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# Optimum Utillization of Water Case Study Wadi Nyala South Dar Fur State

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**Abstract:**

The concept of Water Resources Management (WRM) was applied to study the integrated water resources management in South Dar Fur in Western Sudan. This concept was selected because it is straight forward, simple, and logical. The required data was the determination of domestic water, industrial water and agricultural water uses. This approach required the application of advanced statistical models' simple statistical models, as well as sophisticated softwares. The required data included determinations and calculations of averages, standard deviations, beside the more sophisticated statistical parameters such as coefficient of variation, skewness and their corrections. The software applications paved the road towards the solution of the problems going parallel with fulfilling the objectives. Furthermore, it created an expected integrated water resources management body in South Dar Fur State, to travel parallel with the expected present and future population growth.

Keywords: Integrated, Deviations, Variation, Skewness.

## 1. Introduction :

It is well known that water is basic for life and economic developments. Consequently, international conferences such as Mar Del of 1977 were focused on and recommended that industrial arrangement should ensure development and management of water resources. In 2000 Global Water Partnership (GWP) defined IWRM as a process of developed management of water maximizing economics and welfare.Dublin important four principles, were use of fresh water as a finite resource, water management based on a participatory approach, women have important role, and water management is repeated to be an economic good. Long time ago Integrated Water Resources (IWR) was practiced, but Integrated Water Resources Management IWRM emerged as a recent technique. It became known that water demand and supply are unbalanced. Water supply management without social, ecosystem economics,impacts are insufficient.The international organizations associated with their stake holder organizations genuine wide spectrum were challenged. They divided integrated water resources management broadly into two parts.Integrated Water Resources (IWR), was considered with the integration of rain water, surface water, and ground water. The study was focused on the qualitative quantitative water which was the objective of another research. This research conception dealt with the Water Resources Management (WRM). mainly focusing on the main three different types of water namely domestic use, industrial use and agricultural use.

## II.Methods And Material :

### A. Study Area:

The study area is South Dar Fur State. Figure (1), shows the map of the Sudan including South Dar Fur State. South Dar Fur State is connected via high way roads with Khartoum and Port Sudan. South Dar

State is sometimes suffering from drought because it lies in an arid and semi arid region. Water sources in South Dar Fur State are mainly from Wadis such as Wadi Nyala. In South Dar Fur State rainfall is erratic variable and not reliable South Dar Fur State is located between longitudes 12.00,12.04 N and latitudes 24.50, 24.57 E . The total area of fertile land or arable land in South Dar Fur State is estimated as 125 thousand feddans. South Dar Fur State cultivates many crops, such as beans millet, ground nut, and sorghum.

## B. Methodology

The areas of South Dar Fur State, with its rural and urban areas are located in the vicinity of Wadi Nyala. It included metrological stations, population, geology and demography of South Dar Fur State. It is covered by the geographic information system. The data considered, population, the distribution of which is concentrated on Wadi Nyala banks. The population of South Dar Fur State increased continuously with a constant rate of 10 % back to 9 %. South Dar Fur State depends on wadies including Wadi Nyala as a source of water; with its cities and villages spread along their banks. South Dar Fur State has great potentials of water that is not exploited. It is one of the States that has the greatest area of desertification in the Sudan. The required data to be collected in IWM consisted of domestic, industrial and agricultural water supply. The population data is essential forming the main beneficiaries of the study objective. It is fortunate that the quality of the three types of water rain surface and ground water in the River Nile State was tested according to the Sudan by laws and WHO and was perfectly suitable for use.

