INDEX

1. INTRODUCTION

1.1 Problem Definition:

We often need to save different soils and be able to access it when required. This can be achieved by storing the soils in files which can be easily transferred. **Soil Predictor** is a desktop application that aims to provide a solution by predicting specific crop type by taking the soil information and retrieving them in a specific format.

1.2 Concepts of File Structures used:

Techniques	**Description**
Indexing	Basic file structure used for the project. Involves creation of an index file and a data file. The index file contains the data file record's primary key and the byte offset location in the data file used carrying out operation effectively.
Add	Adding a variable length record into a file without letting it affect the previous content of the file.
+9	
Search	Using indexing, search for any record with any field data in a particular record entered (starting with or part of a name or phone number).
Modify	Using indexing and search operation, get the record that user wished for and update any changes required on existing fields of the records.
Sorting	Depending on user's wish sort the data in the index files on increasing name or phone numbers in the file. A new search index file is created in the process for reducing the burden of sorting the records again from sort. All changes for sort are made in the search index file.

2. SOFTWARE REQUIREMENT SPECIFICATION

2.1 Functional Requirements

The main functional requirements of **Soil Predictor** are:

ID	Description
FR1	Be able to create a record which contains soil details like type, location, pH, etc..
FR2	To store these records in a file.
FR3	To access the records based on a primary key.
FR4	Ability to search result in a list view.
FR5	If no matches are found, the user must be informed clearly.
FR8	Filtering results based on combination of all attributes.

2.2 Non-Functional Requirements

The features that we would like the application to have apart from the functional requirements are listed below.

ID	Description
QR1	Ability to handle unexpected situations like wrong input in place of the number.
QR2	A timely response to the input(Response Time) i.e. the fastness to the search a record, measurements obtained from 1000 searches during testing o more than 2 seconds 100% of the time.

2.3 Hardware & Software Requirements

The hardware and software requirements for PhoneBook applications are:

ID	Description
QR3	Hard Drive Space, application’s need for hard drive space for storing files running the application effectively. No more than 15 Bytes
QR4	A desktop with any operating system that supports
Python. Tkinter	Basic file operations must be supported.

