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# To Calculate Irrigation Efficienciesusing Visual Studio

S. M. Bhagwat[1], P. R. Kolhe[2], V. D. Jadhav[3], A. R. Patil[4], G. G. Kadam[5], R. S. Mhatre[6], M. M. Hyalij[7]

[1]*M.Tech, College of Agriculture Engineering and Technology, Dr. BSKKV, Dapoli Maharashtra, India*
[2]*Associate Processor (CAS), College of Agriculture Engineering and Technology, Dr. BSKKV, Dapoli Maharashtra, India*
[3]*Technical Assistant,,AKMU, Dr.BSKKV, Dapoli Maharashtra, India.*
[4]*Senior Research Assistant, AKMU, Dr.BSKKV, Dapoli Maharashtra, India.*
[5]*Lab Assistant, Department of Irrigation and Drainage Engineering, College of Agricultural Engineering and Technology, Dr, BSKKV, Dapoli Maharashtra, India.*
[6]*M.Tech, College of Agriculture Engineering and Technology, Dr. BSKKV, Dapoli Maharashtra, India*
[7]*M.Tech, College of Agriculture Engineering and Technology, Dr. BSKKV, Dapoli Maharashtra, India*

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**ABSTRACT-**
Irrigation potency is that the magnitude relation, typically expressed as per cent, of the number of water wont to meet the consumptive use demand of the crop and that necessary to keep up a good salt balance within the crop root zone to the entire volume of water entertained, keep or tense for irrigation. Irrigation systems square measure designed and operated to provide the irrigation demand to every field of the farm. The performance of associate degree irrigation system is decided by the potency with that water is keep within the surface reservoir at the headwork, entertained and sent to the irrigated space through the conveyance system and applied to the fields and by the adequacy and uniformity of water application in every field. the potency of associate degree irrigation system is outlined because the per cent of water equipped to the shape that's beneficially used for irrigation on the farm.

## I. INTRODUCTION

Irrigation is outlined because the method of artificial application of water to the soil so as to achieve these following objectives: guarantee enough wet for agricultural crop growth, give crop insurance against short period drought, cut back hazards of soil piping, soften the tillage pan (a dense compact layer), cool the soil and atmosphere to produce an honest atmosphere for plant growth, and wash out or dilute harmful salts within the soil.

Irrigation potency is that the magnitude relation, typically expressed as per cent, of the quantity of water accustomed meet the consumptive use demand of the crop and that necessary to keep up a good salt balance within the crop root zone to the whole volume of water pleased, keep or wired for irrigation. Irrigation systems ar designed and operated to produce the irrigation demand to every field of the farm. The performance of AN irrigation system is decided by the potency with that water is keep within the surface reservoir at the headwork, pleased and sent to the irrigated space through the conveyance system and applied to the fields and by the adequacy and uniformity of water application in every field. the general potency of AN irrigation system is outlined because the per cent of water provided to the shape that's beneficially used for irrigation on the farm.

Attempt has been made to simplify the calculation using Visual studio with the project entitled, Calculation of Irrigation Efficiency Using Visual studio with the focus on following objectives:

1. To simplify the calculations to determine irrigation efficiencies by using different methods using Visual studio.
2. To reduce the time required for determining the irrigation efficiencies.

## II. REVIEW OF LITERATURE

Michael et. al (1978). gives comprehensive treatment of various areas of water resources utilization, command area development and efficient irrigation. The detailed information about irrigation efficiencies and the method to calculate these efficiencies is given in this book. The importance of efficiencies also mentioned in this book.

## III. MATERIAL AND METHOD

This chapter deals with the methodology used to calculate irrigation efficiencies using Visual

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Studio. It includes different formulae and theoretical considerations those are used for calculation. It also encapsulates the configuration of the system and information to design the system.

**3.1 Configuration of the system**

1) Windows 7 ultimate
2) Copyright @ 2009 Microsoft Corporation.
3) Processor: Intel (R) Core (TM) i3-3110M CPU @2.40 GHz.
4) Installed memory (RAM): 4.00 GB (3.39 GB usable)
5) System type: 32 – bit Operating System
6) Microsoft(R) Access 2007

**3.2 About the platform**

1. Visual Studio 2022
2. Copyright (c) 1990, 1992 by Borland International, Inc.

**3.3 Calculation of irrigation efficiencies using different formulae**

**3.3.1 Water conveyance efficiency**

This term is used to measure the efficiency of water conveyance system associated with the canal network, water courses and field channels. It is also applicable where the water is conveyed in channel or pipeline from the well to the individual fields.

