cm).

Natural Radioactivity Hazard Assessment of Soil in Kassala Town-Sudan

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Abstract

Human beings have exposed to natural radiation, which is mainly due to the activity concentration of primordial radio nuclides. In this study measure the concentration of natural activity radiation ,calculation of absorbed dose rate, annual effective dose (indoor/outdoor) and assessment of radiation hazard index for some soil sample from various geographical locations in Kassala Town-Kassala State – Sudan, for the elements 226Ra, 232Th and 40K, using gamma-ray spectrometry. The study found that the average concentration for226Ra, 232Th and 40Kwere found to be 18.19 Bq/Kg, 19.56 Bq/Kg and 732.37 Bq/Kg respectively. The average absorbed dose rate was found to be 50.75nGy/h, annual effective dose were 0.25mSv/y(indoor), 0.06mSv/y(outdoor) and the radiation hazard index is 0.29 The study conclude that the average concentration of all elements in the study is less than the average worldwide(226Ra =35 Bq/Kg),(232Th=30 Bq/Kg) except (40K=400 Bq/Kg) ,also the absorbed dose rate and annual effective dose (indoor/outdoor) are less than the average worldwide(60 nGy/h), (0.41mSv/y(indoor), (0.07mSv/y(outdoor).The assessment of radiation hazard index to the soil of Kassala Town is more less than the standard(≤1).

Keywords: Natural Radioactivity Hazard, Soil sample ,Gamma Spectrometry , Kassala

مستخلص:

لقد ظلت البشرية تتعرض إلى تأثير الإشعاع الطبيعي الناتج بصورة رئيسة من تركيز النشاط للنويدات المشعة، في هذه الدراسة تم قياس تركيز النشاط الإشعاعي وحساب معدل متوسط الجرعة الممتصة، والجرعة الفعّالة السنوية بالداخل والخارج وتقييم الخطر الإشعاعي لعينات من تربة مدينة كسلا – ولاية كسلا – السودان، لمواقع جغرافية مختلفة للعناصر232Th، 226Ra و 40K، باستخدام مطيافية أشعة غاما، توصلت الدراسة إلى أنّ تراكيز متوسط النشاط الإشعاعي لكل من 232Th، 226Ra و40K كانت 19.56 Bq/Kg، 18.19 Bq/Kg و 732.37Bq/Kg،ومعدل متوسط الجرعة الممتصة يساوي 50.75nGy/h والجرعة الفعّالة السنوية تساوي 0.25mSv/y (بالداخل) و0.06 msv/y (بالخارج). كما أنّ قيمة مؤشر الخطر الإشعاعي تساوي 0.29. توصلت الدراسة على أن متوسط تراكيز كل العناصر المدروسة بالنسبة لتربة مدينة كسلا ولكل المواقع الجغرافية أقل من المتوسط العالمي(30Bq/Kg) = 232Th)، (35Bq/Kg= 226Ra و (400Bq/Kg=40K) عدا 40K، وكذلك معدل متوسط الجرعة الممتصة ومتوسط الجرعة الفعّالة السنوية بالداخل والخارج أقل من المتوسط العالمي((0.41 mSv/y)، 60nGy/h(بالداخل))(0.07 mSv/y(بالخارج)) أما بالنسبة لتقييم الخطر الإشعاعي على تربة مدينة كسلا نلاحظ أنه أقل بكثير جداً من قيمة الخطر القياسي(≤1.)

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3. Recommendations

Based on the results of the study, the following points are recommended:

Spoken discourse should be taught and tested, besides co-operation between ESP teacher and the subject matter teacher. Communicative Language Teaching should be introduced at General Education Level accompanied by teacher training in teaching Oral Communication Skills (speaking &listening). Ample time in timetables should be allotted to teaching, practising and using spoken language and it should be tested so that learners can be motivated to learn and use it. Modern Technology should be used in learning/teaching Spoken Discourse. Learners should be exposed to authentic materials, should learn the correct aspects of pronunciation and correct use of structures, besides, the cultural aspects of the Target Language (TL). Positive, interactive and relaxing learning atmosphere should be created and learners should be encouraged to use spoken language outside classroom.