3. DESIGN

3.1 SYSTEM ARCHITECTURE

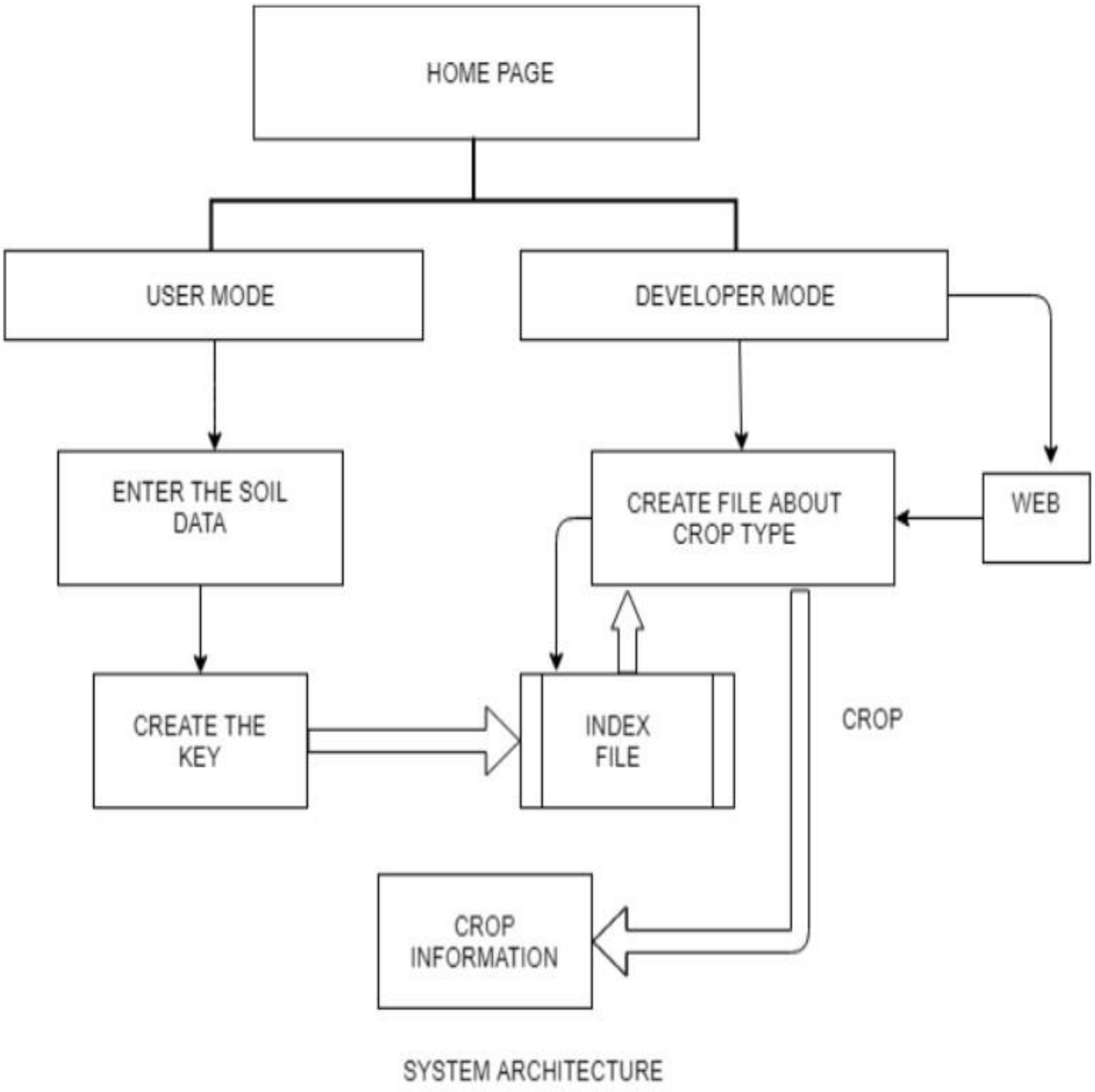


Fig 3.1

3.2 Basic Data Flow Diagram

USER DATA FLOW DIAGRAM

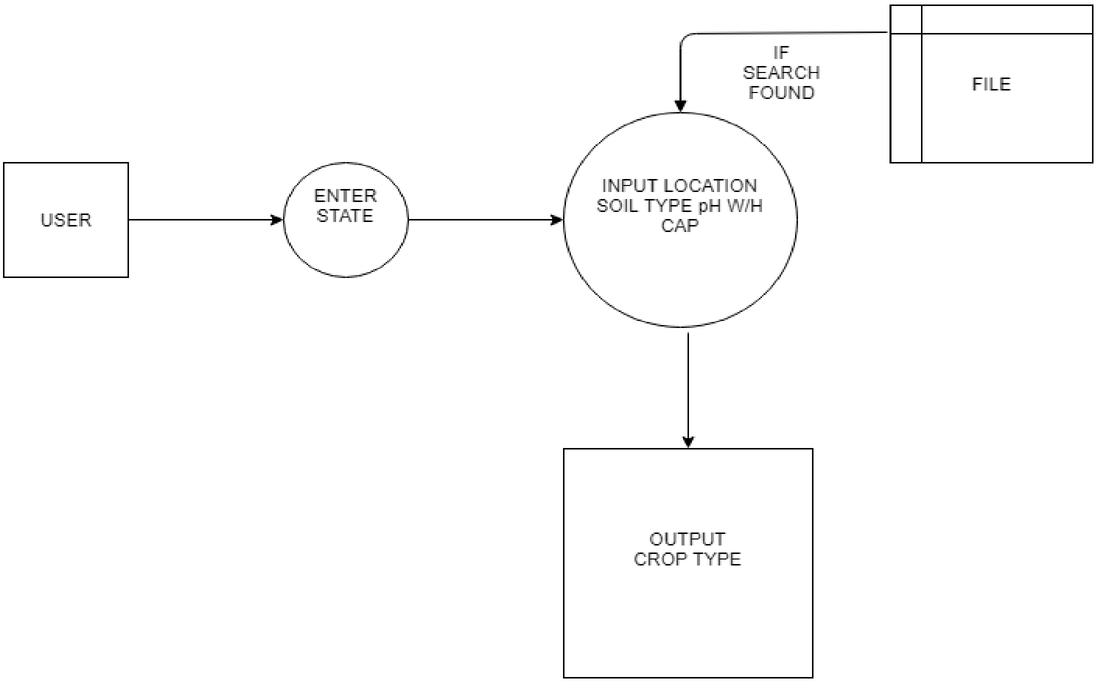


Fig 3.2a

DEVELOPER DATA FLOW DIAGRAM

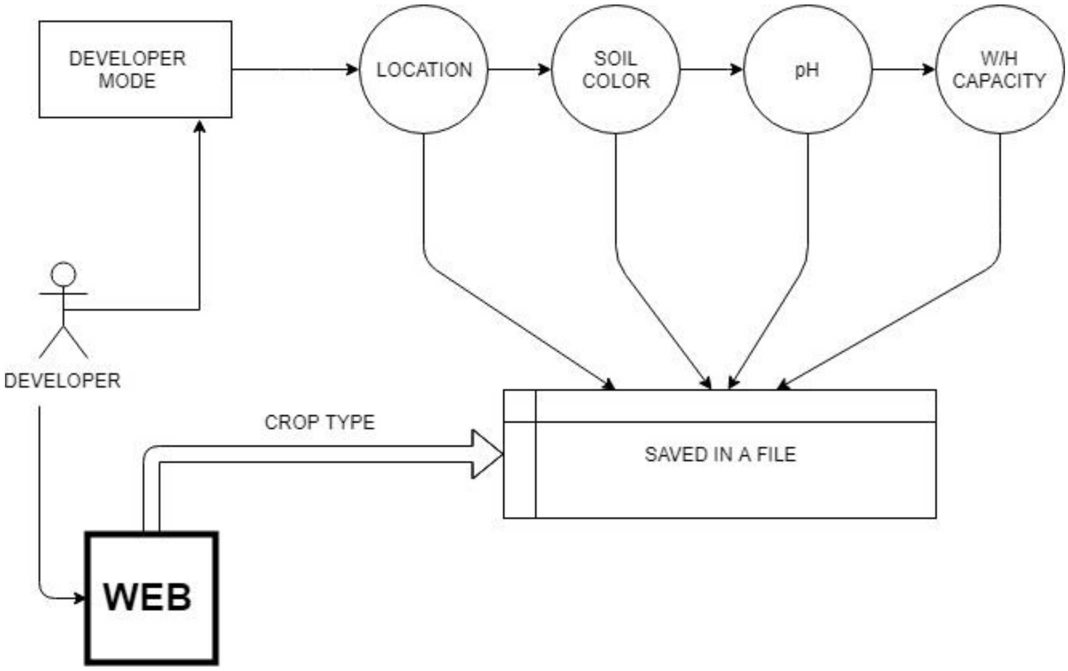


Fig 3.2b

4. IMPLEMENTATION

4.1 Softwares Used

The programming languages used in this application was Python 3. The entire application was developed on Spyder and Anaconda. The reason for selecting Python 3 was that it serves wide variety of purpose. So, it allows this application to grow.

The implementation part of this project started by first stating the requirements. Once the requirements were clear, the user interface was designed. All possible interactions and operations of the application were planned. After all these tasks were completed, the coding part commenced with the development of the user interface.

The UI was designed in Python using Tkinter library. Tkinter is a software platform for creating and delivering desktop applications, as well as rich internet applications that can run across a wide variety of devices.

Simultaneously along with the development of the UI, the backend was developed and later integrated with the UI and tested if it satisfied all the functional requirements.

4.2 Functionalities

4.2.1 Add Record:

The code for adding a record to the data file and to the index files is given below.

```
import random


#pid=1000
typesoil=['Alluvial','Red','Black','Arid','Laterite']
location=['U.P.','Maharashtra','Rajasthan','Uttarakhand','Karnataka']
ph=[3,5,7,9]
whcapacity=[40,50,60,70]
#croptype=['A','B','C','D','E']
#p=1
#pid=str(i+1)+str(j+1)+str(k+1)+str(l+1)
croptype='A'
f=open('mainfilenew.txt','w')
for i in range(len(typesoil)):
    for j in range(len(location)):
        for k in range(len(ph)):
            for l in range(len(whcapacity)):
                pid=str(i+1)+str(j+1)+str(k+1)+str(l+1)
                if pid[0]=='2' and pid[1]=='3':
                    croptype='D'
                elif (pid[0]=='3' or pid[0]=='4' or pid[0]=='5') and 
pid[1]=='1':
                    croptype='D'
                elif ( pid[0]=='1' or pid[0]=='4' or pid[0]=='5' ) and 
pid[1]=='5':
                    croptype='D'
                elif (pid[0]=='2' or pid[0]=='3' or pid[0]=='4' or 
pid[0]=='5') and pid[1]=='4':
                    croptype='D'
                elif (pid[0]=='1' or pid[0]=='4' or pid[0]=='5' ) and 
pid[1]=='2':
                    croptype='D'

cstring=str(pid)+'|'+str(typesoil[i])+'|'+str(location[j])+'|'+str(ph[k])+
'|'+str(whcapacity[l])+'|'+random.choice(croptype)+"$"
                croptype='a'
                f.write(cstring)
                f.write("\n")
                #print(pid,'|',i,'|',j,'|',k,'|',l,end="$")

f.close()
```

4.2.5 Searching a record:

The method to search a record in the file is given below.

```
import re
f=open('mainfile.txt','r')

f2=open('index.txt','r')
'''
location=(input("Enter the location: \npress 1 for U.P.\npress 2 for for 
Maharashtra\npress 3 for Rajasthan \npress 4 for Uttrakhand\npress 5 for 
Karnataka "))
colortype=(input("Enter the Colortype: \npress 1 for Alluvial\npress 2 for 
Red\npress 3 for Black\npress 4 for Arid "))
whcapacity=(input("Enter the Water holding capacity: \npress 1 for 30-
49%\npress 2 for capacity between 40-49%\npress 3 for capacity between 50-
59%\npress 4 for capacity between 60-70%"))
ph=(input("Enter the ph: 1 for 3\n2 for 5\n3 for 7\n4 for 9"))
s='|'+colortype+'|'+location+'|'+ph+'|'+whcapacity+'|'

flag=0
for line in f:
    if(s==line[4:13]):
        print(line,"\n")

'''
```

```
location=(input("Enter the location: \npress 1 for U.P.\npress 2 for for
Maharashtra\npress 3 for Rajasthan \npress 4 for Uttrakhand\npress 5 for
Karnataka "))
colortype=(input("Enter the Colortype: \npress 1 for Alluvial\npress 2 for
Red\npress 3 for Black\npress 4 for Arid "))
whcapacity=(input("Enter the Water holding capacity: \npress 1 for 30-
49%\npress 2 for capacity between 40-49%\npress 3 for capacity between 50-
59%\npress 4 for capacity between 60-70%"))
ph=(input("Enter the ph: 1 for 3\n2 for 5\n3 for 7\n4 for 9"))
s2=colortype+location+ph+whcapacity
flag2=0
for line2 in f2:
    if s2==line2[0:4]:
        offs=int(line2[5:])
print(offs)
f.seek(offs,0)
print(f.readline()[-3])
```

