UNIVERSITY OF BELGRADE - FACULTY OF AGRICULTURE
DEPARTMENT FOR AGRICULTURAL ENGINEERING

UNIVESITY OF BASILICATA
School for Agricultural, Forestry, Food and Environmental Sciences
Potenza, Italy

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Faculty of Agricultural and Food Sciences
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PROCEEDINGS

The Second International Symposium on Agricultural Engineering

ISAE-2015

October, 9-10, 2015.
Belgrade - Serbia

The Second Symposium on
Agricultural Engineering
ISAE-2015

9th-10th October 2015, Belgrade – Zemun, SERBIA
http://www.isae.agrif.bg.ac.rs

Organizer: University of Belgrade, Faculty of Agriculture, Belgrade, Serbia.

Co-organizers: University of Basilicata, School for Agricultural, Forestry, Food and Environmental, Sciences, Potenza, Italy,

University of Sarajevo, Faculty of Agricultural and Food Sciences, Bosnia and Herzegovina.

Support: The European Society of Agricultural Engineers (EurAgEng);

Association for Medicinal and Aromatic Plants of Southeast European Countries (AMAPSEEC).

PROCEEDINGS

Acknowledgements: This publication is published with the financial support of the Ministry of Education, Science and Technological Development, Republic of Serbia

Published by: University of Belgrade, Faculty of Agriculture, Department for Agricultural Engineering, Nemanjina 6, 11080 Belgrade, Serbia

Editors: Dr Rade Radojević
Dr Aleksandra Dimitrijević

Technical editor: Strahinja Ajtić

Circulation: 300 copies

ISBN: 978-86-7834-232-5

CIP - Каталогизација у публикацији -
Народна библиотека Србије, Београд

631.3(082)(0.034.2)
631.17(082)(0.034.2)

INTERNATIONAL Symposium on Agricultural Engineering (2nd ; 2015 ; Beograd)
Proceedings [Elektronski izvor] / The Second International Symposium on Agricultural Engineering, ISAE-2015, October, 9-10, 2015., Belgrade, Serbia ; [organizers] University of Belgrade, Faculty of Agriculture ... [et al.] ; [editors Rade Radojevic, Aleksandra Dimitrijevic]. - Belgrade : Faculty of Agriculture, Department for Agricultural Engineering, 2015 (Beograd : Tampon print centar). - 1 elektronski optički disk (CD-ROM) ; 12 cm

Sistemski zahtevi: Nisu navedeni. - Nasl. sa naslovnog ekrana. - Tiraž 300.
- Bibliografija uz svaki rad.

ISBN 978-86-7834-232-5

1. Faculty of Agriculture (Beograd)
a) Пољопривредне машине - Зборници b) Пољопривреда - Механизација - Зборници

COBISS.SR-ID 218188812

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ISAE - 2015
The Second International Symposium on Agricultural Engineering, 9th-10th October 2015, Belgrade–Zemun, Serbia

Popular Paper

ANDROID SMART PHONE APPLICATION FOR CONTROL PROCESS IN PROGRESSIVE AGRICULTURE PRODUCTION

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Abstract. *This paper explains the development and implementation of a mobile application to make fieldwork easier. The application uses a number of devices in a Smartphone such as a GPS or a camera to collect information and broadcast it to an office in real time. Smart phone technology and Android software application creates new opportunities for farm management applications in agriculture, especially for small farms in EU and USA and the other country of World. Farmers working in agriculture now are able with a low cost smart phone and the specialized different Android application to obtain facilities that could not have before. The use of the Android software application in a smart phone can overleap the high difficulties of Agriculture management requirements which were stand as obstacle for many years so far. The downloading mobile application is staggering, and there appears to be no slowdown in the future. In fact, iOS application download could exceed 100 million per day by 2017. The otherwise this download has also had a huge impact on agriculture in USA and EU, with mobile applications. However for every useful application, there are likely several that will be abandoned after one use. Consider 53% of vendors say they are using less than 20% of the total number of agriculture-related applications they have ever downloaded on their tablets on -at least a weekly basis, according to a recent Crop Life Media Group study for year 2015.*
In this paper present only some top Android smart phone application for 2014. and 2015 (applicable in the near future in modern and progressive agriculture of Serbia, Montenegro and FYR. Macedonia).