4.4: Conclusion

This paper dealt with the problems of using spoken discourse encountered by EST learners, the study showed the importance of mastering the ability to use spoken discourse. The study also highlighted the importance of adopting a more learner-centred approach in teaching EST spoken discourse. Moreover, ways and strategies of facilitating the production of spoken discourse and classroom techniques to teach formulaic expressions were presented to enable EST learners to become more efficient in using spoken discourse.

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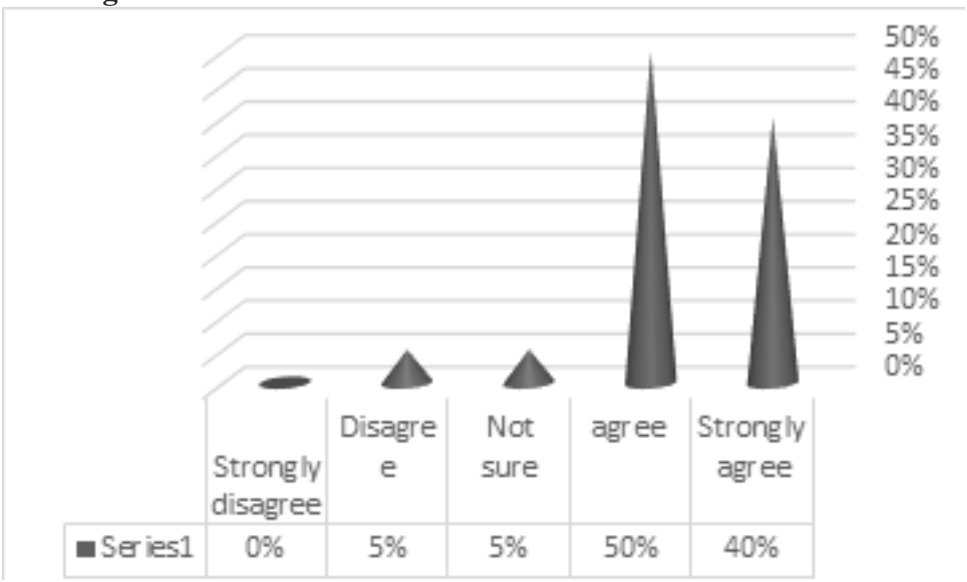
Figure. 4.1: Most EST learners find difficulties in using correct and meaningful utterances.-



Results in figure 4.1 above explain that respondents were sample study, and pointed high percentage in "agree and strongly agree". These are "(50, %) and (40%)" respectively, equals (90%) which is very high. Thus, the highest percentage is going to positive direction of the statements and nearly all answers of the study sample were agreed on. Therefore, this hypothesis is successfully achieved.

4.2: Results:

Based on the hypothesis of the study, and the study reached the following results .EST learners encounter great difficulties when they want to use the spoken discourse whether in their academic setting or social settings. This is because Grammar Translation Method (GMT) is the dominant teaching approach in EST classroom. Moreover, EST syllabus lacks activities and tasks that motivate learners to use spoken discourse. They also lack exposure to authentic discourse, besides, absence of contact with native speakers of the Target Language. All these factors minimise the chances of using spoken discourse. Hence, they are not efficient and successful users of spoken discourse.

3.6: Validity of the Questionnaire

According to Harmer (2002: 322 cited in Sogood: 2016) the test (the questionnaire in this study) is considered to be valid if it tests what it is supposed to test. The researcher constructed the questionnaire. Then, some modifications, additions and deletions were done according to experts' recommendations, until it was finally approved, those experts were Dr. Mohammed Al- Shingeeti1 2- Dr. Amna Badri 3- Dr Nada Al-Jack 4- Dr. Muntasir Hassan Mubarak. Thus, the researcher achieved the purpose for which the questionnaire was intended.

3.7: Reliability of the Questionnaire: The question*naire is reliable because EST practitioners would give the same answers if they were asked again.

4:Analysis, Discussion, Results, Conclusion, and Recommendations: this section explores the analysis and discussion of the tools of the study, followed by the results, recommendations and conclusion.

4.1: The Analysis and Discussion of the Questionnaire

A one-question questionnaire is intended to know the learners' problems from EST teachers' point of view to support and strengthen the learners' answers. The question is divided into sub-questions to know the reasons behind the difficulties. As for the data gathered through the questionnaire, they were tabulated and sorted out statistically by SPSS programme.