GUI FILE

```
from tkinter import *
from tkinter import messagebox

def printfun():
    soilval=soil.get()
    locval=location1.get()
    phval=pH.get()
    wh=whcap.get()
    for i in range(len(typesoil)):
        if soilval==typesoil[i]:
            soilval=str(i+1)
            break
    for i in range(len(location)):
        if locval==location[i]:
            locval=str(i+1)
            break
    for i in range(len(ph)):
        if phval==ph[i]:
            phval=str(i+1)
            break
    for i in range(len(whcapacity)):
        if wh==whcapacity[i]:
            wh=str(i+1)
            break
    print(soilval,locval,phval,wh)
    f=open('mainfile.txt','r')
    f2=open('index.txt','r')
    s2=soilval+locval+phval+wh
    flag2=0
    for line2 in f2:
        if s2==line2[0:4]:
            offs=int(line2[5:])
            print(offs)
            f.seek(offs,0)
            z=f.readline()[-4:-2]
            print(z)

        #    messagebox.showinfo("yes",z)
    f.close()
    f2.close()
    datalist=[]
    so=open("datasoil.txt",'r')
    x=''
    line=so.readline()
    while line:
        datalist.append(line)
        line=so.readline()
    print (datalist)

    index=-1
    for i in range(len(datalist)):
        if(datalist[i][:2]==z):
            index=i
    if index==-1:
        x="No Data Found"
    else:
        for i in range(index+1,len(datalist)):
            if(datalist[i]=="***\n"):
                break
            x+=datalist[i]

    print(x)


    new=Toplevel(root)
    new.geometry("700x2000")
    lt=Label(new,text="Hello "+e1.get()+" Preferred crop in your area
:\n "+x)
    lt.place(x=15,y=70)

    mainloop()




root=Tk()
root.title("Crop Predictor")
root.geometry("500x500")
heading=Label(text="Crop
Prediction",bg="LightSteelBlue1",fg="black",width="500",height="3")
heading.pack()
##########################################################################
#########
typesoil=['Alluvial','Red','Black','Arid','Laterite']
location=['U.P.','Maharashtra','Rajasthan','Uttarkhand','Karnataka']
ph=[3,5,7,9]
```

CROP PREDICTOR

```
whcapacity=[40,50,60,70]
##################################################
slt=Label(text="Soil Type")
slt.place(x=15,y=70)
lct=Label(text="Location")
lct.place(x=250,y=70)
phs=Label(text="pH value")
phs.place(x=15,y=200)
wc=Label(text="W.C. capacity")
wc.place(x=250,y=200)
soil=StringVar()
soilch=OptionMenu(root,soil,'Alluvial','Red','Black','Arid','Laterite')
soilch.config(font=("Arial",10))
soilch.place(x=100,y=70)
location1=StringVar()
locch=OptionMenu(root,location1,'U.P.','Maharashtra','Rajasthan','Uttarkha
nd','Karnataka')
locch.config(font=("Arial",10))
locch.place(x=350,y=70)
pH=IntVar()
phch=OptionMenu(root,pH,3,5,7,9)
phch.config(font=("Arial",10))
phch.place(x=100,y=200)
whcap=IntVar()
whch=OptionMenu(root,whcap,40,50,60,70)
whch.config(font=("Arial",10))
whch.place(x=350,y=200)

name=Label(text="Name")
name.place(x=100,y=300)
e1 = Entry(root)
e1.place(x=200, y=300)
search=Button(text="Search",width="30",height="2",command=printfun,bg="Lig
htSteelBlue1")
search.place(x=120,y=350)



root.mainloop()
```

5. TESTING & RESULTS

5.1 TESTING OBJECTIVES

- Functional Testing: Black box testing to ensure coverage of all functionality mentioned in the SRS. In particular, functions tested include:
  - Addition of record (can be verified by viewing data file)
  - Searching a record (will be visible in the user interface)

- Defect Testing: To root out any bugs and ensure the system works as expected. In particular to ensure that the addition, modification, and deletion of the records work as intended without affecting other records.

5.2 TESTING PROCEDURES USED

Black box testing:

Equivalence class testing

Set of all test cases was partitioned into mutually disjoint subsets whose union is the entire set and one test case from each subset was chosen. There are two important implications for testing:

- The fact that the entire set is represented provides a form of completeness
- The dis jointness assures a form of non-redundancy

The equivalence classes decided upon for the variable “Soil Attributes” were

- set of valid location, color, pH, Water Holding Capacity
- set of invalid location, color, pH, Water Holding Capacity.

