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### Computational planting management in developing bean and pumpkin collections

**Abstract.** This study is on applied computer programme for planting on the territory which may vary or appear limited. Significance of the programme suggested is confirmed by minimizing errors of calculations as reduced time for commercial or experimental crop sowings. Thus, “Planting Manager” programme allows to use available land resources for planning at large or small plots. Such programme is supplied with a simple interface as supposed to be smart in design. All the input variables as the output data may be changed independently as remain under strict regulation. The programme is supplied with the working field and special field for the input data on plot length and width. Addition of pictures and figures may be done in one of preferential formats (jpg, bmp, gif, png, and tif). Saving of intermediate and final files is supposed to be in PDF format. The latter is distinguished by saving documents without distortions. The programme is supplied with the description along with a special instruction unit and related button («Help»). Programme window may be also changed. The programme is designed based on earlier analogues, such as “Vegetable Planner” and others. But its principal advantage is flexibility of key parameters, possibility to load pictures in various formats, edit final document prior to printing. The programme has been used for allocation of more than 50 vegetable varieties at the territory of Zhanga Talap Agrobiocenter of al-Farabi Kazakh National University.

**Keywords:** planting management, computer programme, interface, format.

#### Introduction

One of the reasons for quite extensive development of agricultural biotechnology abroad is a high level of implication of technologies and computation which are determined by the development of agriculture as whole and highly qualified personnel.

Experience of agricultural in the world leading countries management is tightly linked to information technologies in our days. In turn, information technologies are known to make a great positive impact on the level of expenditures in industry and farming as well as quality of final product by optimizing the system or certain steps of manufacturing/processing.

Understanding that farmers in Kazakhstan have had little opportunity to purchase expensive computer programmes it is high time for researchers to elaborate completely different programme products, which would allow to achieve progress

even while using powerless computers without entrance to the web.

Software used for the management of agriculture may be subdivided into the following groups:

I. GIS-related software for handling electronic field maps (Farm Works Site (Pro), SST Summit, SMS Desktop Software (Advanced and Basic), JD Reports MAP, Agro-Net NG, FarmView Record Keeper and others);

II. software measuring field sizes and sampling soil probes in the field (Farm Works Mobile, SST Stratus, SMS Mobile, AGRO-GPS Mobilbox and others);

III. map-designing software (special programmes such as Site, Farm Works Site Pro, SS-Toolbox, LandView Map; universal programmes including MapInfo ArcView and others);

IV. monitoring techniques supporting software (special programmes such as GIS Panorama,

AGRO, AUTO and others; universal programmes such as AutoGRAPH, Sputnik, Bit-Nova, Business Navigator and others);

V. software for husbandry (Stock, Stock Mobile, Porcitec, Vaquitec, Ovitec and others);

VI. classic accountance software (Farm Funds and other 1C programmes).

The programme offered may be referred to the third cluster though it may be composed in field conditions either. This programme was used under crop rotation in the steppe zone of the Almaty Region at “Zhanga Talap” Agrobiocenter of al-Farabi Kazakh National University in 2012-2014.

### Materials and methods

“Planting Manager” as a new computer programme has been created for not that powerful computers under the absence of access to internet. Thus all the requirements put forward by small farmers of Kazakhstan to the software of interest have been taken into account.

“Planting Manager” has been designed on the basis of earlier programme known as Vegetable Planner (vegetable-gardening-online.com) [1]. For this purpose “Object Pascal”, specific object-directed language of programming has been implied in the computer designing medium “Borland Delphi 7.0”. New programme may be used for planning the land piece of any size.

