iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 8 **Issue:** VII **Month of publication:** July 2020

DOI: http://doi.org/10.22214/ijraset.2020.7012

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue VII July 2020- Available at www.ijraset.com

Water Resource Management Approaches for Sustainable Development in Kipkelion West Sub-County, Kenya

Sitienei Anne
Department of Environmental Studies, University of Kabianga, Kenya

Abstract: ***Although water is an important resource, it is threatened by anthropogenic activities both nationally and globally. Therefore, the present study sought to establish management strategies used in water resource management in Kipkelion West Sub-County within Kericho County, Kenya. The study population comprised of households and water management agencies within Kipkelion West Sub-County. A total of 394 households were randomly sampled for the study while purposive sampling technique was used in selecting 10 key informants for interviews. The study area was in Kipkelion West Sub-County within Kericho County in Kenya.***

Household questionnaires and interview guides were used in the data collection. The validity and reliability for the instruments was determined and adjusted through piloting and triangulation methods. Descriptive statistics was employed and results were then presented in graphs, charts and tables.

Findings from the study showed that the main sources of water in Kipkelion West Sub-County were; Rivers and Streams at 48%, Springs at 22%, rain water collection at 17%, piped water at 5%, water vendors at 3%, water piped to dwellings at 2% and wells, ponds, boreholes and dams at 1% each.

In addition, the strategies for managing water resources in Kipkelion West Sub-County can be divided into pollution management strategies at 44%, supply and demand management strategies at 25%, scarcity management strategies at 18%, quality management strategies at 9%, and conservation management strategies at 5%. Taken together, there is need to develop new strategies and approaches for managing the available water resources.

Keywords: Water; sustainability; Kipkelion; Strategies

I. INTRODUCTION

Undisputedly, water is one of the most important resources that the environment has to offer (IWMI, 2007). In the year 2000, the United Nations' assembly passed the Millennium Development Goals (MDGs) in which Goal 7 was interested in ensuring that there is sustainability of the environment. This sustainability included the availability of water, its conservation and sustainability (UNDPI, 2013). Ironically, an estimated number between 350 – 600 million people living in Africa is projected to face water crisis by 2050. At the moment, one third of the global population are found in areas that experience water problems and the water supplies in such areas is 10% lower than the demand (Annan, 2000; Arnell, 2004). In the early months of 2018, water crisis was reported to have hit several towns in Kenya including Nairobi, Nakuru, Kakamega, Mombasa, Kericho, Migori, Bungoma, Muranga and Eldoret towns, the crisis culminated blamed on climate change that has seen rains dissappear, destruction of forests, poor management of the resource and a bulging population (Xinhua, 2018).

Despite the existence of fragmentation in water management governance, and coordination among water related agencies in Kenya, there is still a disconnect between environmental policies on water management and their implementation strategies. Kenya for example, has ideal water policies that when efficiently adhered to would lead to a properly utilized and sustained water use in the environment but the methodologies that are in place to enforce these policies usually lack the anthropological dynamics and consideration.

Water resource management in Kipkelion West sub-County is a preserve of the ruling leaders with WRMA and NEMA as the main body involved in its management. However, the entire Ministry of Water and Irrigation is also working hand in hand with other ministries like Ministry of Environment, and Natural Resource in water resource management but little involvment of community participation in implementation has been addressed. In that connection, effective water conservation strategies are therefore those that ensure inter-seasonal availability of water and effective management of the available water resources. This study was carriedout to determine

©IJRASET: All Rights are Reserved

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue VII July 2020- Available at www.ijraset.com

II. RESEARCH METHODOLOGY

A. Study Area

The study location was Kipkelion West Sub-County in Kericho County, Kenya. Kericho County is located in Western Kenya with its capital at Kericho Town. The County has a land area of about 2,455 kilometers square and a total population of 752,396 according to the 2009 census (KNBS & SID, 2013). The county has a poverty rate of 44%, urbanization of 28% and literacy of 79% (KNBS, 2018). Most of the water issues in the Sub-County and Kericho County as a whole is managed by the Department of Water, Environment and Natural Resources and Lake Victoria South Water Services Board officially situated in Kericho town. Below is a map of Kericho County.