5.3 RESULTS

5.3.1 Home Page:

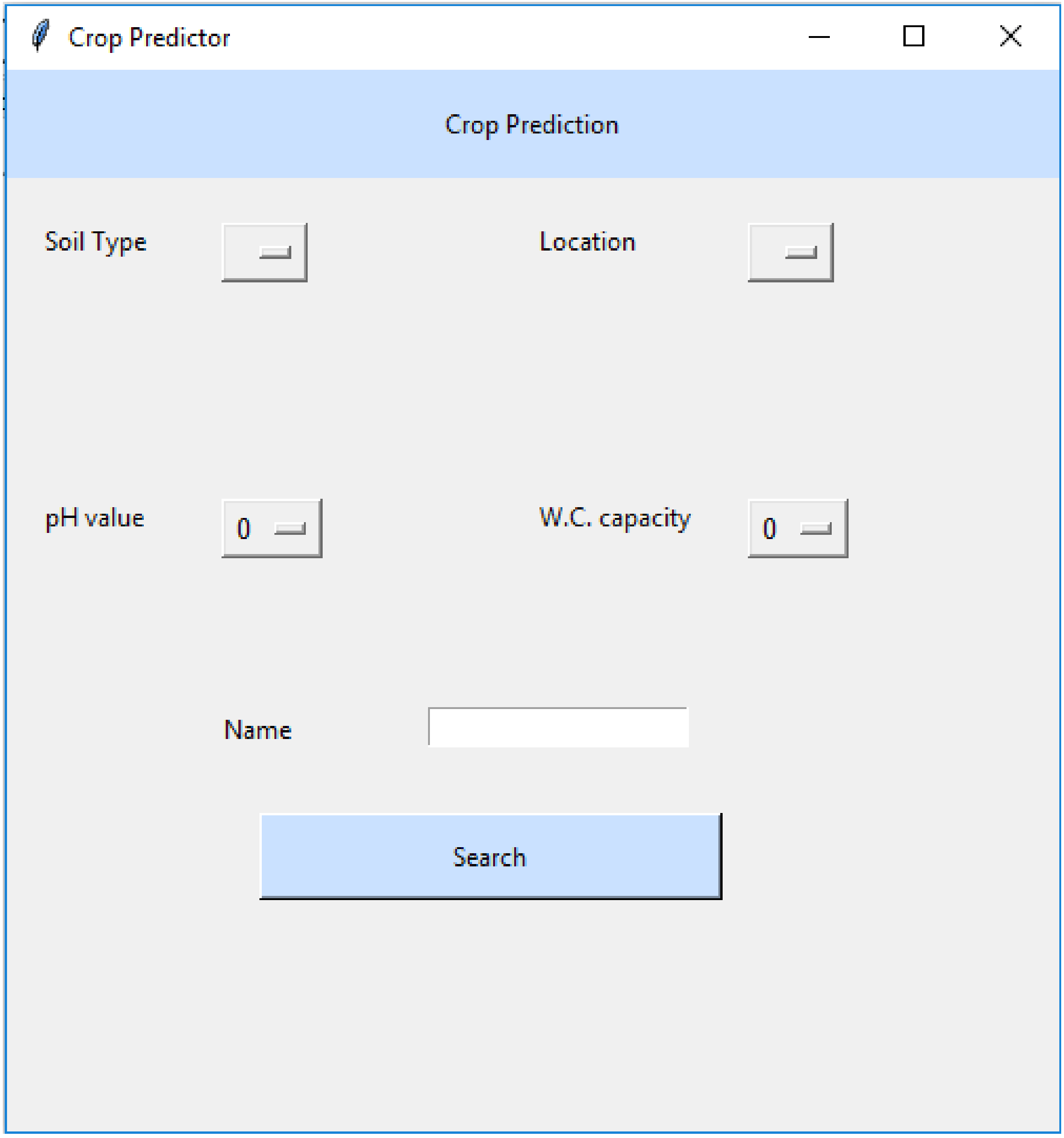
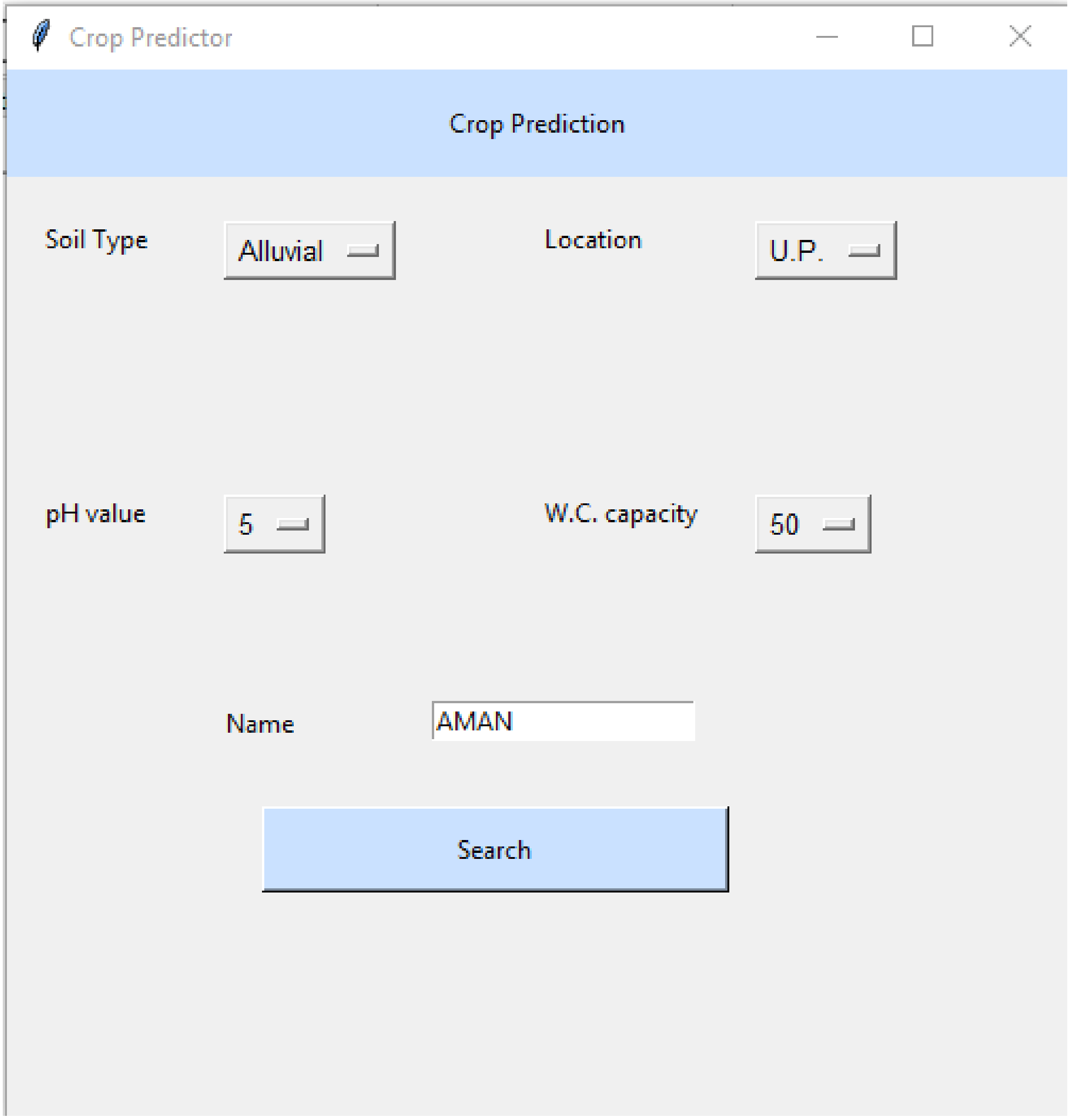


Fig 5.3.1

5.3.2 Filled Entries Page:



Soil Type Alluvial

Location U.P.