Key words: *Android software, Smart phone, Application, Progressive agricultural*

1. INTRODUCTION

A smart phone is not only the device that allow us to make telephone calls [4], but also has additional features and capabilities that, in the past, you would have found only in a personal digital assistant or a computer such as the ability to send and receive e-mail and edit Office documents, internet access, Wi-Fi and modem ability, easy touch screen operation and most of all the capability to run powerful custom software. In fact this opportunity has been identified and several mobile applications have been developed for data acquisition in the field [9], livestock management [2] and several other that appeared as commercial mobile applications for farm management (e.g. John Deere Mobile Farm Manager, Farm Works mobile [6]).

According to the literature, mobile applications are used successfully in the areas of health care, traffic monitoring tourism, education [3]. Mobile services in the agricultural sector are a fact today. Collected information such as climate data that can be applied to production management [5]. Theodoros L., et al. [10], have an Android application for the management of small farms.

A smart phones make it possible to work with real-time data; this is an important factor in decision support systems and in documentation and traceability systems to track products or product properties [1]. The studies mentioned show how different sectors can benefit from mobile services in different ways, given their diversity of needs and conditions.

Smart phones (and operation system Android) are the product of the convergence between regular mobile phones and PDAs [3]. Our working lives have been changed by the increasing use of these devices, whose small size and low weight provide convenience and portability. From a social point of view, mobile communication has an unquestionable relevance. It has also created new forms of business [3]. In recent years, the interest of the scientific community in such communication has increased. The small farms [10], have many complications: A small farming size (3 up to 60 hectares), and High fragmentation fields (many small fields (0.3, 0.5, 0.8 hectares), scattered average in 15 miles radius. Many hired fields from different owners that are changing annually and no specialized employees for supporting the farming process. No clear views of keeping records of past year processes, and any relational information about seed - field - field type - processes - production results. So no information about results of practices been taken on the fields (e.g. percent of success of an applied chemical, and no ability for easy estimations of project and process planning. Most small farms and farmers [10], have not detailed record keeping of the equipment obtained - sold and its maintenance been performed, ability for exact calculations of production cost per hectare, and have not ability for cost estimations for a planning year.

The above characteristics constitute the difficulties that small farms are facing daily. Many farmers who try to be organised put a lot of effort to keep written records of their management approach but most of these notes are hand written notes which are not well organised, cannot be easily linked and compared to data from previous farming years, and in many cases are lost in the cabs of the tractors and other machinery. Obviously, this interest has been raised primarily because a smart phone using specialized software for various farm management processes is the ideal solution for small farm managers. A smart phone can be a mobile office that is very handy, can be carried on in a pocket,

stand on at any agriculture machine (different tractor, combine, car). Smart phones have another characteristic that is very important for small farm managers. This is the 'user interface'. A smart phone touch screen with abilities to zoom in and out with the combination of the simple interface 'buttons, menus and forms' with the support of qwerty keyboard makes them easy to operate for people who are not very familiar with ICT technology. In this category belong most farmers. Especially, old farmers are not very familiar with technology.

Thus, even the best software if it is supplied with bad user interface and not easy operation, it will never be adopted by farmers. Farmers require software that is easy to operate and ask only for the specific data required to complete an operation or a process. Farmers have no time to waste for recording an operation on a field. They will prefer to perform the operation rather than recording it. Thus, software has to be very simple as you can talk to a machine about the operation. To this end it must be said that mobile devices are coming with accompanying tools such as GPS, accelerometer, proximity measurement, etc.