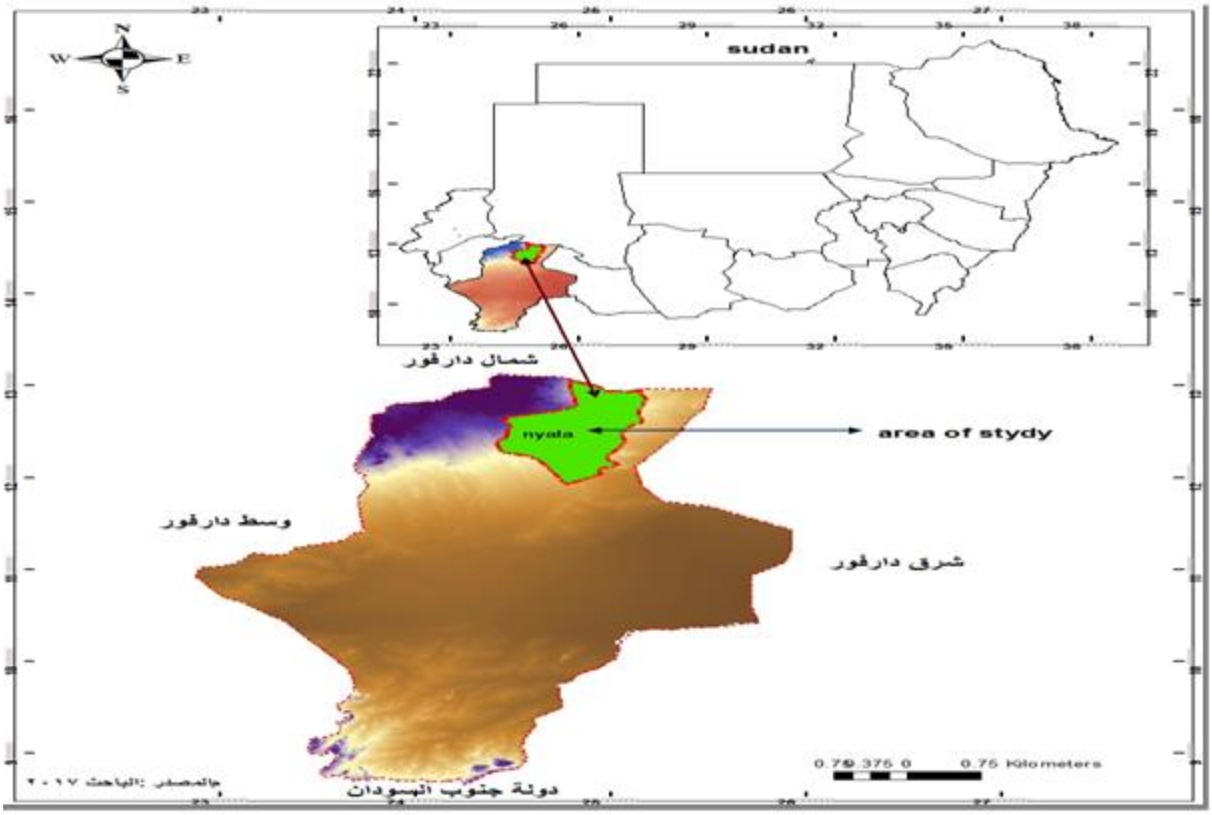


**Fig. No. (1): Map Of Sudan Including South Dar Fur**

## C. Data Collection and Analysis :

Suitable programs were used to analyise the data obtained from the Local and Federal Governments. Modeling was essential which led to the achievements of the research specific objectives. The achievements included qualitative determination of domestic and industrial water together with agricultural water in the state. It was possible to be used revealing capacity building needed to technical staff to develop the area of South Dar Fur State. However, care was focused on water estimation only, forming the part of the objectives. This study involved using Statistical Package of Social Sciences (SPSS). (SPSS) is a software that can analyze most types of data. It can take two mutually exclusive values of a variable in two aspects. It could also be original scaled data, usually programmed as questionnaires, interval or, ratio data. The data used in this study are interval and ratio data. (SPSS) is suitable software, because it is easy and accurate (Andrew Garth-2008). Some advantages of (SPSS) are that it can find both means and medians. It can also graph data on a box plot, showing both level and spread indicating any outliers. Furthermore, it also reveals the differences or correlation between elements of the available data.

## III. Results And Discussions:

Table (1), shows the population growth and future forecast of South Dar Fur State. There was a noticed population steady increase since 2006 to date. From 2018 and future the increase is steady at the rate of 10 % then 9 %, being suitable and logical with the existing circumstances of accepted new resolution and peace.