**Variation of plot length is carried out by the following set of commands:**

```
procedure
TFORM1.ComboBox1Change(Sender:
TObject);
var
index:Integer;
begin
dlina:=ComboBox1.ItemIndex+1;
wirina:=ComboBox2.ItemIndex+1;
if (dlina>0) and (wirina>0) then// under
condition that length and width have been already
given
begin
Panel4.Height:=wirina*100;
Panel4.Width:=dlina*100;
Image2.Height:=wirina*100;
Image2.Width:=dlina*100;
Image2.Picture.LoadFromFile('images/grid.
JPG');//grid.JPG picture is loaded at the background
for index:=0 to dlina*wirina-1 do
begin
```

```
intlist[index]:=0;
end;
end;
end.
```

The programme allows to process pictures of nearly all modern formats, types and sizes. So it is able to operate with jpg, bmp, gif, png, tiff, and ico files.

The site created is released in PDF format to be further saved or printed out.

Sufficient technical conditions claimed to the computer by the programme run as follows:

processor Intel Pentium IV, AMD Athlon, 1.5 GHz;

operative memory not less than 512 Mb;

hard disc not less than 26Mb.

preferable covering operation systems: Microsoft Windows 2000 Professional, Microsoft Windows XP Professional, Microsoft Windows 2000 Server, Microsoft Windows 2003 Server.

The programme is supplied with the information button envisaged to assist the user.

Possessing attractive and transparent interface, such program may be used by any farmer or student without special knowledge in the field of information technologies.

### Results and their discussion

Since 2009 the Agrobiocenter of Kazakh University is located in the Ili District of Almaty Region in the vicinity of the Zhanga Talap Village. Its area of 10 ha includes Teaching Building and the dormitory for 50 students.

There are also Agrobiocological Laboratory, pump and diesel stations, storehouses for agricultural equipment and goods, workshops, chemical plant and parking lot. The agrobiocenter is supplied by the communications including power supply, telephone, water and gas pipes, fire-protection network, and etc.

Since 2012 students under supervision of principal investigators have taken part in a dozen of research projects including setting up and development of collections for vegetable plants, particularly beans and pumpkins. “Planting Manager” (Aytasheva e.a., 2012) has been proposed to rationally use sowing plots of the agrobiocenter as planning the sowings of experimental crops [2].

This is needed also due to specific location of the agrobiocenter which is known to occupy the South-Eastern arid zone of the hollow of the Ili