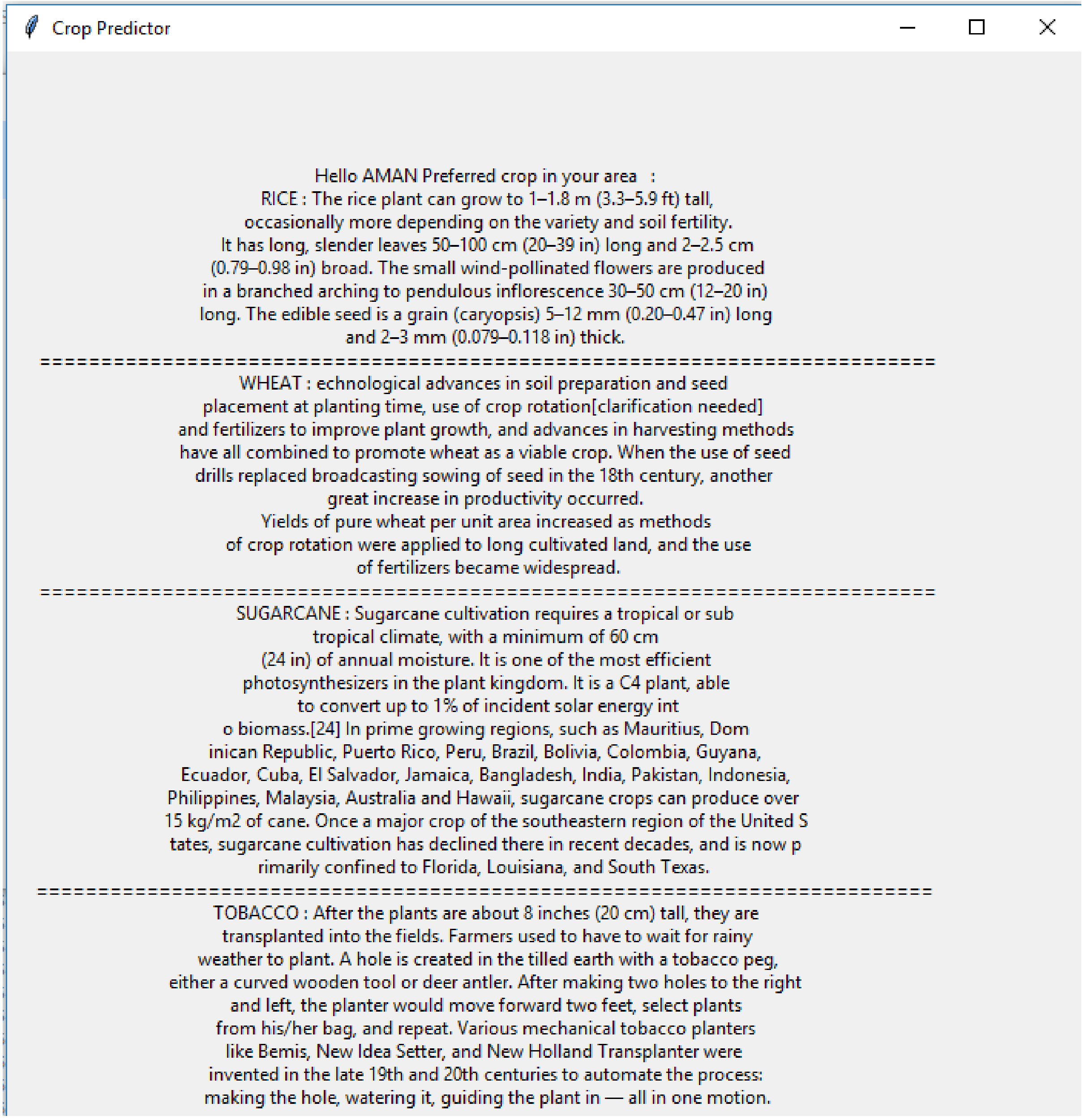
pH value 5

W.C. capacity 50

Name AMAN

Fig 5.3.2

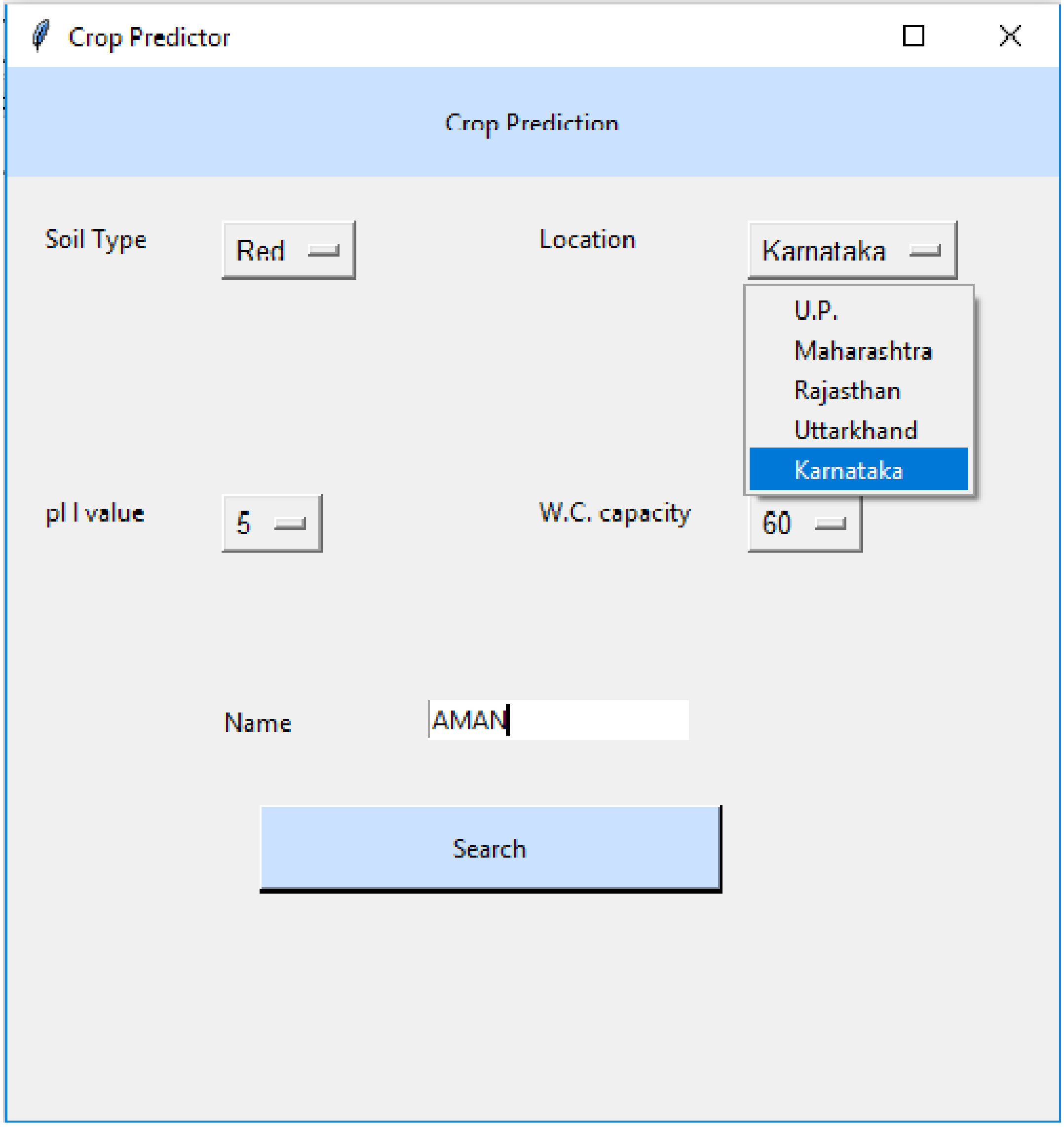
5.3.3. Display / Search Records :



```
Hello AMAN Preferred crop in your area  :
RICE : The rice plant can grow to 1–1.8 m (3.3–5.9 ft) tall,
occasionally more depending on the variety and soil fertility.
It has long, slender leaves 50–100 cm (20–39 in) long and 2–2.5 cm
(0.79–0.98 in) broad. The small wind-pollinated flowers are produced
in a branched arching to pendulous inflorescence 30–50 cm (12–20 in)
long. The edible seed is a grain (caryopsis) 5–12 mm (0.20–0.47 in) long
and 2–3 mm (0.079–0.118 in) thick.
========================================================================
WHEAT : echnological advances in soil preparation and seed
placement at planting time, use of crop rotation[clarification needed]
and fertilizers to improve plant growth, and advances in harvesting methods
have all combined to promote wheat as a viable crop. When the use of seed
drills replaced broadcasting sowing of seed in the 18th century, another
great increase in productivity occurred.
Yields of pure wheat per unit area increased as methods
of crop rotation were applied to long cultivated land, and the use
of fertilizers became widespread.
========================================================================
SUGARCANE : Sugarcane cultivation requires a tropical or sub
tropical climate, with a minimum of 60 cm
(24 in) of annual moisture. It is one of the most efficient
photosynthesizers in the plant kingdom. It is a C4 plant, able
to convert up to 1% of incident solar energy int
o biomass.[24] In prime growing regions, such as Mauritius, Dom
inican Republic, Puerto Rico, Peru, Brazil, Bolivia, Colombia, Guyana,
Ecuador, Cuba, El Salvador, Jamaica, Bangladesh, India, Pakistan, Indonesia,
Philippines, Malaysia, Australia and Hawaii, sugarcane crops can produce over
15 kg/m2 of cane. Once a major crop of the southeastern region of the United S
tates, sugarcane cultivation has declined there in recent decades, and is now p
rimarily confined to Florida, Louisiana, and South Texas.
========================================================================
TOBACCO : After the plants are about 8 inches (20 cm) tall, they are
transplanted into the fields. Farmers used to have to wait for rainy
weather to plant. A hole is created in the tilled earth with a tobacco peg,
either a curved wooden tool or deer antler. After making two holes to the right
and left, the planter would move forward two feet, select plants
from his/her bag, and repeat. Various mechanical tobacco planters
like Bemis, New Idea Setter, and New Holland Transplanter were
invented in the late 19th and 20th centuries to automate the process:
making the hole, watering it, guiding the plant in — all in one motion.
```