**Table No. (1): Population in South Dar Fur.**

| Year | Total Population Thousand | Population Growth % |
|---|---|---|
| 2006 | 335 | - |
| 2013 | 4.65 | 13 |
| 2018 | 1522 | To date.10 |
| 2023 | 2341 | 9 |
| 2025 | 2782 | 9 |
| 2028 | 4281 | 9 |
| 2033 | 6588 | 9 |

To improve and develop the South Dar Fur State it was found vitally necessary to use the available cultivable land properly. The people must be encouraged by the local and central Federal Governments to stay with the challenge that they must enjoy better chances of living using the (**IWRM)** as an effective tool. Balanced development in urban and rural religions in the state, must be carefully supplemented. **Hec-HMS** use of software or simple and advanced statistical models should be applied. These ambitious suggestions must be strengthened with adoption of a policy directed against desertification through stakeholders, including **NGOs** and association with awareness spread, being the well-known tools that help in (**IWRM)** in the state. These last ambitious changes which are adopted in this research are considered the keys leading to solution of the problems and fulfilling the objectives to create an integrated water management body in the South Dar Fur State. This excellent and intelligent technique should travel parallel with the expected present and future population growth. Using the collected data and analysis, applying simple correlation regressions analyzing the results of the analysis and its effects on the South Dar Fur State problems, further in-depth discussion was found necessary. More advanced analysis was conducted, and discussed in relation with (**IWRM)**. The advanced discussion included some simple and advanced statistical model analysis. These included beside the means, standard deviations, the more sophisticated statistical parameters such as coefficient of variation, skewness and their corrections. They involved use of the famous statistical tables of Foster Hazin and Fuller equations. The use of these model equations together with the known statistical coefficient and parameters has paved the road of fulfilling the study objective together with their inherently knitted problems. (Murray R. Spiegel,1972, New York, Schaums Series). Table Hazin, together with Foster table (I) and Foster table (III), are given in appendix (I). are available in many hydrological text books.

The average value of any statistical relevant parameter given as for example the discharge (Q), by the equation: -

$$Average\ \text{Discharge}\ (\text{Q}) = \frac{\text{Sum of the Q s}}{\text{n}} = \bar{Q} \ ---(1)$$

Or

$$Average\ \text{Rainfall}\ (\text{P}) = \frac{\text{Sum of the P s}}{\text{n}} = \bar{P} \ ---(1)$$

Where: -

$\bar{Q}$ = The average discharge per year $m^3 / year$ or average rainfall in mm./year.

$n =$ The number of years of records.

$$S\tan dard\ \text{Deviation}\ \sigma = \sqrt{s} = \sqrt{\frac{\sum_{i=1}^{20}(Q_i - \bar{Q})^2}{20-1}} ---(2)$$

$for\ rains$ Q is substituted by P

(Murray R. Spiegel, 1972, New York, Schaums Series)

$$Coefficient\ \text{of variation}\ = C_v = \frac{\sigma}{\bar{Q}} ---(3)$$

$$Skewness\ \text{coefficient}\ C_s = \frac{\sum_{i=1}^{20}\left[\frac{Q_i}{\bar{Q}} - 1\right]^3}{(20-1)C_v^3} ---(4)$$

$$Corrected\ \text{skewness factor}\ C_s' = F \times C_s ---(6)$$

(Murray R. Spiegel,1972, New York, Schaums Series)

The discharge for recurrent return periods is obtained by the equation: -

$$Q = \bar{Q}(P_m C_v + 1) ---(7)$$

As in the table

$$Best\ \text{solution in the table}\ (2)$$

**Table No. (2): Discharge For Recurrence Period Foster (I)**

| P | %age Probability | 20 | 5 | 1 | 0.1 |
|---|---|---|---|---|---|
| I | $C_s' =$ | | | | |
| II | $I \times C_v$ | | | | |
| III | $II + 1$ | | | | |
| IV | $III \times \bar{Q}$ | | | | |
| V | $Trecurrence - period$ | 5 | 20 | 100 | 1000 |

$$T\ \text{- Recurrence} - period = \frac{100}{P_m} \rightarrow e.g. \frac{100}{20} = 5\ \text{years}\ ---(8)$$

$$and\ \text{P \% age Probability} = \frac{100}{\text{T}} \rightarrow \text{e.g.} \frac{100}{5} = 20\ \% ---(9)$$

The above is the application of Foster table (1); the same is applied on Foster (III) and Hazin tables.