$E_c = \frac{Wf}{Wd} \times 100$

Where,

$E_c$= Water conveyance efficiency (per cent)

Wf = water delivered to the field

Wd= water delivered from the source

**3.3.2 Water application efficiency**

After the water reaches the field supply channel, it is important to apply the water on the land as efficiency as possible. A measure of how efficiently this is done is the water application efficiency, defined as follows:

$E_a = \frac{Ws}{Wf} \times 100$

Where,

$E_a$= Water application efficiency (per cent)

Wf = water delivered to the field

Ws= water stored in root zone of the plants

**3.3.3 Water storage efficiency**

It has been stated that small irrigations may lead to high water application efficiencies, yet the irrigation practice may be poor. The concept of water storage efficiency is useful to evaluate this problem. This concept relates how completely the water needed prior to irrigation has been stored in the root zone during irrigation.

$E_s = \frac{Ws}{Wn} \times 100$

Where,

$E_s$= Water storage efficiency (per cent)

Wn = water needed in the root zone prior to irrigation

Ws= water stored in root zone during irrigation

**3.3.4 Water distribution efficiency**

Not only the application of the right amount of water to the held but also its uniform distribution over the field is important. Permissible length of irrigation runs are controlled to a large extent by the uniformity of water distribution which is possible for a given soil and irrigation management practice. Water distribution efficiency indicates the extent to which water is uniformly distributed in the field

$E_d = (1 - \frac{\bar{y}}{\bar{d}}) \times 100$

Where,

$E_d$ =Water distribution efficiency (per cent)

$\bar{y}$ = average numerical deviation from $\bar{d}$

$\bar{d}$ = average depth of water stored along the run during the irrigation

**3.3.5 Water use efficiency**

The water use efficiency is the ratio of the quantity of yield to the quantity of water in per cent. As follow

$E_w = \frac{Qe}{qw} \times 100$

Where,

$E_w$= water use efficiency (per cent)

$Q_e$ = quantity of yield

qw= quantity of water

**3.3.6 Consumptive use efficiency**

The consumptive use efficiency is the ratio of consumptive use of water by the crop to the amount of water depleted from the root zone of soil.

$E_{cu} = \frac{Wcu}{Wd} \times 100$

Where,

$E_{cu}$= consumptive use efficiency (per cent)

Wcu= consumptive use of water by the crop

Wd =amount of water depleted from the root zone of soil.

**Source Code for Calculation of Irrigation Efficency**

**Home Page**

```
using System;
usingSystem.Collections.Generic;
```

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```
usingSystem.ComponentModel;
usingSystem.Data;
usingSystem.Drawing;
usingSystem.Linq;
usingSystem.Text;
usingSystem.Threading.Tasks;
usingSystem.Windows.Forms;
namespaceCalculation_of_Irrigation_Efficiency
{
public partial class Form1 : Form
   {
public Form1()
      {
InitializeComponent();
      }

private void button1_Click(object sender, EventArgs e)
      {
         Form2 frm2 = new Form2();
frm2.Show();
      }

private void button2_Click(object sender, EventArgs e)
      {
         Form3 frm3 = new Form3();
frm3.Show();
      }

private void label1_Click(object sender, EventArgs e)
      {
         Form4 frm4 = new Form4();
frm4.Show();
      }

private void button3_Click(object sender, EventArgs e)
      {
         Form5 frm5 = new Form5();
frm5.Show();
      }

private void button4_Click(object sender, EventArgs e)
      {
         Form6 frm6 = new Form6();
frm6.Show();
      }

private void button5_Click(object sender, EventArgs e)
      {
         Form7 frm7 = new Form7();
frm7.Show();
      }
   }
}
```

**case 1: /**Water Conveyance Efficiency ***/**