The Hypothesis: First year EST learners at SUST encounter many problems in using Spoken Discourse.

1-signalling that one wishes to speak	This involves using gestures, phrases or sounds (e.g. Ummm, well, Can I just say something here? Hang on a minute.
2-recognizing the right moment to speak	This involves recognizing intonation signals such as falling intonation or changes of pace or volume, pauses or closing discourse markers (e.g. so anyway, yeah)
3-using one's turn without losing it before it is finished	This involves saying the right amount and getting to the point which may vary from culture to culture.
4-recognizing signals of other people's desire to speak	This may involve being aware of gesture and body language and initiating phrases or sounds (e.g. er,um)
5-letting someone else have a turn	This may involve nominating another speaker linguistically (e.g. what do you think? You know him, don't you?)

3: Methodology

3.1: Method and design of the study

The study followed descriptive analytic method to investigate the problems of using EST spoken discourse among the learners via a questionnaire. Both qualitative and quantitative approaches were adopted. The study was designed for investigating these problems, which are encountered by EST learners at their first year of university.

3.2: Study population:

The subject of this study were EST practitioners who work in the different Sudanese universities in Khartoum state.

3.3: Study sample

The study sample were EST practitioners; both males and females who work at the different universities; governmental and private, in Khartoum State. They were chosen randomly to participate in the questionnaire to get their opinions and attitudes.

3.5: The Tool of Data Collection

For data collection, a one-question questionnaire, which contains subquestions, was used. It is mainly intended to find out learners' problems from EST teachers' point of view to find the reasons behind them and the solutions. It is also designed to know EST teachers' problems in teaching EST spoken discourse if there are.

(1) Expository routines, which involve information such as description, narration, instruction, comparison. (2)Evaluative routine are often based on expository routine if not always. They involve the drawing of conclusion, usually requiring the expression of reasoning they typically involve explanation; prediction. (B) Interactional routines are based not so much on information content. They include the kind of turns typically occurring in situations such as service in counters, telephone conversations, interview situations, casual encounters, conversations at parties, conversations around tables at parties, lessons, radio or television interviews , they include turns. These two types of routines are very essential and relevant to EST learners. Hence, they should be acquainted with them.

2.3.5.2: Negotiation skills (Negotiation of Meaning)

In conversational exchanges participants are co-operating with each other; Grice (1975: 45 cited in Yule: 2006) suggests the co-operative principle: "Make your contribution just as informative as required." Supporting this principle are four maxims, often called the 'Gricean maxims':

The quantity maxim	Make your contribution as informative as is required, but not more, or less, than is required.
The quality maxim	Do not say that which you believe to be false or for which you lack adequate evidence.
The relation maxim	Be relevant.
The manner maxim	Be clear, brief and orderly.

Management of interaction is the second aspect of negotiation of meaning which is highlighted by Bygate (1987: 35-36) "Management of interaction refers to the business of agreeing who is going to speak next, and what s/he is going to talk about i.e. the freedom participants have. Burns and Joyce (2002: 6) state, "Spoken interactions involve a joint activity where the speaker and listener are actively matching various kinds of knowledge". The most important aspect of management of interaction is 'Turn Taking' which relates to aspects of who speaks when and for how long. See Matthews (2002: 102) and Bygate (1989: 39 cited in Burns and Joyce: 2002: 30); five abilities are involved in handling turns in successful spoken interactions, in the table below:

formed by a speaker". These require the use of different syntactic structures associated with different functions, examples:

Sentences/utterances	Structures	Functions	Speech act
You left the door open	Declarative	statement	Direct
Did you leave the door open?	Interrogative	Question	Direct
Leave the door open please!	Imperative	Command/ Request	Direct
You left the door open?	declarative	Question	Indirect
Could you pass me the salt?	interrogative	Request	Indirect

The next part discusses what the speaker intends the listener to 'take' or 'interpret the function of what is said, i.e. the area of Discourse Analysis.

2.3.2.2.2: Discourse Analysis

The word 'Discourse' originally comes from the Latin word 'Discursus'. According to Yule (2006: 124) the word 'Discourse' is defined as" language beyond the sentence and the analysis of discourse is typically concerned with the study of language in text and in conversation". Text refers to written language while conversation refers to spoken language. The word 'Discourse Analysis' is used to refer to the study of how sentences in spoken and written language form larger meaningful units such as paragraphs. Some define Discourse Analysis as "The study of language in use."