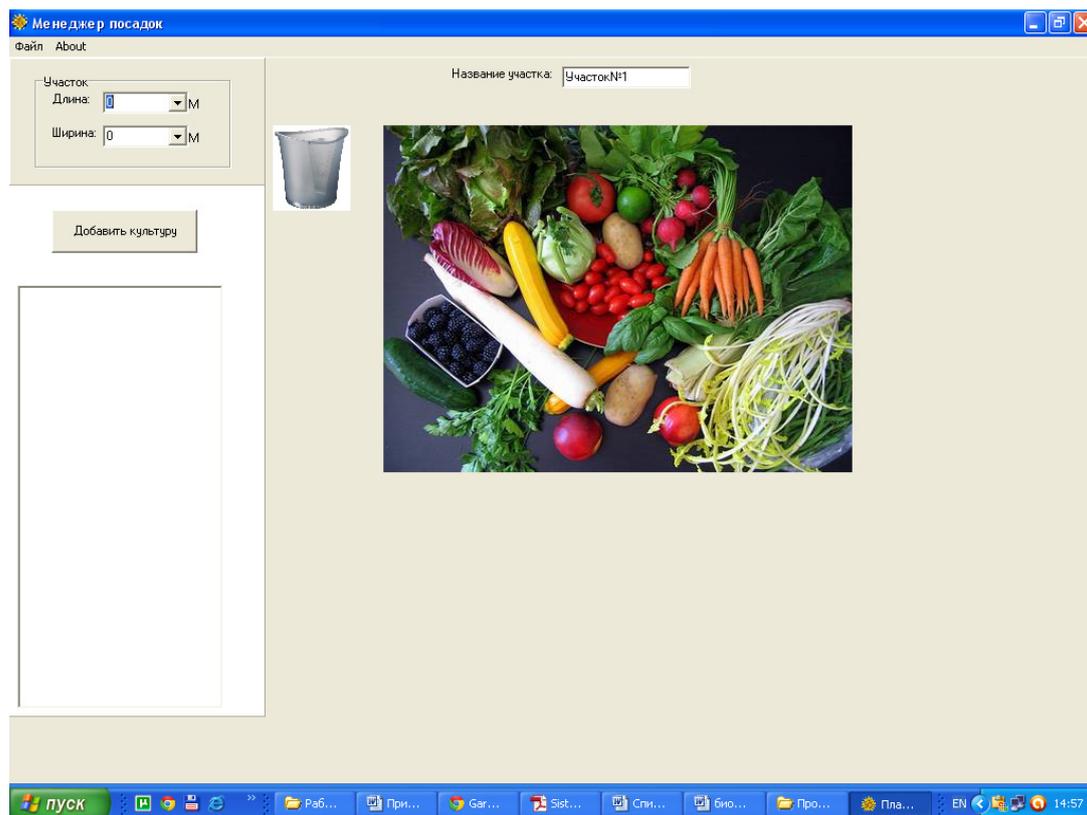


Figure 1 – Initial window of “Planting Manager”