Fuller equation is expressed as: - (Murray R. Spiegel, 1972, New York, Schaums Series)

$$Q_T = \bar{Q}[1+0.80\log\ T]---(10)$$

$Q_T = Expected$ discharge after $(T)$ years.

$\bar{Q} = Average$ discharge during $(t)$, *years* of records.

- **Application Of The Concept Relation Among The Three Water Supply Types And Wrm: -**

According to the data collection in South Dar Fur State the three types of water domestic water, agricultural water, and industrial water are available. The statistical analyses were applied on the three of them.

The three sources of the three types of water data of South Dar Fur State are studied using the concept relation among the three water resources and WRM. South Dar Fur State swings between repeated droughts. This is translated into harmful effects on agriculture. It has also deep and profound effects on industrial and domestic water in Wadi Nyala and other wadies in South Dar Fur State, together with painful low groundwater recharge resulting from short rainfall periods.

- **Domestic Water: -**

Table (3) presents South Dar Fur domestic water data,and_table (4):presents South Dar Fur State statistical analysis total domestic water.

**Table No. (3): Present South Dar Fur Domestic Water Data**

| Year | Yield | Year | Yield |
|---|---|---|---|
| 1993 | 2.592 | 2006 | 3.96 |
| 1994 | 2.592 | 2007 | 3.992 |
| 1995 | 0.285 | 2008 | 3.672 |
| 1996 | 0.285 | 2009 | 5.205 |
| 1997 | 3 | 2010 | 4.32 |
| 1998 | 3.2 | 2011 | 4.185 |
| 1999 | 3.11 | 2012 | 5.184 |
| 2000 | 2.592 | 2013 | 4.535 |
| 2001 | 0.3 | 2014 | 4.497 |
| 2002 | 3.21 | 2015 | 1.073 |
| 2003 | 3.05 | 2016 | 3.403 |
| 2004 | 3.11 | 2017 | 0.208 |
| 2005 | 5.04 | | |

**Table No. (4): South Dar Fur State Statistical Analysis Total Domestic Water**

| Expected Population | P %age Probability | Years | Foster I | Foster III | Hazin | Fuller | Average |
|---|---|---|---|---|---|---|---|
| 2341 | 20 | 5 | 4.30 | 4.26 | 4.34 | 4.77 | 4.42 |
| 4281 | 10 | 10 | 5.38 | 5.35 | 5.47 | 5.51 | 5.43 |
| 6588 | 6.7 | 15 | 5.73 | 5.73 | 5.86 | 5.94 | 5.82 |

❖ **Agricultural Water: -**

Table (5) presents South Dar Fur agricultural water data, and table (6): presents South Dar Fur State statistical analysis total agricultural water.

**Table No. (5): Present South Dar Fur Agricultural Water Data**

| Year | Quantity of water |
|---|---|
| 2014 | 0.951 |
| 2015 | 0.977 |
| 2016 | 0.980 |
| 2017 | 0.980 |
| 2018 | 0.237 |

**Tables No. (6): Statistical Analysis Total Agricultural Water South Dar Fur State**

| Population Million | P %age Probability | Years | Foster I | Foster III | Hazin | Fuller | Average |
|---|---|---|---|---|---|---|---|
| 2341 | 20 | 5 | 0.967 | 0.913 | 1.144 | 1.286 | 1.08 |
| 4281 | 10 | 10 | 1.328 | 1.055 | 3.639 | 1.485 | 1.88 |
| 6588 | 6.7 | 15 | 1.480 | 1.280 | 6.135 | 1.601 | 2.62 |

❖ **Industrial Water: -**

Table (7) presents South Dar Fur industrial l water data, and_table (8): presents South Dar Fur State statistical analysis total industrial water.