All the above characteristics make the smart phones the future of computing in modern societies but also give a hand to small size farmers in order to have a weapon to walk with their management difficulties for an easy, fast and up to date knowledge extraction that can boost their production.

2. HOW DOES OPERATE ANDROID APPLICATION FOR AGRICULTURE

The major objective of the present research was to develop and implement an application using the GPS, camera, accelerometer and Wi-Fi/GPRS devices of Smart phones so that technical staff can use it as a tool in fieldwork when inspecting agricultural plots.

The product developed was GeoFoto an Android applications for agriculture [7]. A GeoFoto session begins by starting the program from the application menu (Fig. 1a). The first step is to select the main menu or the settings menu (Fig. 1b). In the settings menu (Fig. 1c), user can select between storing coordinates in geodesic or UTM projection mode, time interval between epochs and the number of epochs. If the user is working indoors, inside a building, for example, he/she should select "working without connection". In this case, the photograph will be taken without GPS information. Finally, the user can decide how the information is stored.

Fig. 1 GeoFoto screenshots: (a) access to the application, (b) initial screen accessed by the user (c) settings menu, (d) main menu and (f) digital blackboard, (e) possible application in the identification of pests and diseases

Data can be sent by e-mail or stored in an SD card. When the user starts to take photographs, a new window appears, showing the image recorded by the camera in full screen (Fig. 1d). Four buttons are shown at the bottom of the screen. The first one on the left shows or conceals the coordinates on the screen. The second button is the compass and shows the orientation of the Smartphone. The right button shows a new screen where the user can enter additional data (Fig. 1e). This information is later printed on the image and included in a text file and in an e-mail. The camera button is used to take photographs. This button is only enabled once the GPS coordinates have been obtained. If the user selects the settings menu to work indoors, this button is enabled immediately.

Each camera shot generates two files; an image and a text file. Files are named using the concatenation of date and time values. The e-mail subject is also generated using this rule, which prevents any confusion when managing the data. All the recorded data are processed and automatically e-mailed in real time to the office or laboratory, where the information is received and analyzed. This makes it possible to verify that the user has visited the correct plot or that the number of samples collected is enough. Thus, if something goes wrong the problem can be corrected in real time.

3. APPLICABLE OF ANDROID SMART PHONE MOBILE APPLICATION FOR CONTROL PROCESS IN PROGRESSIVE AGRICULTURE PRODUCTION (APPLICABLE IN R. OF SERBIA)

In the introduction to this work has notes about downloading mobile Android applications is staggering, and there appears to be no slowdown in the future.

In fact, iOS application download could exceed 100 million per day by 2017. Therefore these Android smart phone mobile application for process control in

Agriculture Production in the www.market, are different in terms of quality, relevance, cost and accessibility in some regions and countries.

In this paper display Android smart phone mobile application are important for Balkan region and level of development of actual agricultural production.

The Farm Manager is an Android application which is developed at the labs of the Technological Education Institute of SERRES. The main feature of Farm Manager is that, unlike the other tools mentioned before, it is specialized in Greek farming because it is designed and developed to respond to the needs and. Here, we will present the key characteristics of the Farm Manager software that it makes it usable and useful for many agricultural management needs. The Farm Manager (Greece, Thessaloniki), is a useful Android mobile application software tool for small farm management specialized in the needs of Greek farming and potentially other countries which share common characteristics. Farm Manager is currently available since April 2013 and there are more than 347000 people who read about it (http://web2.teiser.gr/web-programming/FarmManager/welcome.html). It is currently used by more than one thousand farmers in Greece from which we have received initial positive feedback. This is very much in line with a finding reported in an ICT adoption study back in 2005 [8]. Then the authors analyzed and contemplated: Probably in Greece and in other countries, which have such high adoption rates of mobile phone technology, it can be used and deliver to farmers IT applications and services that are easily accessible and easy to use. Especially with the new high speed cell network protocols such as 3G and GPRS which promise fast multimedia delivery and fast connection to the Internet, mobile phones can be proved as the best devices for Greek farmers.