Fig 5.3.3

5.3.4. Edit / Search Records :



Soil Type: Red

Location: Karnataka

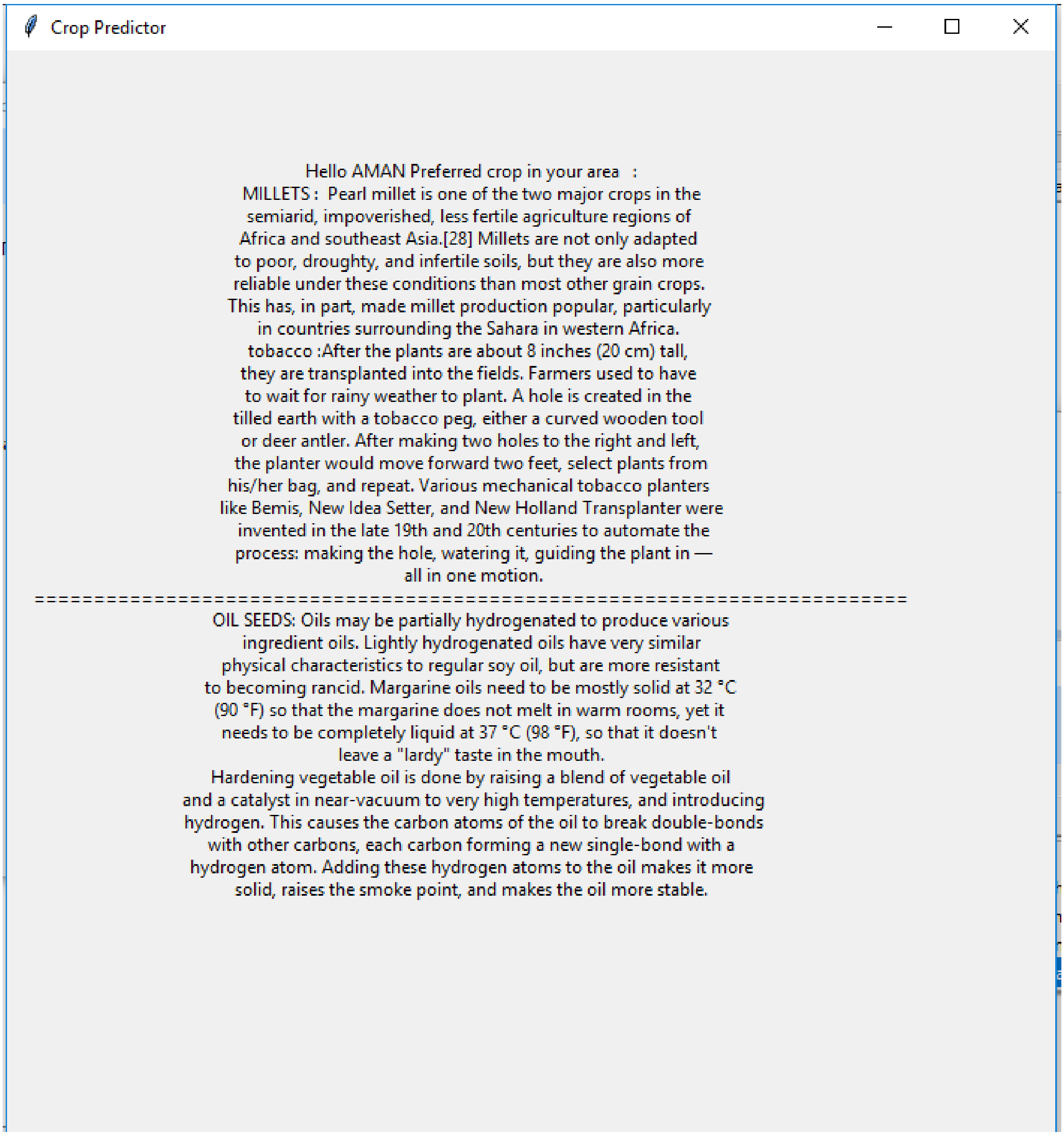
pI I value: 5

W.C. capacity: 60

Name: AMAN

Fig 5.3.4

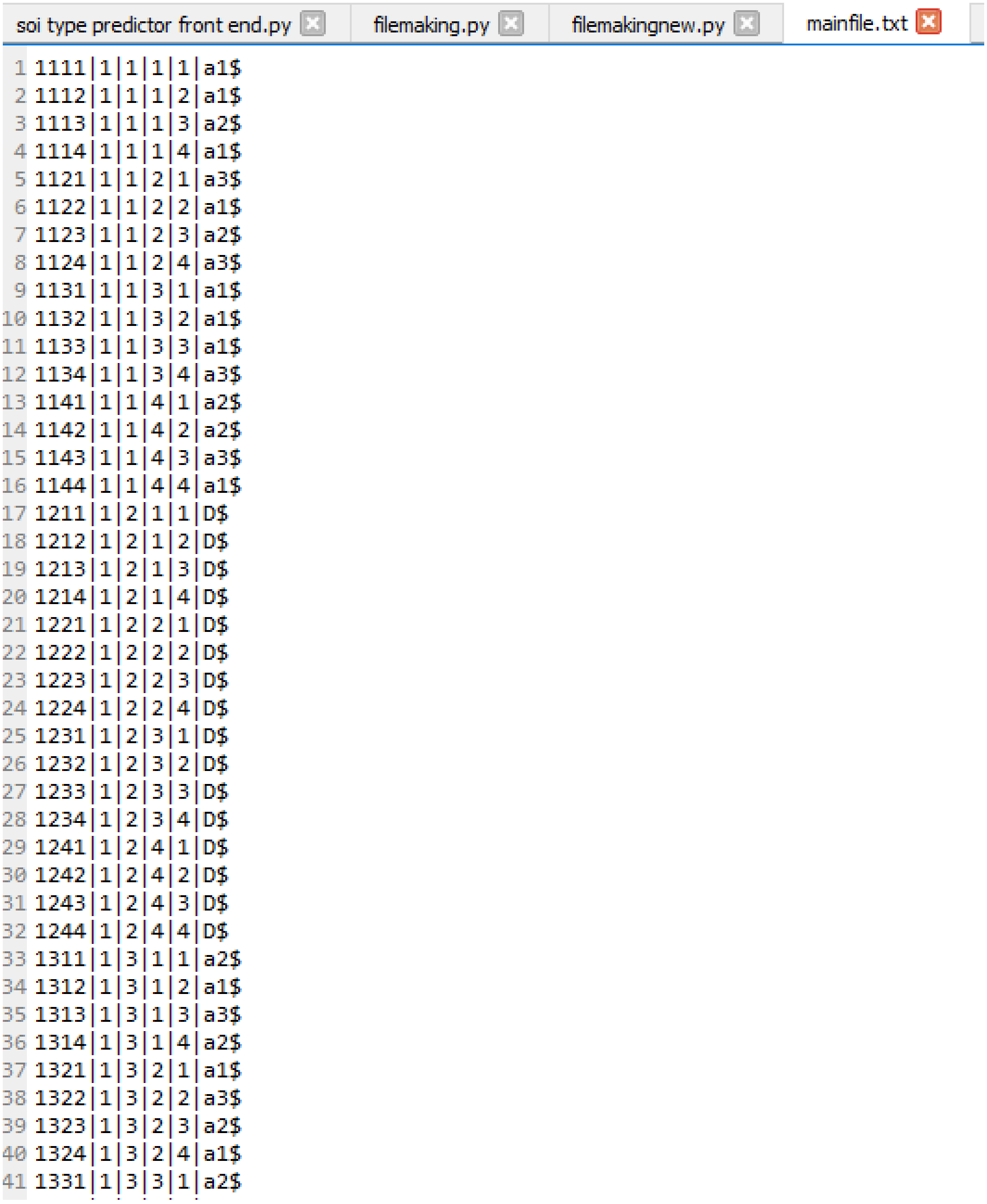
5.3.5. Edit / Search Records Results :



```
Hello AMAN Preferred crop in your area   :
MILLETS :  Pearl millet is one of the two major crops in the
semiarid, impoverished, less fertile agriculture regions of
Africa and southeast Asia.[28] Millets are not only adapted
to poor, droughty, and infertile soils, but they are also more
reliable under these conditions than most other grain crops.
This has, in part, made millet production popular, particularly
in countries surrounding the Sahara in western Africa.
tobacco :After the plants are about 8 inches (20 cm) tall,
they are transplanted into the fields. Farmers used to have
to wait for rainy weather to plant. A hole is created in the
tilled earth with a tobacco peg, either a curved wooden tool
or deer antler. After making two holes to the right and left,
the planter would move forward two feet, select plants from
his/her bag, and repeat. Various mechanical tobacco planters
like Bemis, New Idea Setter, and New Holland Transplanter were
invented in the late 19th and 20th centuries to automate the
process: making the hole, watering it, guiding the plant in —
all in one motion.
==========================================================================
OIL SEEDS: Oils may be partially hydrogenated to produce various
ingredient oils. Lightly hydrogenated oils have very similar
physical characteristics to regular soy oil, but are more resistant
to becoming rancid. Margarine oils need to be mostly solid at 32 °C
(90 °F) so that the margarine does not melt in warm rooms, yet it
needs to be completely liquid at 37 °C (98 °F), so that it doesn't
leave a "lardy" taste in the mouth.
Hardening vegetable oil is done by raising a blend of vegetable oil
and a catalyst in near-vacuum to very high temperatures, and introducing
hydrogen. This causes the carbon atoms of the oil to break double-bonds
with other carbons, each carbon forming a new single-bond with a
hydrogen atom. Adding these hydrogen atoms to the oil makes it more
solid, raises the smoke point, and makes the oil more stable.
```

