# From Community Networks to Community Data: The *AppLea* Farming Mobile App

Aris Pilichos, Merkouris Karaliopoulos, and Iordanis Koutsopoulos
Department of Informatics
Athens University of Economics and Business
104 34 Athens, Greece
email:{mkaralio,jordan@aueb.gr}

***Abstract*—We present *AppLea*, an open source farming Android application that aspires to become the online assistant of farmers and stock-farmers with their daily activities. The app has been developed in close cooperation with the farming community of fourteen villages in Thessaly, Greece, which have access to the Internet thanks to the Sarantaporo.gr community network. Its mission is threefold: (a) to serve as the online logbook of daily activities in the farm, easing their planning, recording and reporting to agronomists and cooperatives; (b) to foster the sharing of data about good (and bad) farming practices among the community; (c) to become an asset for the provision of advanced smart farming services to its members. We describe the main capabilities of the app, which aims to multiply the value of the local community network for the local economy and actively contribute to the sustainability of both.**

## I. Introduction

Community networks (CNs) are crowdsourced initiatives, whereby people combine their efforts and resources to collectively instantiate communication network infrastructures. Since their first emergence in the late 90s, they have taken many forms and shapes and have developed rich organizational frameworks, largely empirically, as a result of accumulated experience with good and bad practices.

The role envisaged for CNs in the current telecommunications landscape can be multi-fold. First, CNs (*e.g.*, [1]) are viewed as one possible approach to amortizing the network infrastructure deployment costs that challenge ambitious broadband visions worldwide [2]. Secondly, small crowdfunded community operators constitute a valid approach towards delivering Internet access to developing regions [3]. Finally, CNs could serve as an antidote to the currently dominant vertically integrated telecommunication network models, where all the network layers belong to one entity and end users are left with limited options when it comes to choosing an operator.

Whichever way a CN serves the community behind it, it must ensure the sustained interest and contributions of that community. Many CNs support over their infrastructure applications that offer value-added services to the community, as a way to motivate its members to join and actively participate in the network. Notably, such applications are often attractive because they avoid the exposure to not well understood and often privacy-unfriendly practices of commercial applications.

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In this paper, we describe a mobile application that has been designed and developed *for*, and at the same time, *together with* the community of farmers and stock-farmers in an agricultural area in Thessaly, Greece. The area includes fourteen villages that enjoy Internet access thanks to the local CN Sarantaporo.gr (http://www.sarantaporo.gr). The CN combines a wireless backbone network of 22 nodes with another 160 nodes in the access network, all relying on WiFi technology. As of autumn 2017, the amount of traffic moved around the network reaches 5.5TB on average and the maximum speed of accessing the network is 30 Mbps for download and upload links. The mobile client (mobile UI) of AppLea is built over the Android OS and its back end over the Firebase web platform. Hereafter, we describe their main functionality.

## II. The AppLea mobile UI

The design and development of the mobile app has been a highly participatory process, engaging from the beginning the local community through workshops, interviews, series of physical and online meetings, as well as alpha and beta testing phases [4]. The functionality of the mobile app that came out of this process can be split into three main parts.

First, the app is meant to serve as an online logbook for all kind of farming activities undertaken by its users. This part implies private use, rendering it the equivalent of an online personal assistant. Secondly, the app features a social networking component, customized to the particular farming context. It lets users set up groups of friends and share with them farming tips and photos about their farms, crops, animals. This sharing practice escalates in the third component of the app, through which the app users can aggregate and jointly store their logbook entries at community scale. This way, they can give rise to the missing critical asset for the provision of smart farming services to them such as those offered by the gaiasense system (http://www.gaiasense.gr/en/).

### A. Online logbook and private statistics

Upon signing in the app, the user lands on the app homepage that bears a calendar interface. The user may scroll the

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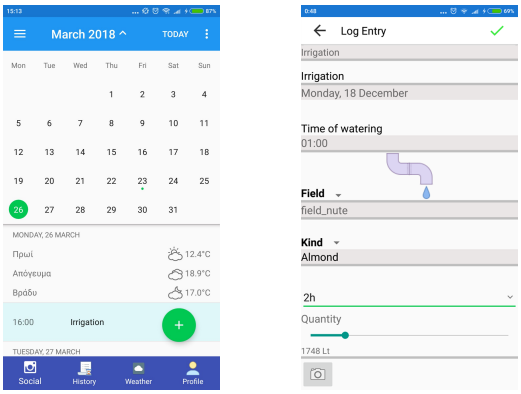
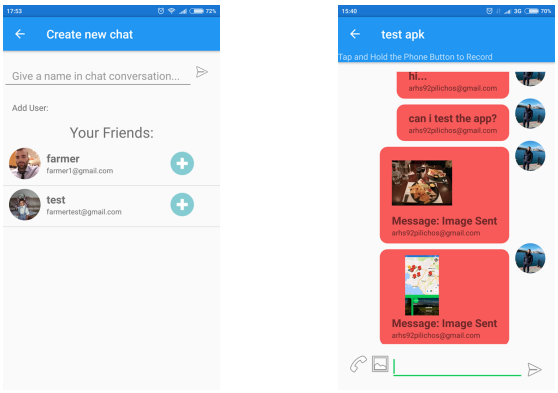