B. Population and Sample size

The study targeted all households (24512) within the study area and other stakeholders in water resource management (KEWASCO, WRMA, NEMA, Sub-County Water Office and Lake Victoria South Water Service Board). A sample size of 394 was used in the study according the formular by Nausima (2000);

$$n = \frac{N}{1 + N(e)^2}$$

Where; n = Sample size
N= total number of households and
e = is the level of precisionat 5%

C. Research Instruments

The study employed both questionnaires for household respondents and interview guides for stakeholders

1) *Household Questionnaires:* The questionnaires were used since they are easy to administer and can be answered easily and quickly by the respondents (Ary et al., 2006). The questionnaires were the main data collection instrument in achieving the three objectives of the study. The questions were structured specifically to answer the research question on management strategies, used in water resource management in Kipkelion West Sub-County.
2) *Other stakeholders' Interview Schedule:* As defined by Avoke (2005), interviews are qualitative in-depth interviews that targets people who are widely knowledgeable concerning a given topic under investigation in this case water resource management. The interview guide was designed for officers from KEWASCO, WRMA, NEMA, Sub-County Water Office and Lake Victoria South Water Service Board who are directly charged with the responsibility water resource management give general information related to water resource management in the study area.

D. Instrument Validity and reliability

Generally, instrument validity is a measure of the accuracy of the instrument. To be precise, Orodho (2004) defined validity as the ability of a given instrument to measure what it is intended to measure. On the other hand, Reliability deals with the level at which the research instruments used in a study can produce consistent results after repeated trials (Amin, 2005; Kothari, 2011). The present study validated its instrument through triangulation, which is the use of more than one method in data collection (questionnaires, interview schedule and observation). Triangulation was useful in showing concurrent validity of qualitative and quantitative data. (Cohen *et al.*, 2000). In addition, randomization procedure that was used in selecting the study samples with an objective of eliminating biasness. To test for reliability, the instruments were pre-tested for reliability using Cronbach's alpha (α) approach during the pilot study. In order to ascertain reliability of the research instrument, the numbers construct for each variable were expanded. An alpha value was expected to be greater than 0.7 to be accepted as reliability index as indicated by Litwin (1995).

E. Data Collection Procedures

The data required to meet the objectives of this study was mainly collected using questionnaires as it provides respondent's an opportunity to give feedback significantly.

The questionnaires were issued at random to respondent in Kipkelion West Sub-County and their location noted down in case of callbacks. Each respondent shall have up to 24 hours to fill and the questionnaires were collected the following day. The allocated time was adequate for one to analyze and fill in the information needed for this study. The questionnaires were issued sequentially following the Ward boundaries and collected sequentially too. There was a keen bias toward water management institutions where key informant interviews were conducted. Field observation was also done near water resources.

©IJRASET: All Rights are Reserved

F. Pilot Testing of Research Instruments

Before the actual data collection, the researcher conducted a pilot study in one of sub-counties in Kericho County. The Sub-County was chosen such that it depicts similar characteristics as the one under study. The main aim of the pilot study was to enhance validity and reliability of the research instruments (Creswell, 2012). A test-retest method was used in determining the suitability of the research instruments as provided by Pearson Product Moment Correlation Co efficiencies. A correlation coefficient of above 0.70 was deemed reliable (Cohen & Manion, 2007).

G. Data Analysis and Presentation

Descriptive statistics was used in the data analysis. This entailed the use of frequencies, percentages, means and standard deviation (SD) to give the overall description of the opinions of the respondents. Results were then represented inform of tables and figures.

III. RESULTS AND DISCUSSION

A. Sources of water in Kipkelion West Sub County

From the collected data, there were 10 main sources of water in Kipkelion, West Sub County. These are rivers, streams, springs, rain water collection, piped water, water sold by vendors, water piped directly into dwellings, wells, ponds boreholes and dams. Table 1 lists these sources from the most frequent to the least frequent with their respective percentages.

Table 1: Sources of Water in Kipkelion West Sub-County

	Water Source	Frequency	Percentage
1	Stream/River	166	48%
2	Springs	76	22%
3	Rain Water Collection	58	17%
4	Piped water	17	5%
5	Water vendors	11	3%
6	Piped into dwelling	7	2%
7	Well	5	1%
8	Pond	5	1%
9	Boreholes	3	1%
10	Dam	1	0%
	TOTAL	349	100%

B. Unimproved vs. Improved Sources of Water

The sources on Table 1 were further categorized under improved and un improved. Improved sources where considered to be sources like boreholes, piping and rainwater collection where deliberate human effort had been applied to make the sources available. Unimproved sources on the other hand were sources like natural rivers, streams, springs and natural ponds where very little human effort had been made to make these sources available. The data relevant to this information was analyzed per Ward and is as presented in the Figure 1