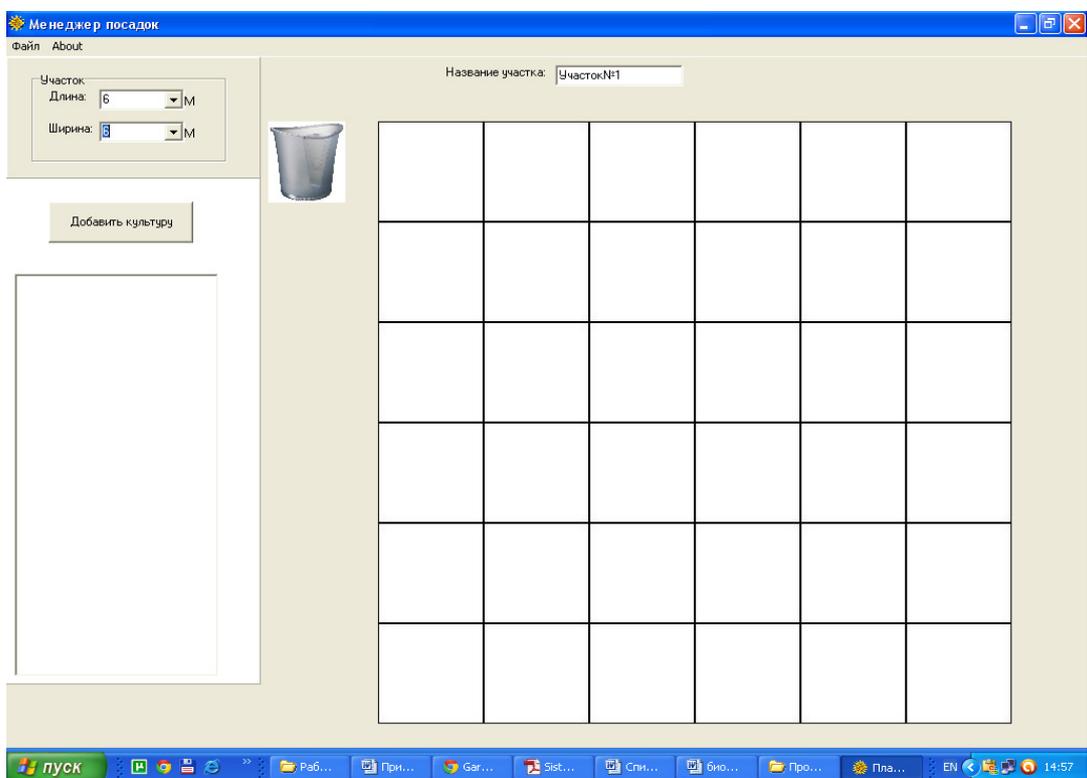


Figure 2 – Field with “freezed” area of 6 x 6 m

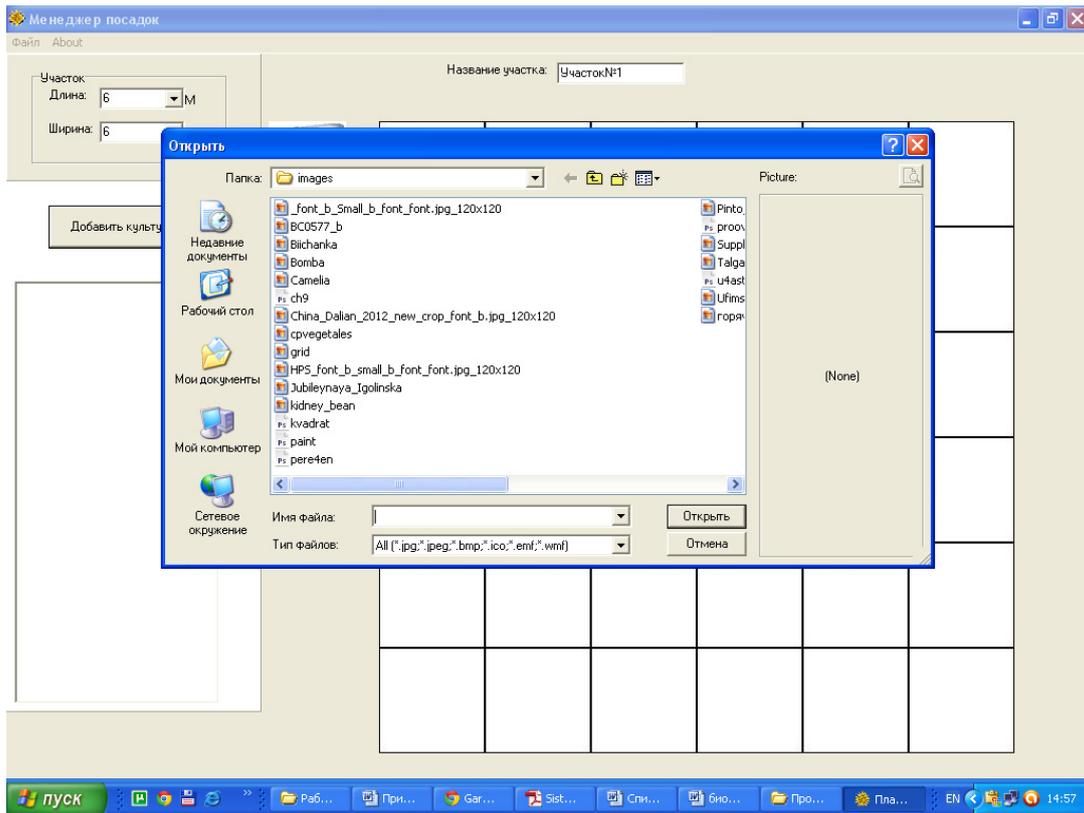