(a) Creating an entry

(b) Form for irrigation logbook entries

Fig. 1. Adding entries to the calendar interface.




(a) Adding a friend to the chat

(b) Chatting interface

Fig. 2. Chat interface in AppLea

calendar left and right to the desired day to add an entry for an activity undertaken in the farm (ref. Fig. 1).

When adding an entry, the user declares the type of activity she wants to report and the farm this activity relates to. The possible activities are fixed and form a drop-down list: irrigation, spraying, pruning, top-dressing, ploughing, crop collection. Each form includes custom information fields, as shown in Fig. 1b. Through this part of the app, a farmer can:

- review weather info and add it to her entries about farming activities;
- insert reminders about periodic or one-time activities, *e.g.*, lubrication of farming machinery;
- filter the volume of logbook entries by farm, cultivation type, activity, or time interval to generate statistics about her farming practices and the use of resources;
- generate summaries of these entries as .pdf, adhering to given stylistic templates for submission to local cooperatives (mandatory for biologically cultivated farms), or to agronomists for obtaining advisory services.

### *B. Social networking for farming practices*

The second main part of the app functionality is accessed through an interface that resembles mainstream social networking tools. Through this, the app user can:

- create and share photo snapshots, and add a like or an encouraging comment to them.
- chat with friends and colleagues (Fig. 2) in point-to-point or group mode, to exchange tips or get advice on a question that came up with respect to farming practices.

The "friends" and their detailed rights, *i.e.*, which users have access to which entries in the user's logbook, are specified in the user profile page of the app.

### *C. Data sharing towards the community data asset*

The third mission of the app is to help generating a critical mass of data that can support the provision of smart farming services to the community. To this end, the app data need to be combined with other types of data, from sensors measuring environmental and soil properties. These data are produced automatically as far as the required infrastructure is in place. On the contrary, the collection of manually entered data on farming practices has turned out to be more challenging since it requires change of year-long practices and the adoption of a sharing mindset by farmers.

To motivate data sharing practices, AppLea incorporates gamification functionality. Central to this is the scoreboard component, which computes and reports the points that users collect for sharing entries and knowledge with other application users. With the help of filters, a user may check how she ranks in terms of data sharing across all app users; users she has declared as friends; users of a given age group or living in the same village with her. Likewise, aggregate ranks can be produced at the level of all users living in the same village, or belonging to the same age group.

## III. The AppLea backend

The backend server is implemented on Firebase, a popular mobile and web application development platform. AppLea utilizes Firebase to store user inputs in JSON format and immediately synchronize all devices when changes are performed to the data, almost real-time. Additionally, the app uses the Firebase authentication service, which enables user authentication through only client-side code and also via email and password login credentials stored in the platform.

## References

[1] R. Baig, R. Roca, F. Freitag, and L. Navarro, "Guifi.net, a crowdsourced network infrastructure held in common," *Computer Networks*, vol. 90, no. 3, pp. 150–165, 2015.

[2] European Commission, "Guide to high-speed broadband investment," Tech. Rep. Release 1.1, October 2014. [Online]. Available: http://ec.europa.eu/newsroom/dae/document.cfm?action=display&doc_id=6908

[3] L. Maccari, M. Karaliopoulos, I. Koutsopoulos, L. Navarro, F. Freitag, and R. Lo Cigno, "5G and the Internet of EveryOne: Motivation, Enablers, and Research Agenda," in *Proc. 2018 European Conference on Networks and Communications (EuCNC)*, June 2018.

[4] P. Antoniadis, I. Apostol, P. Micholia, G. Klissiaris, V. Chryssos, and M. Karaliopoulos, "Multi-Disciplinary Methodology for Applications Design for CNs, including Design Guidelines and Adoption Facilitation (v1)," Jan. 2017. [Online]. Available: https://www.netcommons.eu/?q=content/deliverables-page