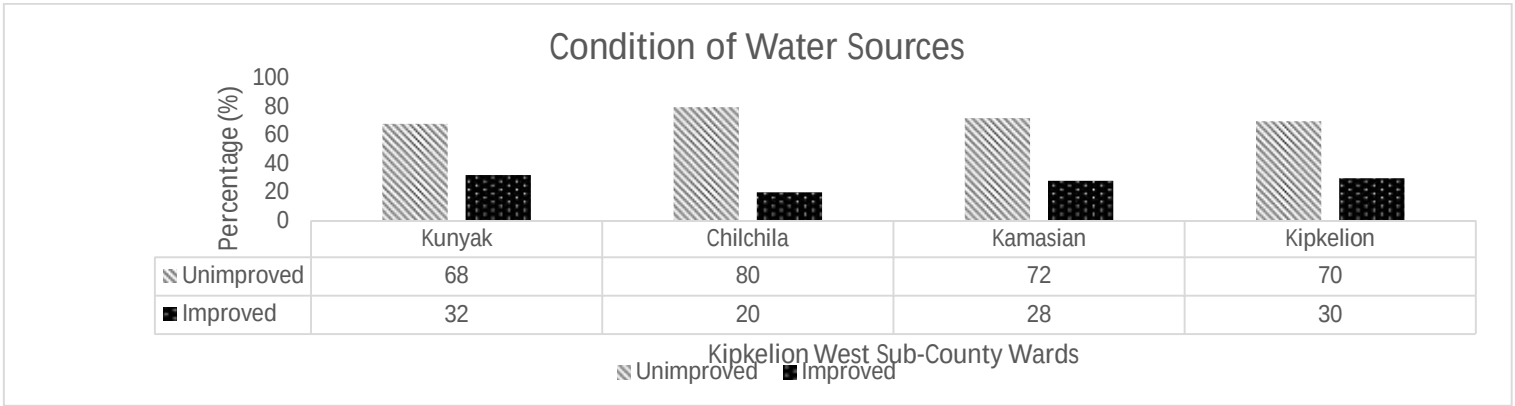


Figure 1: Unimproved vs. Improved Sources of Water

©IJRASET: All Rights are Reserved

From the figure above, it can be noted that Chilchila had the highest percentage of households relying on unimproved sources of water at 80% of the total population. This was 12% more as compared to Kunyak that was at 68%. The study attributed this to the fact that Chilchila had more households than Kunyak and would consequently have a higher user per source ratio.

The geographical positioning of the Wards, the infrastracture and the amenities within the Ward also seemed to have an effect on the level of improvement done on the water sources. This is why Kunyak for example having a better road access showed slightly better performance in terms of water sources improvement than Chilchila that had poor road access.

C. Sustainability of the Water source in the Area

Majority of the respondents (>80%) had permanent sources of water for domestic use. On the other hand, minority of (<20%) used seasonal sources of water whose duration of unavailability ranged from 1 to 3 months whereas the distance to the alternative source of water ranged from 500 Meters to 3 Kilometers.

D. Strategies, Used in Water Resource Management in Kipkelion West Sub-County.

Interestingly, most water resources in Kipkelion West Sub-Country regardless of the ownership regime are open for use by the adjacent communities and without a fee most of the time. The generosity stems from the indigenous culture of the predominantly Kipsigis inhabitants. They believe that water should be given for free because it is a basic need and has been given by nature free of charge.

This thus leads to people opening up beaten paths on their land to water sources like rivers, streams and springs endowed to them. When one household constructs an improved water source like a well or borehole, the surrounding households are usually automatically allowed to once again access the new water resource free of charge.

Observations made determined that whereas this common sharing of water as a resource improved the availability and access to water in Kipkelion West Sub-County, it gave rise to the tragedy of the commons (Hardin, 1968). This is a situation that arises when there are many people utilizing a resource but very few or none of the users managing the same resource. This section deals with the management of these resources to the level of awareness of the respondents.

E. Deliberate Strategies put in place for the water Resource Management

Respondents were asked to state to the best of their knowledge if there were any deliberate efforts put in place to manage the available water resources in their area. Table 2 shows a summary of the responses.

Table *2*: Efforts in place to manage the resources

Response	Frequency	Percentage	Cumulative	Percentage
Yes	57	16%	57	16%
No	235	67%	292	84%
Maybe	13	4%	305	87%
Not sure	27	8%	332	95%
Nonresponse	17	5%	349	100%
TOTAL	349	100%		

It is clear that more than a third of the sampled population did not believe that there were any measures put in place to manage water as a resource. This must have been as a result of the fact that water resources are highly shared with fewer people taking care of them as compared to the people utilizing them. It might even be concluded from this data that at least 60% of the population in Kipkelion West Sub County does not take part in the management of water as a resource. If they did, then they could have known that there were strategies that existed to manage the resources as the 16% of the population who had an idea about the strategies in place.