Fig 5.3.5

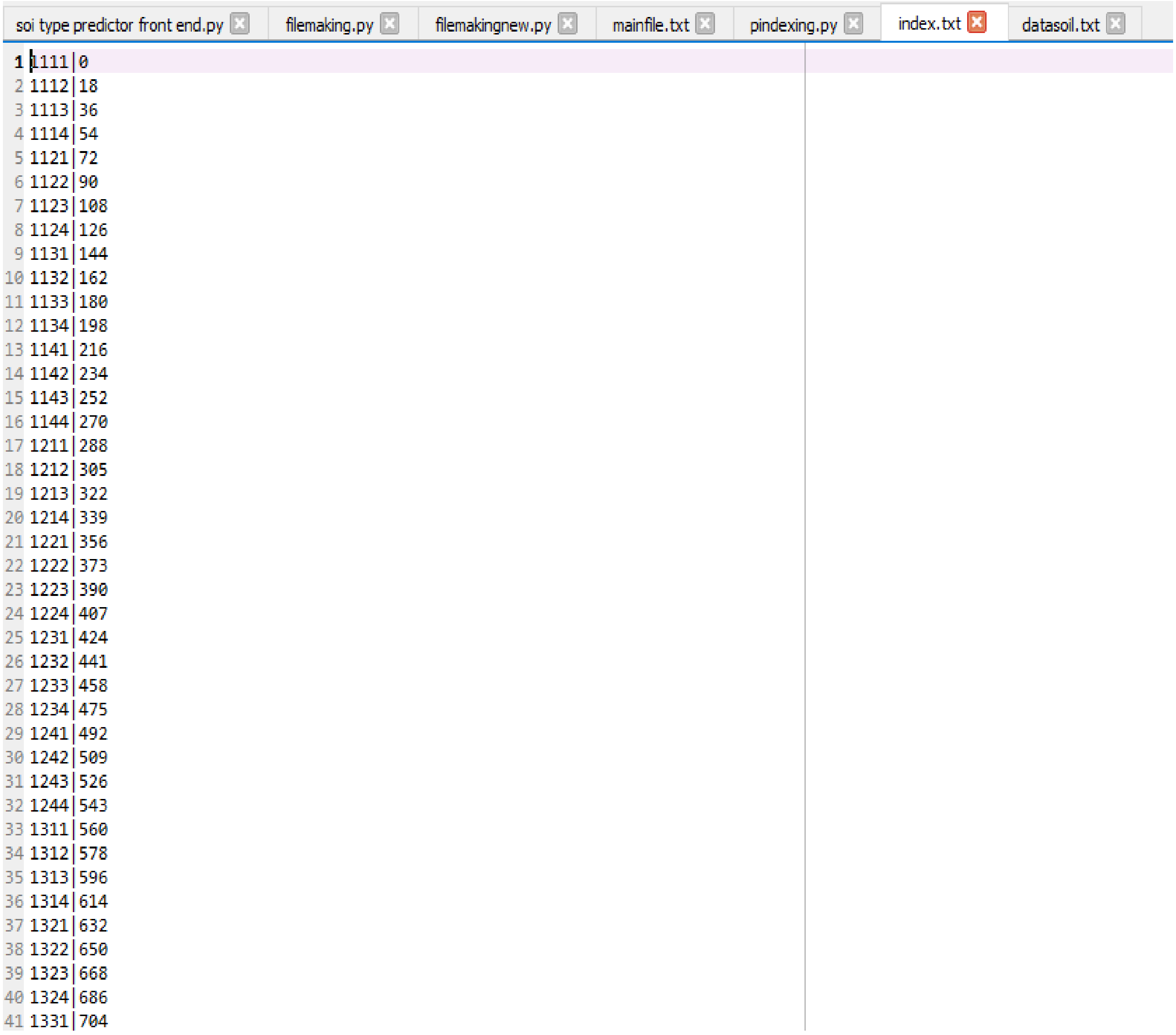
5.3.6. Soil Data With Crop Match :



```
1111|1|1|1|1|a1$
1112|1|1|1|2|a1$
1113|1|1|1|3|a2$
1114|1|1|1|4|a1$
1121|1|1|2|1|a3$
1122|1|1|2|2|a1$
1123|1|1|2|3|a2$
1124|1|1|2|4|a3$
1131|1|1|3|1|a1$
1132|1|1|3|2|a1$
1133|1|1|3|3|a1$
1134|1|1|3|4|a3$
1141|1|1|4|1|a2$
1142|1|1|4|2|a2$
1143|1|1|4|3|a3$
1144|1|1|4|4|a1$
1211|1|2|1|1|D$
1212|1|2|1|2|D$
1213|1|2|1|3|D$
1214|1|2|1|4|D$
1221|1|2|2|1|D$
1222|1|2|2|2|D$
1223|1|2|2|3|D$
1224|1|2|2|4|D$
1231|1|2|3|1|D$
1232|1|2|3|2|D$
1233|1|2|3|3|D$
1234|1|2|3|4|D$
1241|1|2|4|1|D$
1242|1|2|4|2|D$
1243|1|2|4|3|D$
1244|1|2|4|4|D$
1311|1|3|1|1|a2$
1312|1|3|1|2|a1$
1313|1|3|1|3|a3$
1314|1|3|1|4|a2$
1321|1|3|2|1|a1$
1322|1|3|2|2|a3$
1323|1|3|2|3|a2$
1324|1|3|2|4|a1$
1331|1|3|3|1|a2$
```