```
using System;
usingSystem.Collections.Generic;
usingSystem.ComponentModel;
usingSystem.Data;
usingSystem.Drawing;
usingSystem.Linq;
usingSystem.Text;
usingSystem.Threading.Tasks;
usingSystem.Windows.Forms;

namespaceCalculation_of_Irrigation_Efficiency
{
public partial class Form2 : Form
   {
public Form2()
      {
InitializeComponent();
      }

private void label1_Click(object sender, EventArgs e)
      {

      }

private void label4_Click(object sender, EventArgs e)
      {

      }

private void label3_Click(object sender, EventArgs e)
      {

      }

private void button1_Click(object sender, EventArgs e)
      {
doubleWf, Wd, Ec;
Wf = Convert.ToDouble(textBoxWf.Text);
         Wd = Convert.ToDouble(textBoxWd.Text);
Ec = Wf / Wd * 100;
textBoxEc.Text = Ec.ToString();
      }

private void textBox3_TextChanged(object sender, EventArgs e)
```

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```
    {

    }
  }
}
```

**Case2:/*** Water Application Efficiency***/**

```
using System;
usingSystem.Collections.Generic;
usingSystem.ComponentModel;
usingSystem.Data;
usingSystem.Drawing;
usingSystem.Linq;
usingSystem.Text;
usingSystem.Threading.Tasks;
usingSystem.Windows.Forms;

namespaceCalculation_of_Irrigation_Efficiency
{
public partial class Form3 : Form
  {
public Form3()
    {
InitializeComponent();
    }

private void button1_Click(object sender,
EventArgs e)
    {
doubleWs, Wf, Ea;
Ws = Convert.ToDouble(textBoxWs.Text);
Wf = Convert.ToDouble(textBoxWf.Text);
Ea = Ws / Wf * 100;
textBoxEa.Text = Ea.ToString();
    }
  }
}
```

**case 3: /*** Water storage Efficiency ***/**

```
using System;
usingSystem.Collections.Generic;
usingSystem.ComponentModel;
usingSystem.Data;
usingSystem.Drawing;
usingSystem.Linq;
usingSystem.Text;
usingSystem.Threading.Tasks;
usingSystem.Windows.Forms;

namespaceCalculation_of_Irrigation_Efficiency
{
public partial class Form4 : Form
  {
public Form4()
    {
InitializeComponent();
    }

private void Calculate_Click(object sender,
EventArgs e)
    {
doubleWs, Wn, Es;
Ws = Convert.ToDouble(textBoxWs.Text);
Wn = Convert.ToDouble(textBoxWn.Text);
Es = Ws / Wn * 100;
textBoxEs.Text = Es.ToString();
    }
  }
}
```

**case 4: /*** Water Distribution Efficiency ***/**

```
using System;
usingSystem.Collections.Generic;
usingSystem.ComponentModel;
usingSystem.Data;
usingSystem.Drawing;
usingSystem.Linq;
usingSystem.Text;
usingSystem.Threading.Tasks;
usingSystem.Windows.Forms;

namespaceCalculation_of_Irrigation_Efficiency
{
public partial class Form5 : Form
  {
public Form5()
    {
InitializeComponent();
    }

private void button1_Click(object sender,
EventArgs e)
    {
double y, d, Ed;
      y = Convert.ToDouble(textBoxy.Text);
      d = Convert.ToDouble(textBoxd.Text);
      Ed = 1 - y / d * 100;
textBoxEd.Text = Ed.ToString();
    }
  }
}
```

**case 5: /*** Water Use efficiency ***/**

```
using System;
usingSystem.Collections.Generic;
usingSystem.ComponentModel;
usingSystem.Data;
usingSystem.Drawing;
usingSystem.Linq;
usingSystem.Text;
```

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```
usingSystem.Threading.Tasks;
usingSystem.Windows.Forms;

namespaceCalculation_of_Irrigation_Efficiency
{
public partial class Form6 : Form
   {
public Form6()
      {
InitializeComponent();
      }

private void textBoxQe_TextChanged(object sender, EventArgs e)
      {

      }

private void textBoxqw_TextChanged(object sender, EventArgs e)
      {

      }

private void button1_Click(object sender, EventArgs e)
      {
doubleQe, qw, Ew;
Qe = Convert.ToDouble(textBoxQe.Text);
qw = Convert.ToDouble(textBoxqw.Text);
Ew = Qe / qw * 100;
textBoxEw.Text = Ew.ToString();
      }
   }
}
```

**case 6: /*** Consumptive use Efficiency ***/**