**Table No. (7): Present South Dar Fur Industrial Water Data**

| Year | Quantity of water |
|---|---|
| 2014 | 0.686 |
| 2015 | 0.644 |
| 2016 | 0.722 |
| 2017 | 0.718 |
| 2018 | 0.214 |

**Tables No. (8): Statistical Analysis Total Industrial Water South Dar Fur State**

| Population Million | P %age Probability | Years | Foster I | Foster III | Hazin | Fuller | Average |
|---|---|---|---|---|---|---|---|
| 2341 | 20 | 5 | 0.692 | 0.664 | 0.629 | 0.931 | 0.729 |
| 4281 | 10 | 10 | 0.930 | 0.787 | 0.787 | 1.075 | 0.895 |
| 6588 | 6.7 | 15 | 1.008 | 0.910 | 0.946 | 1.159 | 1.005 |

❖ **Investigation of Wrm: -**

It is well known and logical to assume that the consumption of water to be 150,150 and 1500 liters per person per day respectively in arid and semi arid regions as that of the South Dar Fur State.

According to the above analysis of the three types of water domestic, agricultural and industrial the following calculations are conducted as shown in table (9).

**Table No.(9)Estimated Water Using the Concept of Wrm**

| Item | Recurrent Period | Type of water | Probability % | Quantity m $m^3$ | Population Million |
|---|---|---|---|---|---|
| 1 | 5 | Domestic Water | 20 | 4.42 | 2.341 |
| | 10 | | 10 | 5.43 | 4.281 |
| | 15 | | 6.7 | 5.82 | 6.588 |
| 2 | 5 | Industrial Water | 20 | 0.729 | 2.341 |
| | 10 | | 10 | 0.895 | 4.281 |
| | 15 | | 6.7 | 1.005 | 6.588 |
| 3. | 5 | Agricultura Water | 20 | 1.08 | 2.341 |
| | 10 | | 10 | 1.88 | 4.281 |
| | 15 | | 6.7 | 2.62 | 6.588 |

Exanimation of table (9) depicts the summary of the total water available within South Dar Fur State. Table (10), is obtained from table (9) as calculated to obtain the result of **(IWRM)** from the **(WRM)** concept.

**Table No. (10): Result of (IWRM) From (WRM) Concept.**

| Item | Recurrent Period | Probability % | Total Quantity Domestic + Agricultural + Industrial m $m^3$ | Population Million | Share per Person $m^3$ |
|---|---|---|---|---|---|
| 1 | 5 | 20 | 6.229 | 2.341 | 1.00 |
| 2 | 10 | 10 | 8.21 | 4.281 | 1.99 |
| 3 | 15 | 6.7 | 9.45 | 6.588 | 1.49 |

The optimum quantity of water per person per day is

150 +150+1500 = 1800 liters

Hence the optimum quantity per person per year is = 18 00 x 365

$$= 6\,57\,000 \text{ Liter} \quad = \quad 657 \quad m^3 / year$$

It is important to refer to the graphs in appendix (G) from which is detected figure (2).