Fig 5.3.6

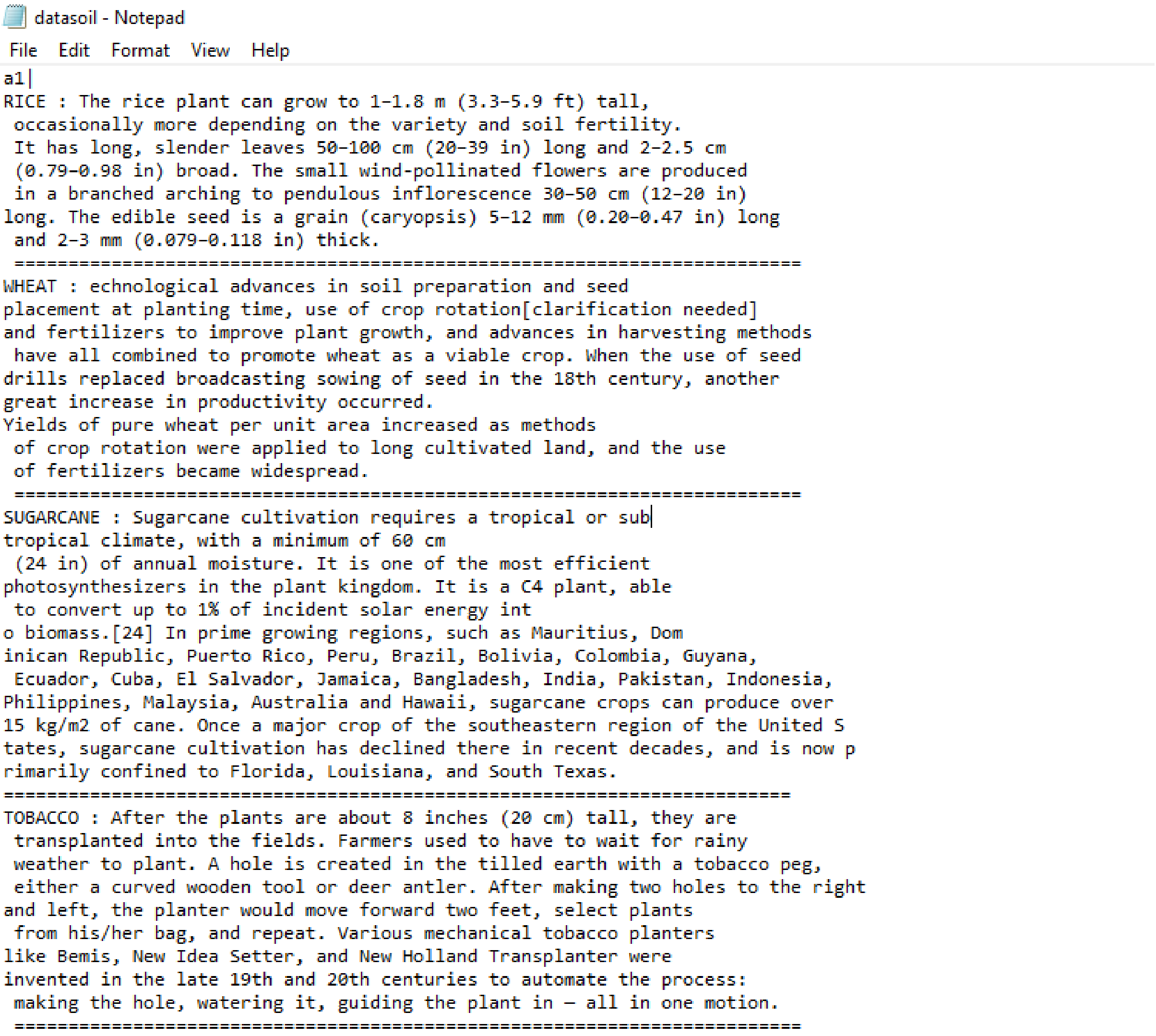
5.3.7. Index File :



```
1111|0
1112|18
1113|36
1114|54
1121|72
1122|90
1123|108
1124|126
1131|144
1132|162
1133|180
1134|198
1141|216
1142|234
1143|252
1144|270
1211|288
1212|305
1213|322
1214|339
1221|356
1222|373
1223|390
1224|407
1231|424
1232|441
1233|458
1234|475
1241|492
1242|509
1243|526
1244|543
1311|560
1312|578
1313|596
1314|614
1321|632
1322|650
1323|668
1324|686
1331|704
```

Fig 5.3.7

5.3.7. Crop Data



```
a1
RICE : The rice plant can grow to 1-1.8 m (3.3-5.9 ft) tall,
 occasionally more depending on the variety and soil fertility.
 It has long, slender leaves 50-100 cm (20-39 in) long and 2-2.5 cm
 (0.79-0.98 in) broad. The small wind-pollinated flowers are produced
 in a branched arching to pendulous inflorescence 30-50 cm (12-20 in)
long. The edible seed is a grain (caryopsis) 5-12 mm (0.20-0.47 in) long
 and 2-3 mm (0.079-0.118 in) thick.
 =========================================================================
WHEAT : echnological advances in soil preparation and seed
placement at planting time, use of crop rotation[clarification needed]
and fertilizers to improve plant growth, and advances in harvesting methods
 have all combined to promote wheat as a viable crop. When the use of seed
drills replaced broadcasting sowing of seed in the 18th century, another
great increase in productivity occurred.
Yields of pure wheat per unit area increased as methods
 of crop rotation were applied to long cultivated land, and the use
 of fertilizers became widespread.
 =========================================================================
SUGARCANE : Sugarcane cultivation requires a tropical or sub
tropical climate, with a minimum of 60 cm
 (24 in) of annual moisture. It is one of the most efficient
photosynthesizers in the plant kingdom. It is a C4 plant, able
 to convert up to 1% of incident solar energy int
o biomass.[24] In prime growing regions, such as Mauritius, Dom
inican Republic, Puerto Rico, Peru, Brazil, Bolivia, Colombia, Guyana,
 Ecuador, Cuba, El Salvador, Jamaica, Bangladesh, India, Pakistan, Indonesia,
Philippines, Malaysia, Australia and Hawaii, sugarcane crops can produce over
15 kg/m2 of cane. Once a major crop of the southeastern region of the United S
tates, sugarcane cultivation has declined there in recent decades, and is now p
rimarily confined to Florida, Louisiana, and South Texas.
=========================================================================
TOBACCO : After the plants are about 8 inches (20 cm) tall, they are
 transplanted into the fields. Farmers used to have to wait for rainy
 weather to plant. A hole is created in the tilled earth with a tobacco peg,
 either a curved wooden tool or deer antler. After making two holes to the right
and left, the planter would move forward two feet, select plants
 from his/her bag, and repeat. Various mechanical tobacco planters
like Bemis, New Idea Setter, and New Holland Transplanter were
invented in the late 19th and 20th centuries to automate the process:
 making the hole, watering it, guiding the plant in — all in one motion.
 =========================================================================
```

Fig 5.3.8

6. CONCLUSION

The application Crop Predictor has successfully demonstrated the functional requirements by performing the required operations as intended. It performs addition of the records, searching, and prediction of Crops without affecting other records.

Future work planned included:

- Predict a Crop when no data is available in data set, i.e. data predicting techniques.
- Adding more States and attributes of soil.

All in all, the Crop Predictor developed supports all the primitive operations and models the real world well.

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