```
using System;
usingSystem.Collections.Generic;
usingSystem.ComponentModel;
usingSystem.Data;
usingSystem.Drawing;
usingSystem.Linq;
usingSystem.Text;
usingSystem.Threading.Tasks;
usingSystem.Windows.Forms;

namespaceCalculation_of_Irrigation_Efficiency
{
public partial class Form7 : Form
   {
public Form7()
      {
InitializeComponent();
      }

private void label2_Click(object sender, EventArgs e)
      {

      }

private void button1_Click(object sender, EventArgs e)
      {
doubleWcu, Wd, Ecu;
Wcu = Convert.ToDouble(textBoxWcu.Text);
        Wd = Convert.ToDouble(textBoxWd.Text);
Ecu = Wcu / Wd * 100;
textBoxEcu.Text = Ecu.ToString();
      }
   }
}
```

## IV. RESULTS AND DISCUSSION

This chapter deals with the results obtained by calculation of the Irrigation and Drainage formulae using Visual Studio. The programme is prepared in the C # language, Wimdow From Application , Visual Studio 2022.

### 4.1 Steps to be followed

1) Enter the option from 1 to 9 serially.
2) Give the input values.
3) After pressing enter key, output will be displayed.
4) Again press the enter key to switch over to the main page.
5) Follow the same procedure to design the different parameters.

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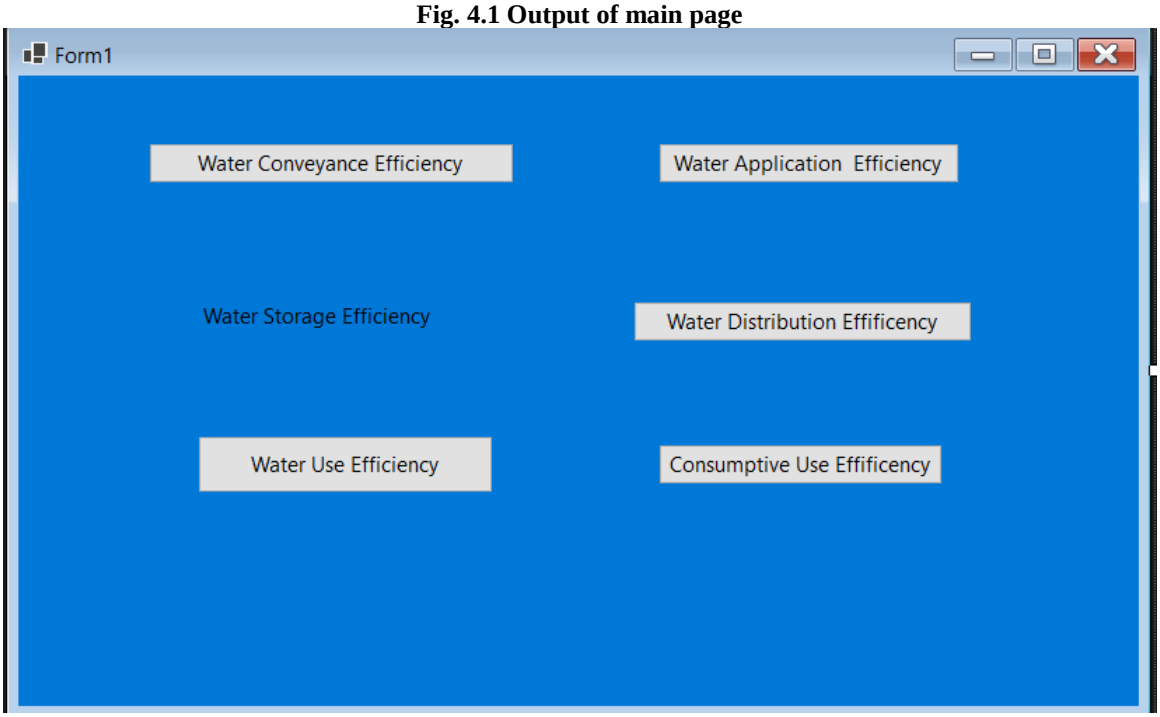
**Fig. 4.1 Output of main page**



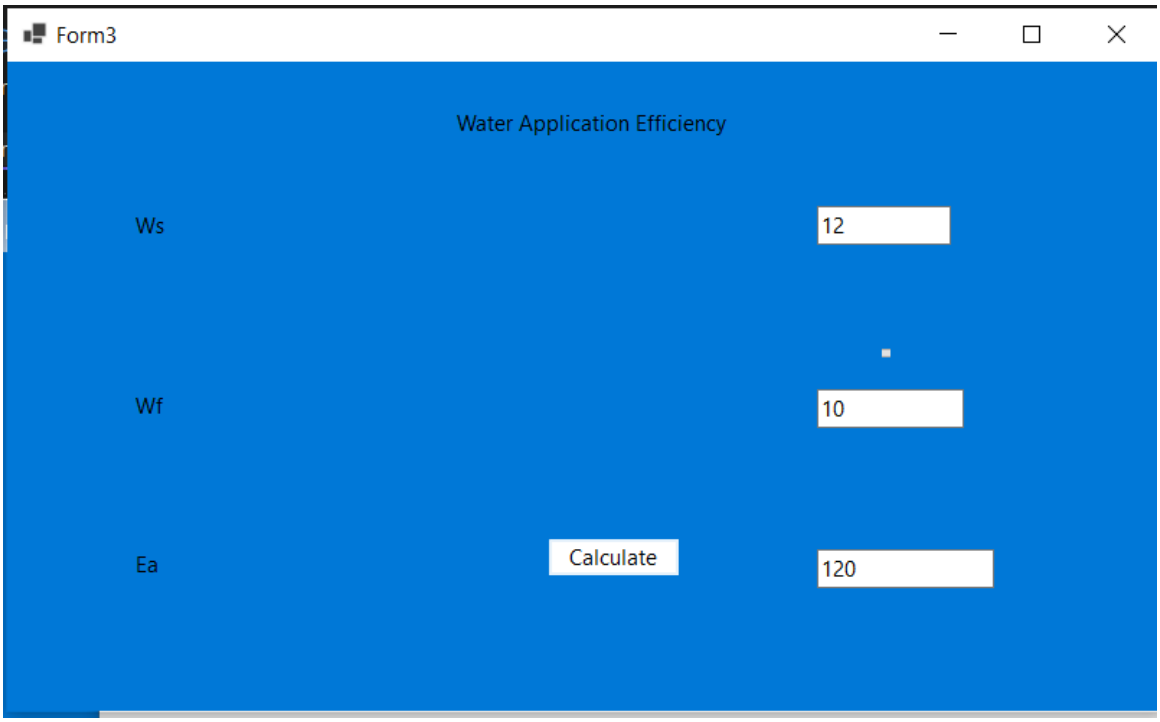




**Fig. 4.2 Output to water application efficiency**

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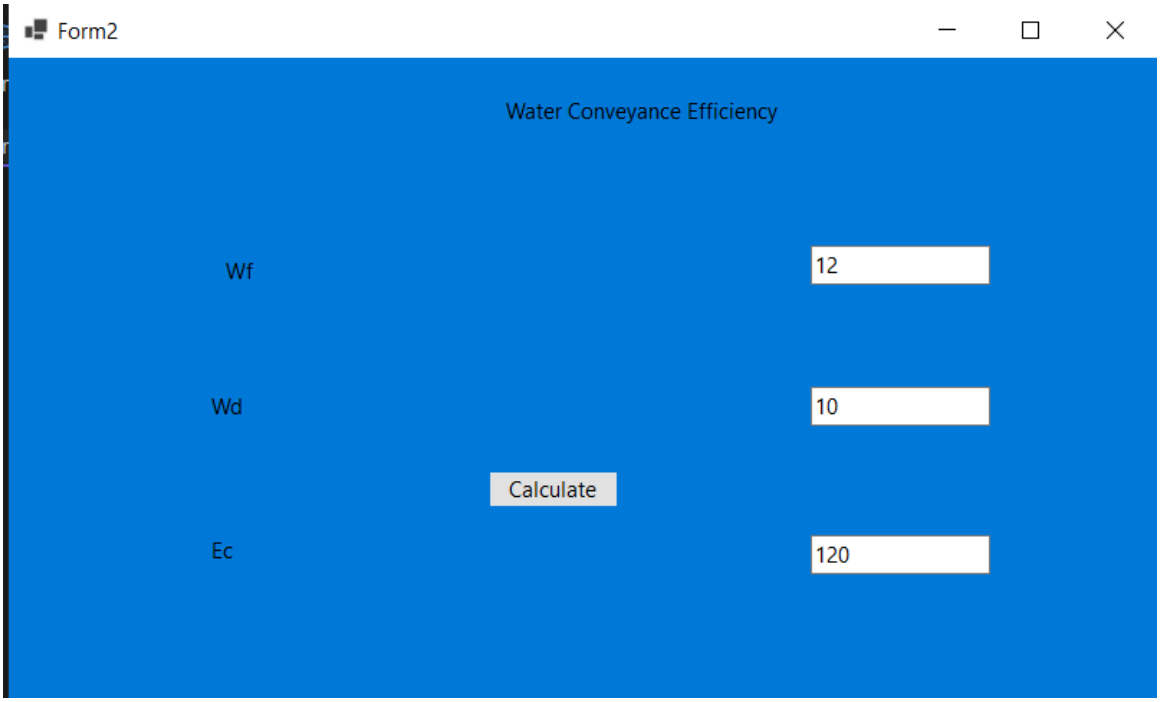


**Fig. 4.3 Output to water conveyance efficiency**

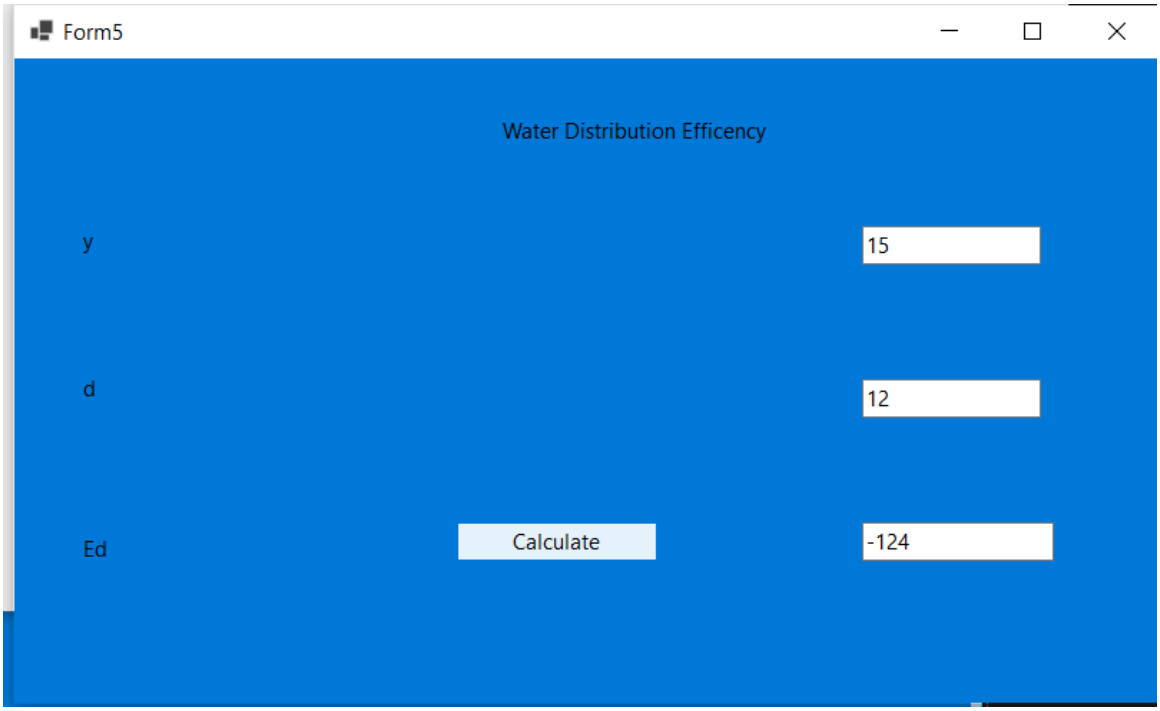