Figure 3 – Choice of crops

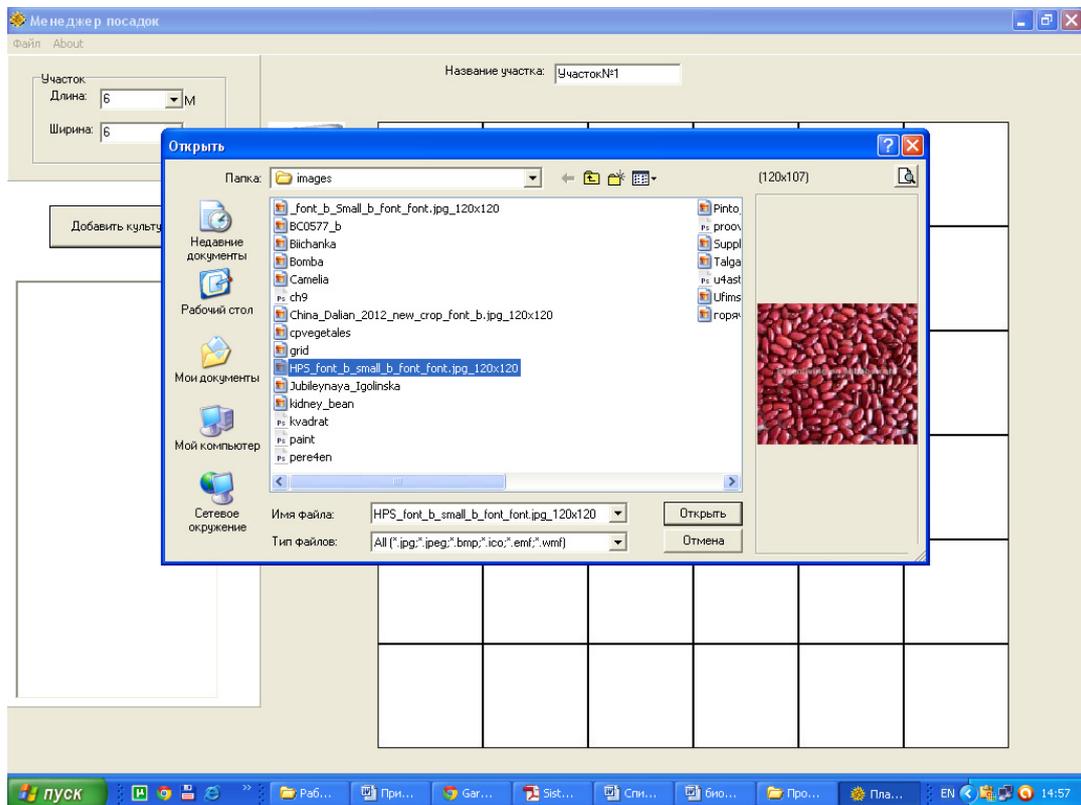
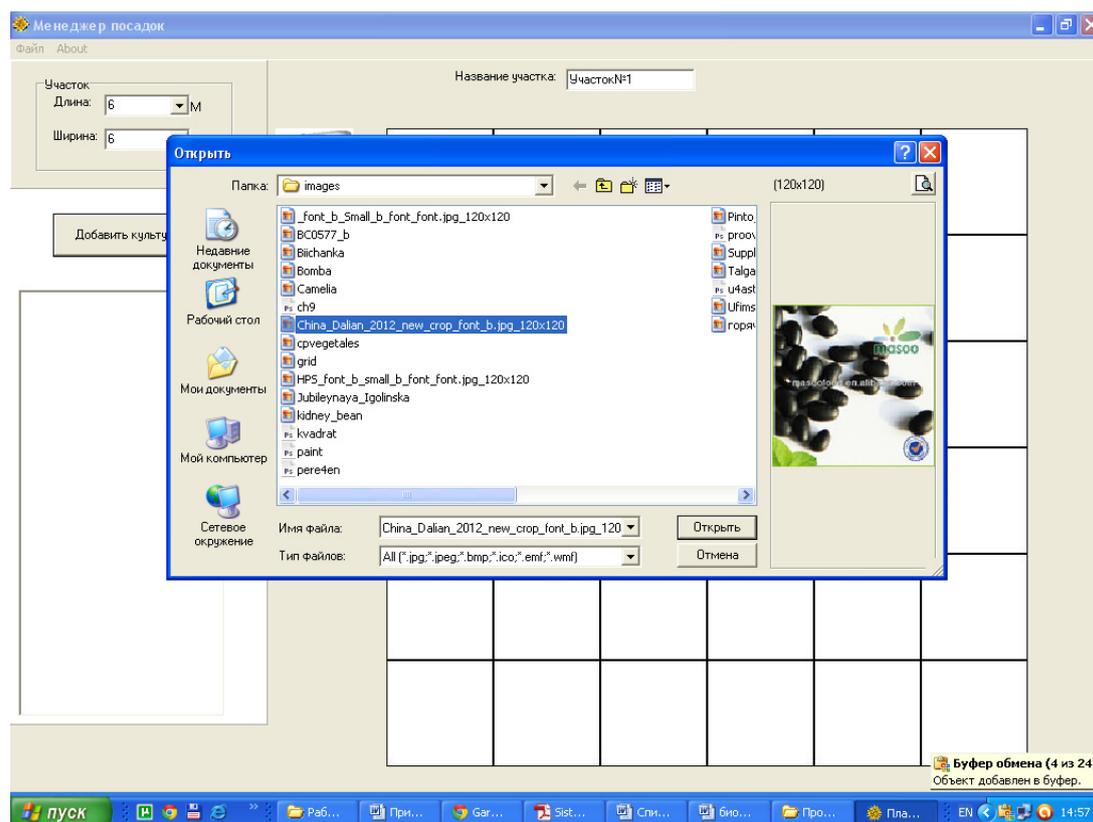