2.3.2.5: Spoken Interaction

According to Bygate (1987: 22-23) in spoken interaction, the speaker and the listener do not merely have to be good processers of the spoken words, be able to produce coherent and understandable language; but they should be good communicators i.e. good at saying what they want to say to ensure mutual understanding. Hence, the communication of meaning depends on two kinds of skills: 1-Routines 2-Negotiation skills

2.3.5.1: Routines

Routines are defined by (ibid) as conventional ways of presenting information, so they are predictable and help ensure clarity. There are two main kinds of routines:

(A) Information routines such as stories; description of places and people; presentations of facts; comparisons; instruction. Information routines may be identified as:

logical, morphological, syntactic, or pragmatic. Such reductions constitute problems for students because they tend to use "full forms" . d. Performance Variables, Foreign and Second Language Learners are subject to hesitation, pauses, false starts, and correction. Teachers should help them to use hesitation markers "Uh, Um" i.e. Colloquial Language; it is very difficult for Foreign Language Learners to get used to the Colloquial Language (idioms, slang, and cultural knowledge, for instance). The practitioner's role here is to get his/her learners to use these forms to communicate fluently. f. Rate of Delivery the most important aim of foreign/ second language learners is fluent communication using the target language. Therefore, practitioners should aim at helping the learners to speak the language rapidly and fluently. g. Stress, rhythm and intonation all elements of pronunciation are essential to the English language since they convey meanings above the words meanings; Different aspects of pronunciation can be taught as well. h. Interaction helps a lot in developing learners' language. When negotiating meaning (giving feedback, asking for explanation) they learn new words and new structures.

2.3.2.2: The Features of Using Spoken Language

The features of using spoken form are dealt with in terms of what the speaker 'intends to mean' when using language i.e. Pragmatics, and in terms of what the speaker 'intends the listener to 'take' or 'to interpret the function of what is said' i.e. Discourse Analysis; Brown (1993: 231).

2.3.2.2.1: Pragmatics

According to Yule (2006) "Pragmatics is the study of 'invisible' meaning, or how we recognise what is meant even when it isn't actually said or written." i.e. speaker meaning. Paralanguage: can be spoken, can be written or it can be a mixture of the two. Different communicative behaviours (tone of voice; whisper, body language; smile/frown, wave hands, touch people, eye-contact etc.) are used alongside with language production because they help effective communication. For the rest see (Cook: 2010: 52, 116,117) and Brown (1994: 231).

In pragmatics, Cross-cultural communication is a difficult task to teach because of the contrast that exist between the different cultures, Mathews (1994: 202). The most important subdivision of Pragmatics is speech acts. Cook (2010:117) defines speech acts as "The action per-

EST learners' profile indicates that the method of teaching and the syllabus are not based on learners needs. Hence, the learners lack Communicative Competence that enable them to comprehend and use spoken discourse.

2.3.1: Definition of Communicative Competence

In Canale's (1983) definition, four components of Communicative Competence are highlighted:

1. **Grammatical Competence** is the accurate use of words and structures; the mastery of the linguistic code. 2. Discourse Competence is the complement of Grammatical Competence; it is the ability to combine sentences in stretches of discourse to form a meaningful whole out of a series of utterances. 3. Sociolinguistic Competence is appropriate use of utterances according to the social context i.e. the knowledge of the sociocultural rules of language and of discourse. This is the ability to produce and understand the utterance (the language) which is appropriate to the context in which they are uttered. 4. Strategic Competence is described by Canale and Swain (1980:30) as "The verbal and non-verbal Communication Strategies, (e.g. gestures) to compensate for breakdowns in communication due to insufficient Grammatical Competence or any other difficulties. Verbal Communication Strategies such as: "talking around" an unknown word, avoiding certain structures."

2.3.2: Definition of Speaking

Chaney (1998: 13) defines speaking as "The process of building and sharing meaning through the use of verbal and non-verbal symbols, in a variety of contexts". In order to exchange meanings for different purposes, and as preparation for speaking, EST learners need to master large number of vocabulary and structures.