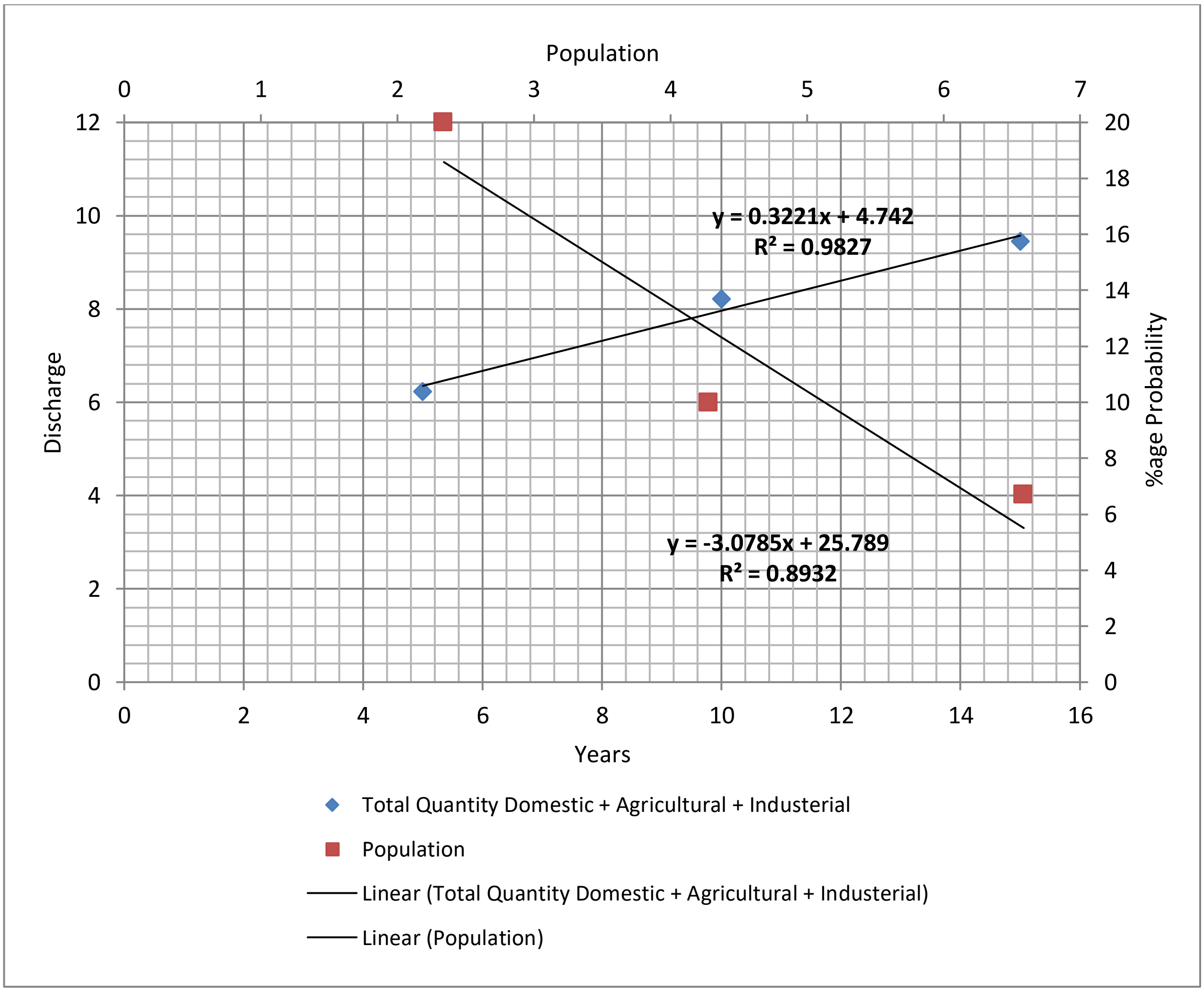


**Fig.No.(2): Presentation of South Dar Fur State Water Scarcity**

It is clearly revealed that South Dar Fur State is very poor in water resources. An effort has to be endeavored by the working staff stakeholder to promote the existing situation in South Dar Fur. A program is suggested for capacity building of all the stake holders in South Dar Fur to propose an enabling body to formulate and establish an integrated water resources management committee for future optimal utilization of South Dar Fur State Water.

## Iv.Conclusion :

- South Dar Fur State has 70 % 0f the Sudan total area.
- South Dar Fur State is suffering water shortage.
- South Dar Fur is very poor in minerals and industry resources, especially in cement and gold.
- Wadi Nyala annual discharge yield approach about 14 milliards, approximately about 17 % of all South Dar Fur Wadies flows.

## V.Recommendations :

- Proper management utilization of South Dar Fur State water resources can be directed to reduce desert encroachment enhance industries including gold mining.
- Lack of discharge measurement data in both Wadi Nyala and South Dar Fur State other wadies formed a bottle neck against the development of the South Dar Fur State.
- During the collection of the data it became clear that more effort must be exercised to obtain reliable data to obtain reliable results.