Figure 4 – Choice of the picture for pasting in the field with declared parameters



**Figure 5** – Crop allocation in the field

Riverbed. The site is characterized to be windy, dry and sunny.

“Planting Manager” is attributed by the following functions: document creation in PDF format with a field with changeable parameters, document’s editing, saving and printing, allocation of pictures showing all planting crops, in the field.

When the programme is loaded to the computer, it is ready for operation (see Fig. 1-5). Upon the opening, the window shown in Fig. 1 is displayed. Field for input parameters, button “Add the crop” and the list of already pasted crops are allocated in the left side of the window.

The field of common plan of sown crops, basket for wrong versions and the name of the piece of land which is given independently are indicated in the right side.

By pressing “Add the crop” button the user is invited to choose a picture from the gallery of images (from “Images” folder) to have it then posted in the field.

It is recommended to fill up the images folder beforehand with such amount of pictures which are required for designing a sowing plan.

The programme is supposed to process images of all known so far formats, except gif files, or animated scenes.

The folder may be filled with any number of pictures coming from any locations: hard discs, web, flash accumulation cards, and etc. Images may be of any size. However, the size of 125-130 MPx has been recorded to be preferential for working convenience. When the choice is completed, and crops pictures are fixed, the user should proceed by pressing the button “Open” in the right bottom corner. Thus the picture would appear in exact square of the field.

After drafting sowing plan as a whole, the user is advised to open the folder “File” in order to choose one of the lines, “Save” or “Print”. In case of saving, it is up to the user to find out special place on the disc to execute this order. “Planting Manager” has been used for targeting experimental plants of food and heirloom beans and pumpkins from the university collection. However, in its common appearance a new programme has much in common with other planting programmes (“Vegetable Planner”, see related outlooks at <http://vegetable-gardening-online.com>).

Nonetheless, the advantage of “Planting Manager” is accounted for by its independence from picture’s size and format together with the opportunity to save the output in rigid PDF format.

### **Conclusions**

Present information technologies are entering agricultural biotechnology to assist in pacing towards less expensive, less erroneous as less time-consuming farming.

New computation “Planting Manager” programme has been used at the Zhanga Talap Agrobiocenter of al-Farabi Kazakh National University. Its efficiency has been confirmed by accomplishment of several research projects, and namely while setting up domestic collections for food and heirloom pumpkins and generation of new bean lines. This programme has been developed on the basis of similar external programmes (i.g. “Vegetable Planner”) by using

“Delphi” computational language in object-oriented “shell” of “Pascal” system. The latter is reknowned by its easy implication, efficiency and high productivity.

The programme mitigates main requirements to the software of the farmers and the biotechnologists, especially in terms of cheapness, fewer technical demands, optional access to the web, and simplicity in handling. In addition, new programme is convertible into Kazakh as other languages to be implied as proper mean of farmers’ as researchers’ multicultural communications.

### **References**

- 1 “Vegetable Planner” (<http://vegetable-gardening-online.com>)
- 2 Aytasheva Z.G., Polischuk E.V., Bykova Ch. S. Applied Computer Planting Manager Programme. State Certificate of Proprietal Rights No. 1034, Astana, August 1, 2012.