2.3.2.1: Factors That Make Speaking Difficult and the Solutions

Brown (2001:270-, cited in El-Bel Chelbi: 2010) highlighted eight problems that make speaking difficult; they are a. Clustering, students tend to use word-by-word production because of memory limitation or lack of vocabulary. b. Redundancy as spoken language is redundant, learners are allowed to rephrase, repeat, and use hesitation markers such as "I mean" or "You know" from time to time during their Oral Production to be intelligible.

c. **Reduced Forms**: reduced forms in spoken discourse may be phono-

Background	•Recently completed secondary school •All Sudanese; similar language background (1st language is Sudanese Colloquial Arabic (SCA) •Males and females •Age range from18-21; they are conscious of learning English which has negative effect on learning/using it.
Previous learning and language level	•Learn English in a foreign language context (3hours per week) •Focus on reading and writing skills •Oral communication skills are neither taught nor tested •Learn science in their 1st language, so they have good command of their specialised contents •Master linguistic competence but lack communicative competence •Beginners level in spoken English •Some pronunciation and intonation problems
	•The teaching is teacher-centred; focus on forms of the language and on accuracy rather than on functions and fluency.
Present tuition details	•The teaching is teacher-centred; focus on forms of the language and on accuracy rather than on functions and fluency. • They are not taught how to use the language for the purpose of communication neither in social settings nor in their academic setting. •Lack of exposure to authentic discourse, no access to native speakers, no use of modern teaching techniques (no modern equipment…this results in unmotivated learners •Prescribed textbooks not relevant to their area of specialisation (they learn General English). Aspects of spoken language are neither taught nor tested). •Learn English 2 hours per week
Access to spoken English	•Large number of them do not use English neither inside nor outside the classroom. That was confirmed by the oral interview results. •Some students listen to English programmes on TV/radio such as news, films preferably
Learners' attitudes towards learning/ teaching	•As Oral Communication skills were not included in their previous learning experience, this has negative effect on using spoken discourse. •Combining English with Science is a great challenge and for some is demotivating. •Autonomous learning may have negative effect on some of them.

tools for study. The population of the study consisted of students of college of engineering- Majma'ah University. Interviews were also made with employees of Aramco and SABEC.

The study proved that the English language course that engineering professional study seem inadequate in relation to English language use in a work place. Moreover, they lack experience in using English in professional work environment. The recommendations were: classes should purposefully be made multi-lingual to force student to communicate in English. Making English as language of interface computer in school or college and popular digital, besides, teaching English, which is relevant to industrial work place situation and creating artificial work place environment within academic setting.

2.2.3: The third study was presented by Eiman Fatah Al-Aleem Mohammed Khalid (November 2015) on: "The Problems of Teaching ESP in the Sudanese Universities": A case study of four Sudanese universities'.

This study investigated the problems of teaching ESP in four of the Sudanese universities; namely, U of K, SUST, OIU and Ahfad University for Women. A questionnaire for ESP lecturers, and structural interviews for the heads of ESP departments. The results revealed that ESP lecturers are not trained, ESP syllabus content are insufficient and the learners' level at English language is low. The researcher recommended the following: lecturers' training in the field of ESP, and provision of sufficient ESP material course based on learners' needs. ESP syllabuses should be authentic.

Comment: the three studies were closely related to the current study as they deal with problems of using EST spoken needs. The findings were, to some extent, similar to findings of the current study in the sense that these learners are of weak-level language proficiency and the teaching materials used are not relevant to the learners' field of study. Moreover, ESP or rather EST teachers lack training.

2.3.0: EST learners' classroom profile

This classroom profile is intended to investigate the relationship between learners' needs and the teaching, to know the reasons behind the learners' problems. The idea of classroom profile is taken from (Burns and Joyce: 2002: 62) and adapted to the learning-teaching situation at SUST.

gance has no place in EST.

2.1.6: The Vocabulary of Scientific English

Scientific English vocabulary is of three types: 1- Technical Terms; words which are never used outside the realm of science. 2-Sub-Technical Terms/Semi-Technical Terms which are commonly met in general English but often change their 'normal' meaning and take a specialized meaning within a Scientific and Technical Context, e.g., cycle (its use in blood cycle).C. Compounding; a biologist also uses compound nouns; instead of saying: transmission of virus by seed; s/he says virus seed transmission.