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# Appendix I

## Hazen Table

| $C_s'$ | %age probability | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 99 | 95 | 80 | 50 | 20 | 5 | 1 | 0.1 | 0.01 | 0.001 | 0.0001 |
| 0 | -2.11 | -1.64 | -0.92 | 0 | 0.92 | 1.64 | 2.08 | 2.39 | 2.53 | 2.59 | 2.62 |
| 0.2 | -1.91 | -1.56 | -0.93 | -0.05 | 0.89 | 1.72 | 2.25 | 2.66 | 2.83 | 2.94 | 3.00 |
| 0.4 | -1.75 | -1.47 | -0.93 | -0.09 | 0.87 | 1.79 | 2.42 | 2.95 | 3.18 | 3.35 | 3.44 |
| 0.6 | -1.59 | -1.38 | -0.92 | -0.13 | 0.85 | 1.85 | 2.58 | 3.24 | 3.59 | 3.80 | 3.92 |
| 0.8 | -1.44 | -1.30 | -0.91 | -0.17 | 0.83 | 1.90 | 2.75 | 3.55 | 4.00 | 4.27 | 4.34 |
| 1.0 | -1.30 | -1.21 | -0.89 | -0.21 | 0.80 | 1.95 | 2.92 | 3.85 | 4.42 | 4.75 | 4.95 |
| 1.2 | -1.17 | -1.12 | -0.86 | -0.25 | 0.77 | 1.99 | 3.09 | 4.15 | 4.83 | 5.25 | 5.50 |
| 1.4 | -1.06 | -1.03 | -0.83 | -0.29 | 0.73 | 2.03 | 3.25 | 4.45 | 5.25 | 5.75 | 6.05 |
| 1.6 | -0.96 | -0.95 | -0.80 | -0.32 | 0.69 | 2.07 | 3.40 | 4.75 | 5.67 | 6.25 | 6.65 |
| 1.8 | -0.87 | -0.87 | -0.76 | -0.35 | 0.64 | 2.10 | 3.54 | 5.05 | 6.08 | 6.75 | 7.20 |
| 2.0 | -0.80 | -0.79 | -0.71 | -0.37 | 0.58 | 2.13 | 3.67 | 5.35 | 6.50 | 7.25 | 7.80 |

## Foster Table (I)

| $C_s'$ | %age probability | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 99 | 95 | 80 | 50 | 20 | 5 | 1 | 0.1 | 0.01 |
| 0 | -2.32 | -1.64 | -0.84 | 0 | 0.84 | 1.64 | 2.32 | 3.09 | 3.70 |
| 0.2 | -2.18 | -1.59 | -0.85 | -0.03 | 0.83 | 1.71 | 2.48 | 3.39 | 4.20 |
| 0.4 | -2.04 | -1.53 | -0.85 | -0.06 | 0.82 | 1.76 | 2.64 | 3.72 | 4.72 |
| 0.6 | -1.92 | -1.47 | -0.85 | -0.09 | 0.81 | 1.81 | 2.80 | 4.08 | 5.30 |
| 0.8 | -1.80 | -1.41 | -0.85 | -0.12 | 0.79 | 1.86 | 2.97 | 4.48 | 6.00 |
| 1.0 | -1.68 | -1.34 | -0.84 | -0.15 | 0.76 | 1.90 | 3.15 | 4.92 | 6.74 |
| 1.2 | -1.56 | -1.28 | -.83 | -0.18 | 0.74 | 1.94 | 3.33 | 5.40 | 7.66 |
| 1.4 | -1.46 | -1.22 | -0.82 | -0.20 | 0.71 | 1.98 | 3.50 | 5.91 | 8.66 |
| 1.6 | -1.36 | -1.16 | -0.81 | -0.23 | 0.67 | 2.01 | 3.69 | 6.48 | 9.79 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1.8 | -1.27 | -1.10 | -0.79 | -0.25 | 0.64 | 2.03 | 3.88 | 7.09 | 11.00 |
| 2.0 | -1.19 | -1.05 | -0.77 | -0.27 | 0.61 | 2.05 | 4.07 | 7.78 | 12.60 |
| 2.2 | -1.11 | -0.99 | -0.75 | -0.29 | 0.57 | 2.07 | 4.27 | 8.54 | 14.30 |
| 2.4 | -1.03 | -0.94 | -0.73 | -0.31 | 0.53 | 2.08 | 4.48 | 9.35 | -- |
| 2.6 | -0.97 | -0.89 | -0.71 | -0.32 | 0.49 | 2.09 | 4.68 | 10.15 | -- |
| 2.8 | -0.91 | -0.84 | -0.68 | -0.33 | 0.45 | 2.09 | 4.89 | 11.20 | -- |
| 3.0 | -0.84 | -0.79 | 0.66 | -0.34 | 0.41 | 2.08 | 5.11 | 12.30 | -- |
| 3.2 | -0.78 | -0.74 | -0.64 | -0.35 | 0.37 | 2.06 | 5.35 | 13.50 | -- |
| 3.4 | -0.73 | -0.69 | -0.61 | -0.36 | 0.32 | 2.04 | 5.58 | -- | -- |
| 3.6 | -0.67 | -0.65 | -0.58 | -0.36 | 0.28 | 2.02 | 5.80 | -- | -- |
| 3.8 | -0.62 | -0.61 | -0.55 | -0.36 | 0.23 | 1.98 | 6.10 | -- | -- |
| 4.0 | -0.58 | -0.56 | -0.52 | -0.36 | 0.19 | 1.95 | 6.50 | -- | -- |
| 4.5 | -0.48 | -0.47 | -0.45 | -0.35 | 0.10 | 1.79 | 7.30 | -- | -- |
| 5.0 | -0.40 | -0.40 | -0.39 | -0.34 | 0.00 | 1.60 | 8.20 | -- | -- |