©IJRASET: All Rights are Reserved

The 16% who knew of strategies in place to manage the available water resources had suggested strategies that fell under 6 different categories as shown in Table 3

Table 3: The Categories of Water Resource Management Strategies in Kipkelion West Sub-County

	Category	Frequency	Percentage
1	Pollution management	25	44%
2	Supply management	12	21%
3	Scarcity management	10	18%
4	Quality management	5	9%
5	Conservation management	3	5%
6	Demand management	2	4%
	TOTAL	57	100%

From the table, it can be seen that 53% (44% pollution management and 9% quality management) of the strategies were geared toward making sure that the available water resources were not polluted. The main agents of pollution included human activities like farming around the sources, river bathing and other forms of misuse that led to both soil and chemical pollution of the water sources. Natural water pollution agents like heavy rains that led to erosion that deposited sediments into the water sources were also some of the challenges that the pollution mitigation strategies needed to address. The 44% of the strategies therefore mainly included planting reeds and grasses around the water source in order to keep water pure and free from erosion contaminants. Springs were also strategically cemented to keep the water clean and fenced to prevent animals from directly accessing the springs. The leadership of the respective areas also strictly required the inhabitants to appropriately use the endowed water resources. For example, in Chilchila Ward, the Chiefs were strict about people bathing and washing clothes next to rivers for the argument that it led to downstream pollution. There was an example in Kunyak where a bathroom was strategically built next to the river to encourage the inhabitants to use the bathrooms instead of directly bathing in the river.

The 21% supply management strategies and the 4% demand management strategies involved ensuring that the water resources could efficiently serve the dependent population. This efficiency is in terms of the quantity of water in relation to the available dependent population, the ease of access to the water resource and the number of people that could use a certain resource simultaneously.

To increase the quantity of water available, strategies like water harvesting and resource improvement were used. The ease of access was most of the time addressed by maintaining a clear road to the water resources. Such roads sometimes passed through privately owned land. There were times the water resources itself could be found in privately owned land but the adjacent inhabitants would still be allowed to utilize. Simultaneous use at the source was mostly managed by increasing the number of water outlets like pipes and taps at the water resource.

The 18% scarcity management strategies were mainly explored during the dry seasons when the seasonal sources had all dried up and there was increased dependence on the permanent sources. In such a case, most households practiced water storage. There was usually an increase in water vendors at this stage and an increase of water outlets at the permanent sources. People with private boreholes or wells would open them up to the public during the scarcity management seasons. There are however instances of misuse where the residents do not follow any resource management. These include the direct watering of animals in the river that negatively impact on the water quality downstream.

IV. CONCLUSION

In conclusion, the strategies for managing water resources in Kipkelion West Sub-County can be divided into pollution management strategies, supply and demand management strategies, scarcity management strategies, quality management strategies and conservation management strategies. There is need to develop new strategies and approaches for managing the available water resources. The new strategies should be participatory in nature and involve not only the relevant stakeholders, but also the community members as the main users of the resource.