2.2: Previous Studies

2.2.1: Three studies were explored; The first study was conducted by Fatah Al- Rahman Dafallah Abudur-Rahman (2007): 'ESP Learners' Needs, A Case Study of Medicine Students at Some Sudanese Universities'

This study investigated ESP learners' needs and their role in course design at some Sudanese universities; their needs divided into three categories; general needs, academic needs and job needs. The researcher adopted a descriptive and analytic methodology. The data were collected by using Al-Busairi's (1990) questionnaire. The findings revealed that EST courses are not relevant to the students' specialization and the learners are not motivated, besides, ESP teachers are unqualified, untrained and excessively loaded. Moreover, students needs differ according to their levels. The recommendations were designing a syllabus that meets the target group's needs and requirements in learning ESP, besides, improving listening skills, as it is the most needed skill. The use of authentic materials bridged the gap between Academic and Occupational English. This enables the learners to communicate effectively in both the academic field and work place in the future.

2.2.2: The second study was written by Ehab Fouad Ali Ahmed (2013) on 'ESP Needs Analysis; English Language Communitive Programs as Received by Engineering Specialists, Riyadh Area'.

This study investigated the English Language Communitive Needs of engineering professionals in Riyadh area. The study used the framework of needs analysis to investigate the extent of English use in the careers of engineering professional and the required level of the four skills in different activities. The researcher used three questionnaires as

and spelling [7] reading. Reading at this stage is important, as they need to read books and electronic material. At this stage, they need to write essays only. However, during work, these students will be required to write reports and engage in technical correspondence. [8] Symbols; they will be acquired in the technical class.

2.1.4: Features and Characteristics of EST

Different scholars highlight different features of EST discourse, Close (1965:8&9) points out the features and characteristics of the Language of Science and Technology (LST) concerning vocabulary, syntax and morphology.

1. Combination of ideas; examples: test-tube, i.e. lass vessel in the form of a tube, used for making test) or a grouping of nouns that has not been adapted as a compound (e.g. respiration occurs).

2. Words describing things i.e. indicating their shapes, measurements, properties, qualities or conditions. Such words are round, square, dry, wet, rough, smooth.

3. Names of things: science is concerned with matter, elements, substances, objects, solids, liquids and gases.

4. Expressions of impersonal activity: emphasis is on what happens to things, i.e. objectively, e.g. the liquid was examined and was found to contain X. 5. Style: EST contains statements of fact rather than expressions through imaginative figures of speech.

Trimble (1985:20) highlights various significant features stating that an EST text is concerned only with the presentation of facts and hypotheses.

1. Description: 2. Definition 3. Visual-verbal relationship: this is used for the purpose of illustration 4. Instructions: they are used to tell someone what to do and how to do something to achieve a certain goal. They are found in Technical Discourse usually in Technical Manuals. There are two types of instructions; [1] direct instructions, which are stated in the imperative, and [2] indirect instructions, which often sound more like suggestions than command. This type contains modal verbs: “can” “may” “should”, and sometimes “must”.5. Classification.

2.1.5: The Syntax of Scientific English

1- Frequent use of: the passive voice 2- declarative sentences and the present tense. The word “will” is used for judging or guessing but not for the future tense 3- long and complex Sentences. So stylistic ele-

it is normal language. The main reasons behind its emergence is the expansion in Science, Technology and Economy after World War II, besides, the focus on the learners and their needs. All definitions agree on teaching of English to specific group of learners who have specific purposes for learning the language. These purposes might be professional, academic or scientific. ESP developed in five stages according to Hutchinson & Waters (1987: 9-14). 1-Register analysis2-Rhetorical or discourse analysis 3-Target situation analysis (TSA) 4-Skills and strategies 5-Learning-centred approach. ESP is different from EGP in many ways; nevertheless, there is an overlapping between them, Widdowson (1983) establishes distinctive features of ESP and EGP to clarify their relation.