Farm Manager is an important step towards this development and its adoption rate is very impressing so far. Currently the tool is expanded to support high management requirements such as accountant facilities, ground analysis, store management, production result and annual use knowledge extraction. An initial version for Windows mobile is available and iPhone edition is under development.

Tractor Pal. This application (Fig.3), keeps inventory and maintenance records for all your personal agriculture machines and attachments, including cars and trucks of all brands. Tractor Pal enables you to log all of your large and small machinery and automobiles including tractors, pickups, lawn mowers, cars, combines, sprayers, loaders, skid-loaders, backhoes, attachments, and more.

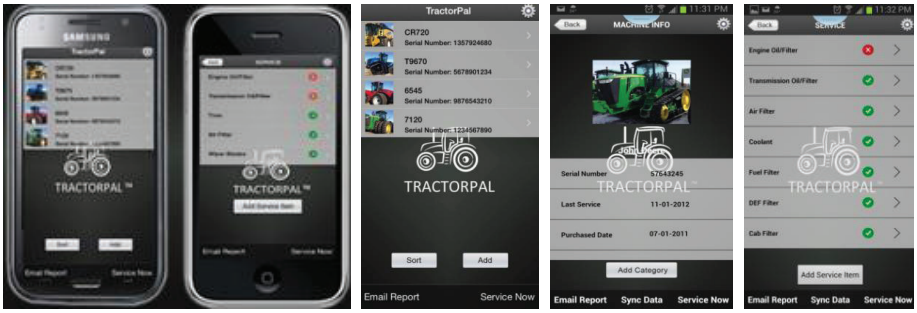

Fig. 3 Application Tractor Pal screen

Application Tractor Pal record each item's maintenance (e.g., changing oil, filters, tires, and irregular repairs), and will remind you when service is required. (*Applicable for:* Android).

Machinery Guide. You can use your tablet or smart phone as a precision tractor GPS system using the Machinery Guide application (Fig.4). It is one of the first guidance software programs that functions as a precision farming application using an antenna. These antennas are capable of receiving and processing free corrections (e.g., EGNOS, WAAS).

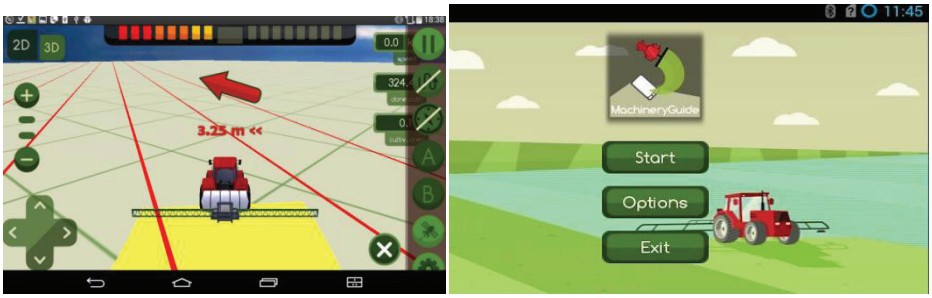

Fig. 4 Application Machinery Guide screen

It can be used for any farming activity which is done by tractor or other agricultural machinery, including fertilization, manure application and spraying. It even can be used for land measurements as well. *(Applicable for:* Android*).*

Agrivi Application. Based on best-practice production processes for more than 60 crops, Agrivi application (Fig.6.) guides farmers to improve their production and increase productivity.

Its features include project-oriented farm management with a simple and fast way of planning, monitoring and tracking all farm activities and inputs usage, advance sales and expense tracking ensures taking control over farm finances, inventory management with low inventory alarms removes delays in production caused by lack of inputs and weather monitoring with detailed 7-day weather forecast and 3-year weather history for each field and smart disease risk detection alarms. *(Applicable for:* Android*,* iPad*,* iPhone).