**Fig. 4.4 Output to water distribution efficiency**

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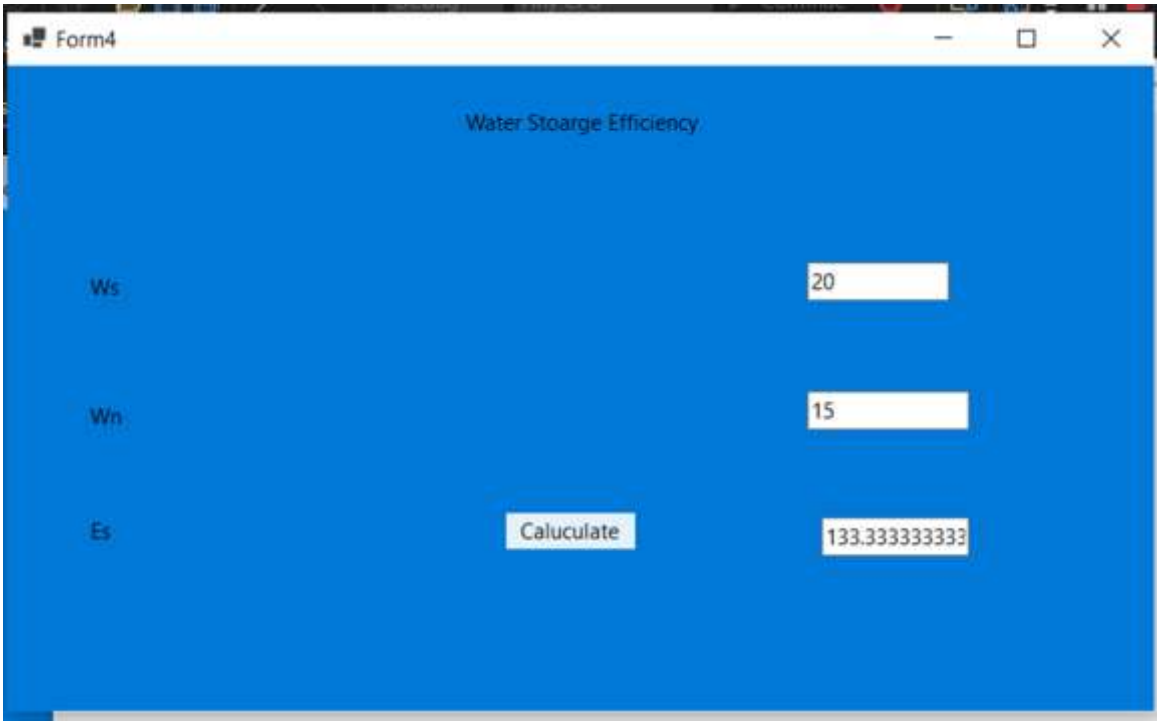


**Fig. 4.5 Output to water storage efficiency**

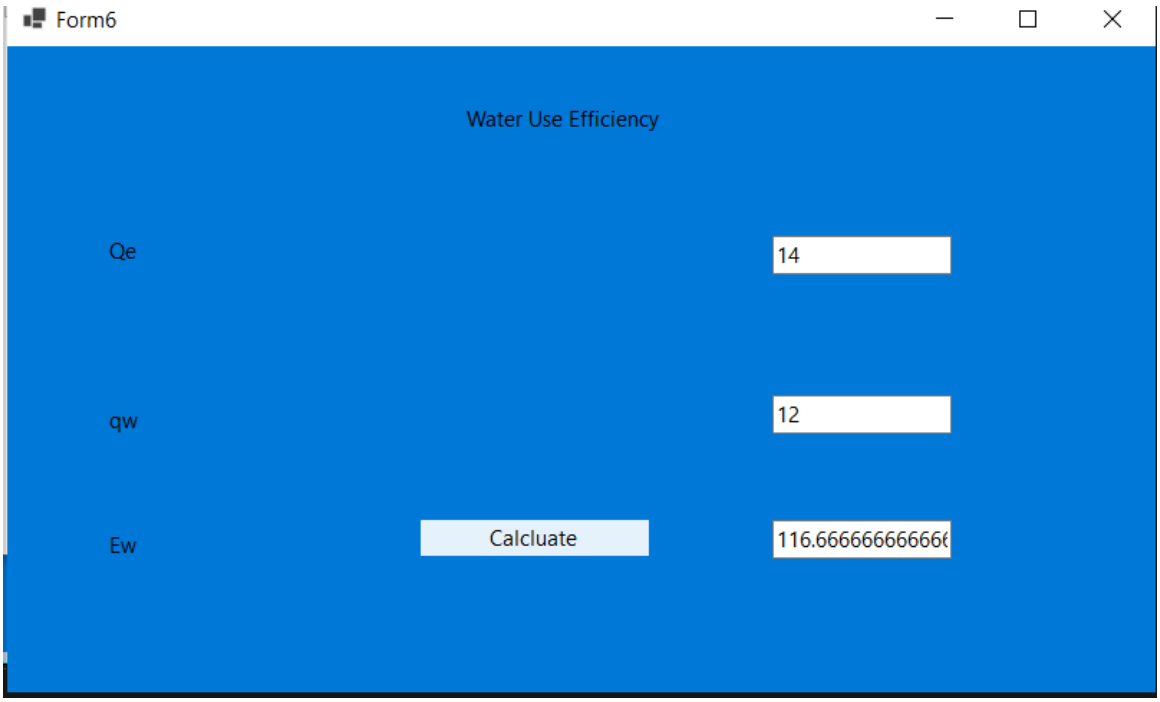


**Fig. 4.6 Output to water use efficiency**

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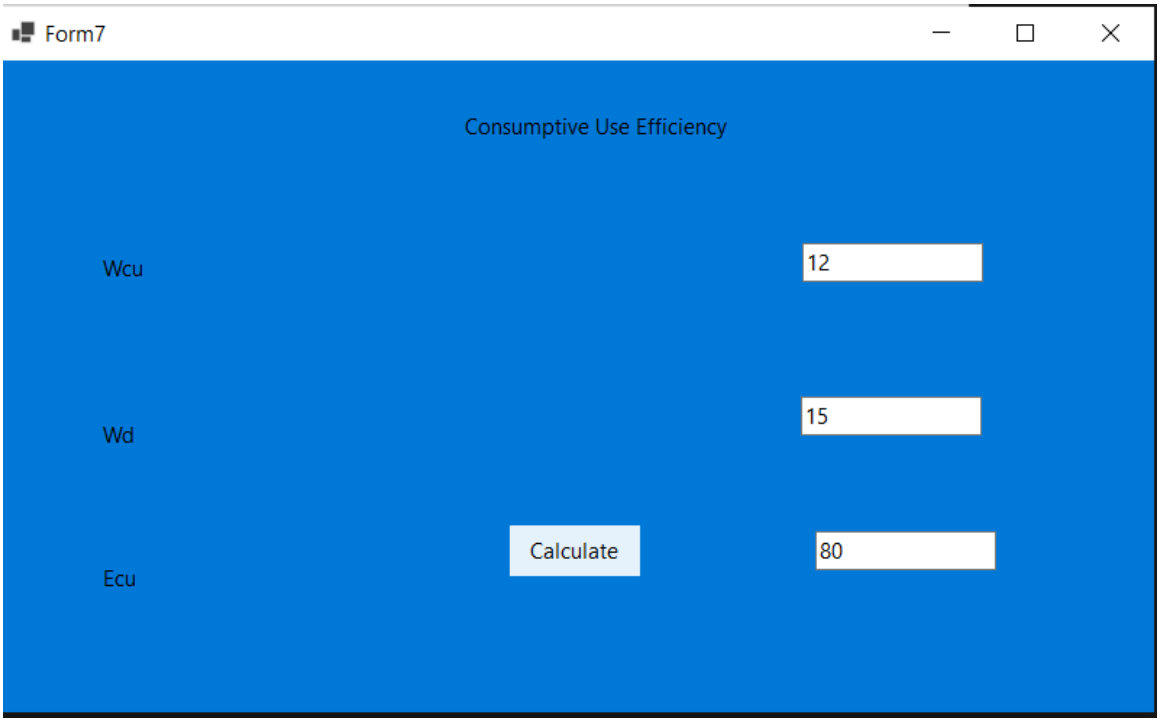


**Fig. 4.7 Output to consumptive use efficiency**

## V. SUMMARY AND CONCLUSTIONS

### 5.1 Summary

The irrigation efficiencies such as water application efficiency, water conveyance efficiency, water distribution efficiency, water use efficiency, water storage efficiency and consumptive use efficiency were accurately determined. Thus, this is time consuming. So by using the software Visual Studio 2022; project work was done accurately and in very less time. Thus software found to be beneficial for determining irrigation efficiencies.

### 5.2 Conclusions

1. The calculations were done accurately using Visual Studio.
2. It is user friendly.
3. It is time efficient.
4. This is boon for determining irrigation efficiencies.

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