2.1.2: English for Science and Technology (EST)

The acronym EST is used to refer to English for Science and Technology, which emerged in the early 1960s with the emergence of ESP as it laid its basis. In the (1950s and 1960s) the term 'factual English' was used by many scholars to mean Scientific English i.e. the English which is used to convey scientific facts. Recently, the concept of Scientific English Discourse has been used with the advent of Communicative Language Teaching (CLT) in the 1970s." Chris Kennedy and Rod Bolitho (1985:4) state that English for Science and Technology (EST) is an important branch of ESP, which covers the areas of 1. English for Academic Purposes (EAP) which is taught within educational institutions for study in a specific discipline; involving pre-study, in-study, and post-study courses. 2. English for Occupational Purposes (EOP), which is taught in a situation where learners need to use English as part of their work or profession; involving pre-experience, simultaneous/ in-service and post-experience courses.

2.1.3: EST Learners' Specific Needs and Requirements

Michel West (1967: 95) presents the requirements of this group in eight aspects of language ability, in a spoken language they consists of five things: [1] economic structures [2] vocabulary capable of explaining meaning of technical field [3] pronunciation [4] intonation (standard intelligible pronunciation to deliver oral presentations and hold discussions [5] behaviourisms (delay words, polite clichés, gestures, wordless noises). For the written and printed English we must add: [6] writing

The rules that are required are the rules of Communicative Competence and our learners lack Communicative Competence which enables them to use the language (a) accurately (correct word and sentence structures), (b) appropriately (appropriate interpretation and production of L2), and (c) flexibly (use of communication strategies to compensate for difficulties) according to the social context.

1.3: Significance of the Study

EST spoken discourse is a vehicle of professional advancement and of business. Hence, it is necessary for EST learners to be able to speak with confidence to interact socially and to carry out most of their discussions, seminars etc. in academic settings and in their future work place. These students may also get in contact with English speaking people. Spoken Discourse is a neglected area in the field of ESP. Hence, this study will be of great benefit to ESP teachers and researchers.

1.4: Objective and Limit of the Study

This study aims at investigating the main problems encountered by EST learners when using Spoken Discourse. The study is confined to investigating problems of using EST spoken discourse encountered by EST learners in their first year of study at (SUST) from 2018 to 2019.

1.5: Question of the Study

1. What are the main problems that encountered by EST learners when using Spoken Discourse?

1.6: Hypothesis of the Study

1. EST learners encountered by many problems when using EST Spoken Discourse; they do not know how to begin, maintain and end conversations. They also do not know how to use cohesive and coherent utterances, appropriately and flexibly. Moreover, they do not know how to speak about their area of specialism in English.

2.0: Literature Review and Previous Studies

2.1: Literature Review

This part Surveys the area of English for Specific Purposes (ESP) and English for Science and Technology (EST).

2.1.1: English for Specific Purposes (ESP)

The acronym ESP stands for English for Specific (specified/special/specialised) Purposes. The word 'special' refers to specific aim/purpose for which the learners learn the language; NOT a special kind of language;

المستخلص

تهدف هذه الدراسة لتقصي بعض مشكلات استخدام الخطاب الإنجليزي الشفاهي العلمي ___ التكنولوجي وسط طلاب العلوم والتكنولوجيا. كما هدفت الدراسة لمعرفة المسببات الرئيسة لهذه المشكلات لإيجاد الحلول لها. يتكون مجتمع الدراسة من أربعين من أساتذة اللغة الإنجليزية: لأغراض خاصة الذين يعملون في مختلف الجامعات السودانية الحكومية والخاصة. استخدمت الباحثة استبانة، تمت تعبئتها من قبل أربعين من هؤلاء الأساتذة (ذكورا ،واناث)، كما تم تحليلها بواسطة الحزم الإحصائية للعلوم الاجتماعية. اتبعت الباحثة الطريقة التحليلية الوصفية لمعالجة البيانات. كشفت النتائج عن عدم قدرة هؤلاء الطلاب على استخدام الخطاب الإنجليزي الشفاهي بفاعلية وبطلاقة في بيئتهم الاجتماعية وفي مجال تخصصهم، وذلك يعزى إلى أنهم لم يدرسوا كيفية استخدام هذا النوع من الخطاب مما جعلهم غير معتادين على استخدامه، علاوة على أن هؤلاء الأساتذة والأستاذات ينقصهم التدريب في تدريس هذا النوع من الخطاب نسبة لأنه لم يوضع من ضمن احتياجات ومتطلبات هؤلاء الطلاب في منهجهم. كل هذا أثر سلباً على استخدام الخطاب الإنجليزي الشفاهي، ونتج عن ذلك عدم وجود دافعية لاستخدامه. أوصت الدارسة بضرورة تدريس وامتحان الطلاب في كيفية استخدام الخطاب الإنجليزي الشفاهي وضرورة استخدام نصوص من مجال تخصصاتهم، بجانب التعاون بين أساتذة اللغة الإنجليزية لأغراض خاصة وأساتذة مادة التخصص لتحفيز الطلاب لاستخدامه بنجاح.