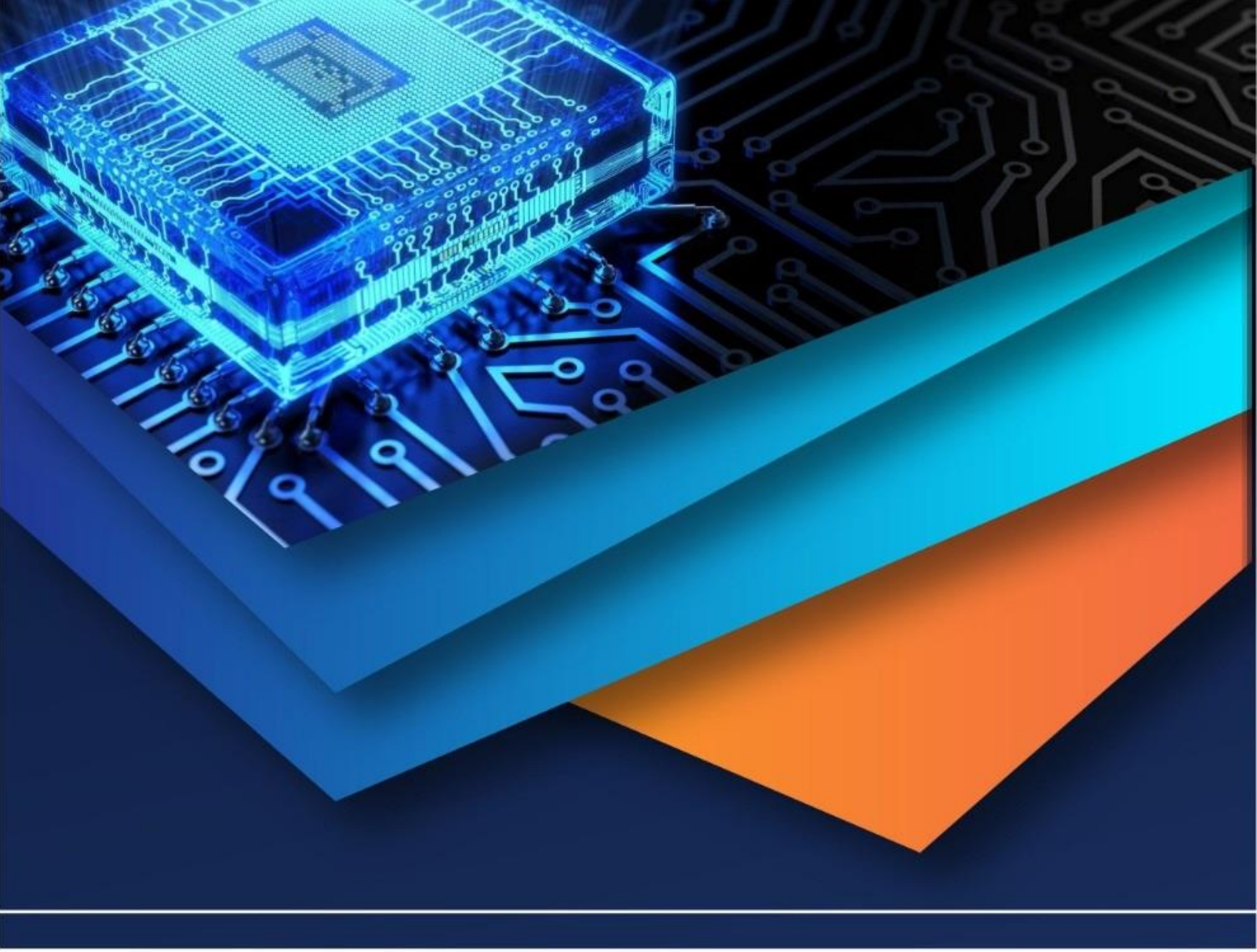
1) Conflict of Interest: The author declares that no conflict of interest exist.

©IJRASET: All Rights are Reserved

REFERENCES

[1] IWMI. (2007). Water for food Water for life: A Comprehensive Assessment of Water Management in Agriculture. London: International Water Management Institute
[2] UNDPI. (2013). We Can End Poverty: Millenium Development Goals and Beyond 2015. United Nations.
[3] Annan, K. (2000). We the Peoples: The Role of the United Nations in the 21st Century. Report prepared for the Millennium Summit.
[4] Arnell, N. W. (2004). Climate change and global water resources: SRES emissions and socioeconomic scenarios. Global Environmen Chang, 14, 31- 52.
[5] Xinhua. (2018, February 20). Water crisis hits major towns as rivers dry up. Retrieved from Business Today: https://businesstoday.co.ke/water-crisis-hits-major-towns-rivers-dry/
[6] KNBS. (2018, February 13). Kericho County. Retrieved from Society for International Development: http://inequalities.sidint.net/kenya/county/kericho/
[7] Avoke, M. (2005). Special education needs in Ghana: Policy, practice and research. Winneba: Special Educational Books. Department of special education, University of Education, Winneba Ghana
[8] Orodho, J. A. (2004). Techniques of writing research proposals and reports in education and social sciences. Nairobi: Masola Publishers.
[9] Amin, M. E. (2005). Social science research: Conception, methodology and analysis. Makerere University.
[10] Kothari, C. R. (2004). Research methodology: Methods and techniques. New Age International.
[11] Cohen, J. A. S., & Semple, R. J. (2000). Mindful parenting: A call for research. Journal of Child and Family Studies, 19(2), 145-151.
[12] Litwin, M. S. (1995). How to measure survey reliability and validity (Vol. 7). Sage.
[13] Cohen, L., Manion, L., & Morrison, K. (2007). Observation. Research methods in education, 6, 396-412.
[14] Creswell, J. W. (2012). Educational research: planning. Conducting, and Evaluating.

©IJRASET: All Rights are Reserved



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)