## **Foster Table (III)**

| %age probability | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $C_s{}'$ | 99 | 95 | 80 | 50 | 20 | 5 | 1 | 0.1 | 0.01 | 0.001 | 0.0001 |
| 0 | -2.33 | -1.64 | -0.84 | 0 | 0.84 | 1.64 | 2.33 | 3.09 | 3.73 | 4.27 | 4.76 |
| 0.2 | -2.18 | -1.58 | -0.85 | -0.03 | 0.83 | 1.69 | 2.48 | 3.38 | 4.16 | 4.84 | 5.48 |
| 0.4 | -2.03 | -1.51 | -0.85 | -0.06 | 0.82 | 1.74 | 2.62 | 3.67 | 4.60 | 5.42 | 6.24 |
| 0.6 | -1.88 | -1.45 | -0.86 | -0.09 | 0.80 | 1.79 | 2.77 | 3.96 | 5.04 | 6.01 | 7.02 |
| 0.8 | -1.74 | -1.38 | -0.86 | -0.13 | 0.78 | 1.83 | 2.90 | 4.25 | 5.48 | 6.61 | 7.82 |
| 1.0 | -1.59 | -1.31 | -0.86 | -0.16 | 0.76 | 1.87 | 3.03 | 4.54 | 5.92 | 7.22 | 8.63 |
| 1.2 | -1.45 | -1.25 | -0.85 | -0.19 | 0.74 | 1.90 | 3.15 | 4.82 | 6.37 | 7.85 | 9.45 |
| 1.4 | -1.32 | -1.18 | -0.84 | -0.22 | 0.71 | 1.93 | 3.28 | 5.11 | 6.82 | 8.50 | 10.28 |
| 1.6 | -1.19 | -1.11 | -0.82 | -0.25 | 0.68 | 1.96 | 3.40 | 5.39 | 7.28 | 9.17 | 11.21 |
| 1.8 | -1.08 | -1.03 | -0.80 | -0.28 | 0.61 | 1.98 | 3.50 | 5.66 | 7.75 | 9.84 | 11.96 |
| 2.0 | -0.99 | -0.95 | -0.78 | -0.31 | 0.61 | 2.00 | 3.60 | 5.91 | 8.21 | 10.51 | 12.81 |
| 2.2 | -0.90 | -0.89 | -.75 | -0.33 | 0.58 | 2.01 | 3.70 | 6.20 | -- | -- | -- |
| 2.4 | -0.83 | -0.82 | -0.71 | -0.35 | 0.54 | 2.01 | 3.78 | 6.47 | -- | -- | -- |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.6 | -0.77 | -0.82 | -0.68 | -0.37 | 0.51 | 2.01 | 3.87 | 6.73 | -- | -- | -- |
| 2.8 | -0.71 | -0.71 | -0.65 | -0.38 | 0.47 | 2.02 | 3.95 | 6.99 | -- | -- | -- |
| 3.0 | -.67 | -.66 | -0.62 | -0.40 | 0.42 | 2.02 | 4.02 | 7.25 | -- | -- | -- |