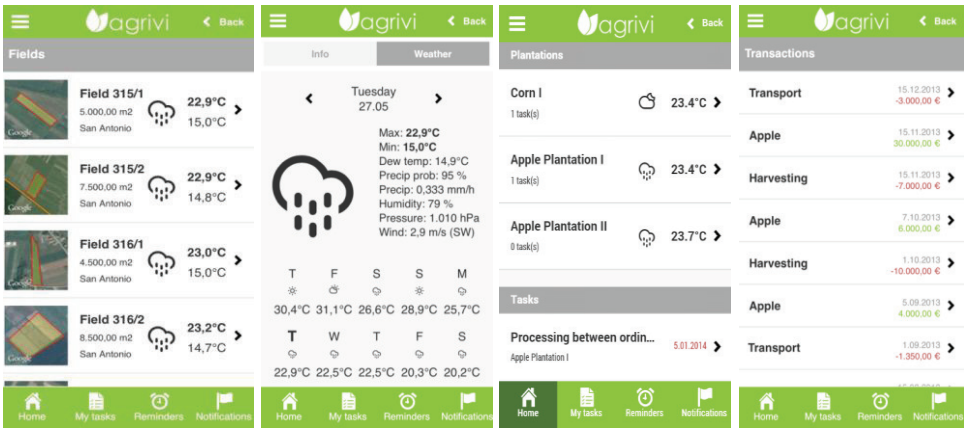

Fig. 5 Application Agrivi application screen

The Corn Yield Calculator, developed by lifelong farmers, allows you to quickly estimate the amount of corn in a given field (Fig.6.). Once in the field, simply "pick" three ears and determine if you have small, medium, or large kernels of corn. Next, provide specific field data for that field, including row spacing and row length, and the app will calculate the yield. *(Applicable for:* Android, iPad, iPhone).

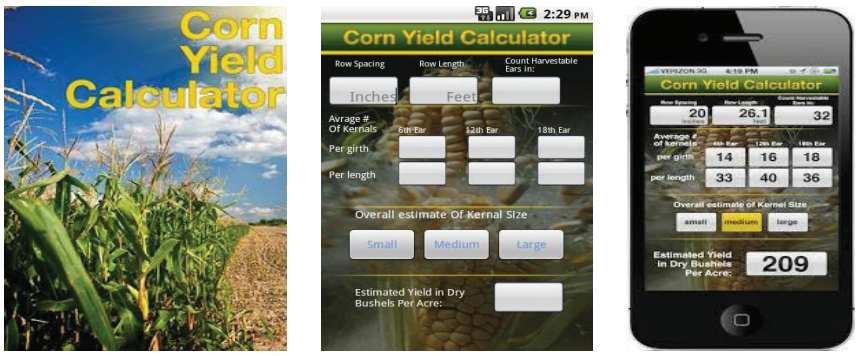

Fig. 6 Application the Corn Yield Calculator screen

4. CONCLUSION

A Smart phone technology and Android software application creates new opportunities for farm management applications in agriculture, expecialy for small farms in EU and USA and the other country of World. Farmers working in agriculture (EU, USA) now are able with a low cost smart phone and the specialized different Android application to obtain facilities that could not hove before . The use of the Android software application in a smart phone can overleap the high difficulties of Agriculture management requirements which were stand as obstacle for many years so far.

Recent advancements on smartphones (Andriod Application) and the capabilities of the related software, can offer great easiness and wider access and extend the reach of agricultural information and services to the public. However, the use of smartphones and application programs for all agricultural operations and tehnologies associated with other public services is not yet on a widespread level.

The authors of this paper believe that in the near future should be as soon as possible consistent application of such Android software application for many agricultural users. Now the implementation of the program barely registered with small farmers agriculture of the Republic of Serbia, Montenegro and Republic of Macedonia.

Acknowledgement: *The authors wish to thank to the Ministry of Education, Science and Technological development,Republic of Serbia, for financing the TR 31051 Project.*

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