الكلمات المفتاحية:القدرة اللغوية-القدرة الاتصالية-استخدام المعنى الخفي للغة-تحليل الخطاب.

Introduction :

The educational policy towards English language in Sudan has led to a continuous decline in the four language skills (Sandell: 1982). Moreover, Grammar Translation Method (GTM) has still been used which indicates that the learners do not have opportunities to practise speaking skills, and they are not widely exposed to the language since they learn English as a Foreign Language (EFL) i.e. a school subject. Nevertheless, most of them have sufficient knowledge of how the syntactic and lexical rules of English operate because GTM focusses on grammar. Therefore, most Sudanese learners encounter great difficulties when they want to use Spoken Discourse. Nonetheless, few studies were carried out in teaching Oral Communication Skills (OCS) with regard to ESP students.

1.2: Statement of the Problem

Sudanese EST learners know the rules of grammar but they cannot use the language for Oral Communication; Hymes (1972: 75) comments, “There are rules without which the rules of grammar would be useless”.

Problems of Using English for Science and Technology (EST) Spoken Discourse
A Case Study of 1st Year Students of Science and Technology at Sudan University of Science and Technology (SUST)

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Abstract

This study aimed at investigating some problems of using English for Science and Technology (EST) spoken discourse among EST learners. The study also attempted to know the main reasons behind these problems to suggest solutions for them. The population of the study were 40 EST practitioners both males and females who work in different Sudanese Universities, both governmental and private. For collecting data, a questionnaire was completed by the practitioners and analysed by using Statistical Package for Social Science (SPSS). A descriptive analytical method was adopted. The findings revealed that these learners lack the ability of using spoken discourse efficiently and fluently in their different social and academic settings. This inability is attributed to the fact that the learners are not accustomed to using this discourse because it is neither taught nor tested. Moreover, EST practitioners are not trained to teach this kind of discourse because it is not considered as part of the learners' needs and requirements in their syllabus. This affects the use of spoken discourse negatively. Hence, the learners are not motivated to use it. Teaching and testing of English spoken discourse besides, the use of authentic materials, co-operation between EST practitioners and the subject matter teachers were recommended to motivate learners to use spoken discourse successfully.

KeyWords: Linguistic Competence-Communicative-Competence-Pragmatics-Discourse Analysis

Contents

Articles Page

Editorial

In the name of Allah the most gracious and most merciful.

First of all, we would like to thank our honourable readers for welcoming our previous publications of this periodic journal. Also, we would like to thank you, honurable readers, for your invaluable comments and feedback, which have contributed to the improvement of our journal and would definetelly contribute to make our future work much better in this regard.

Thanks to Allah, here is the fourth edition of the Journal of the University of Marrawy for Technology. With a firm commitment and determination, we continued our efforts to improve the journal and can assure you that we will continue in the same way to make it much better in terms of design and content.

Further, its our pleasure to inform you that the electronic version of this journal will soon be released, based on Allah's will, and it would be made available and accessible everytime and everywhere.

As we put this Issue of the journal before you, may we kindly ask you to persistantly keep in touch and provide the journal with your inputs, especiallly scientific academic writtings of all kinds that your community needs.

Finally, we hope you find this issue of the journal very interesting.

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ISSN: 1858 – 8522 (print)
Title: Abdulatif Alhamad University of Technology
Journal Imprint: Sudan : Abdulatif Alhamad University of Technology، Merowe، 2017
Frequency : Bi annual
Type of publication : Periodical
Language : Arabic + English

MEROWE UNIVERSITY OF TECHNOLOGY-ABDULATIF ALHAMAD JOURNAL

REFEREED SCIENTIFIC BIANNUAL JOURNAL - Volume (4) - June 2019