

**Experts' Assignment Algorithm for Cloud-based Agro-advisory  
Service Information System (CASIS) using Weighted Sum Model:  
Piloting CASIS**



**Authors: K. Fue, S.D. Tumbo, C. Sanga**

**Presenter: Kadegehe Fue**

**Institution: Sokoine University of Agriculture**

**UbuntuNet-Connect 2015, 19-20 November 2015, Maputo, Mozambique**

# Outline

- **BACKGROUND**
- **EXPERIENCES AND CHALLENGES OF CASIS**
- **ALGORITHM FOR CASIS**
  - **Weighted Sum Model (WSM) Algorithm**
  - **Implementation of WSM**
- **RESULTS AND DISCUSSIONS**
- **CONCLUSION**

# BACKGROUND

- Agriculture is the main drivers of Africans economies
  - Agriculture contribute 70% in Africa and 80% in Tanzania
- Millennium Development Goals (MDGs)
  - Agriculture was main asset to achieve MDGs
- Cloud-based Agro-advisory Service Information System
  - could address one of the problem facing agriculture
    - ❖ (i.e. ineffective agricultural extension services)
- In Tanzania, farmers have started adopting ICT based Agro-advisory Systems

# Adoption of Technology

- The adoption of new technologies in agriculture depend on two important factors, namely:
  - user's own benefit analysis
    - ❖ how the user perceives the technology and how much value to put on it
  - the seriousness of the national programme or on the national legislation
    - ❖ e.g. incentive to adopt it or punitive actions to ignore it

# ICT based Agro advisory in Tanzania

- Examples of ICT based services are mobile payment and agro-advisory services
  - Tigo Kilimo, Voda Club, Z- Kilimo and M-Pesa
- WHAT ARE THE PROBLEM OF THE ABOVE SYSTEMS?
  - Structured answers and use of USSD??
  - USSD (Unstructured Supplementary Service Data) is a Global System for Mobile (GSM) communication that is used to send text between a mobile phone and an application program in the network.
- Experts' Assignment Algorithm is the answer for the above problem

# CASIS

- CASIS is the farmers' agro-advisory information system.
- The CASIS consists of both web and mobile based applications which enables farmer to submit their questions, problems and enquiries to the system by sending a short text message via mobile phone or web form.
- A farmer asks and an expert provides answers

## **EXPERIENCES AND CHALLENGES OF CASIS**

The challenge to provide advisory services to farmers has been hindered by

- having not very sophisticated technology in use
- depended on mobile phone as the main tool to provide information to the farmer.
- Few agricultural extension officers willing to provide advisory service
- most of the questions from the farmers cannot be answered.

# LIMITATION TO CASIS

- It does not consider the correctness of the given advisory to the farmers.
- It assumes that the extension officers assigned to answer questions are well trained to deliver extension education and services to farmers.

# ALGORITHM FOR CASIS

- Weighted Sum Model (WSM) Algorithm
- Automatic answers could be the best solution but the farmers of Kilosa district provide
  - very much unstructured messages that have a lot of errors in terms of spelling, shortened words
  - they use national language (Kiswahili), local languages or even abbreviations to seek advisory service.
- Automatic assignments of questions require that the system calculates the numbers of questions to be answered and the number of available experts to answer.

## Weighted Sum Model (WSM) Algorithm

- This involves modeling the expert's response time and number of questions he/she has provided to the system.
- The request and response time is very important when responding to farmers questions.
- When the answer takes a lot of time then farmers tend to complain.

## Weighted Sum Model (WSM) Algorithm

- This is always solved if the question is assigned to another expert who is going to respond very fast.
- The period under which the question has not been answered is called **‘lapsing time’**.
- The time at which the farmer's question is received to the system is called **‘question time’**
- the time at which the farmer gets answer is called **‘response time’**.
- **‘lapsing time’** is the difference between the **‘question time’** and **‘response time’**.

## Weighted Sum Model (WSM) Algorithm

- There is a delay when packets containing the answer move from the expert to the farmer. For modern technologies, this could be **negligible**.
- It should be noted that the '**lapsing time**' should be very small to account for best performance of **agro-advisory system**.
- When it is increasing then the system acceptability is at stake.
- The **greater** the '**lapsing time**' the **less** the system is going to be accepted by the farmers and other agricultural stakeholders (e.g. researchers, processors, traders, policy makers, input suppliers etc)

# WSM Parameters

- $x_1$  (on workdays) and  $x_2$  (on weekends) are determined using cumulative average answer wait minutes where **scale is 1 to 40** where **1 represent 40 minutes and 40 represent 1 minute wait**.
- $p_1$  represents probability of questions answered within **40 minutes** wait time for a period of last 5 workdays.
- $p_2$  represents probability of questions answered within **40 minutes** wait time for a period of last 2 weekends.

# The WSM decision boundary

- The decision boundary (**lapsing time**) is homogeneity and numerical so as to give a single output quickly.
- The input ( $x_1, x_2$ ) and output ( $y$ ) variables are numeric.
- The main concept is that the output is generated using linear combination or WSM using the given set of inputs
- $y = p_1x_1 + p_2x_2$  where  $p_1$  and  $p_2$  are cumulative weighted probability of responding to questions.
- Probability adjustable as the expert answers the questions per week or per weekend.  $p$  is calculated using number of answers received against number of questions assigned.

# WSM : Assumptions

- Most experts don't respond to questions in weekends but this algorithm counts the points of weekend too when determining the best ones.
- In weekend days, the decision boundary can only be determined using  $y = p_2x_2$  where  $p_1x_1$  is considered as null decision variable when  $y = p_1x_1 + p_2x_2$  can't give final decision.

# CASIS simulated data

p1	x1	p2	x2	WSM
0.72	23	0.5	12	22.56
0.23	24	0.45	23	15.87
0.45	32	0.67	24	30.48
0.39	29	0.34	17	17.09
0.56	32	0.45	26	29.62
0.74	22	0.57	34	35.66

# WSM Performance

- WSM provides a fast decision output that could be fed to the system.
- It is likely that the WSM provide the same output every time.
- The random selection among the best performers is necessary.
- Also, random selection can be used to increase the total points of the weaker (i.e. worst) respondents.

# WSM Performance

- Provides an alternative to human being manual way of assigning questions
- Creates a room where biasness is avoided to increase efficiency of the system.
- The behavior of the extension officers toward answering advisory service through their mobile phones has dramatically changed and some have not changed (i.e. constant behavior).

# RESULTS AND DISCUSSIONS

- The number of answered questions increases the points or credits to the best performers but it can be relying more on ‘lapsing time’.
- ‘Lapsing time’ of many questions is the average of ‘lapsing time’ of the week or month.
- Using week ‘lapsing time’ provides new data of the best performers.
- It means that the best performers of the current week can change dramatically.
- The worst performer could be incorporated to the new week.

# RESULTS AND DISCUSSIONS

- The expert who seems to be very fast in answering has not reached 40 WSM which is half of the maximum required.
- This shows that the algorithm was well simulated.
- Most of the time, the extension agents in the database have not been answering questions within the 40 minutes of the assignment.
- **In the database only 11% of the questions were answered in period of 40 minutes.??????**

# Conclusion

- This algorithm has provided the best solution to the manual assignment.
- The weakest point of the algorithm is that it is bias to some individuals especially when the ‘lapsing time’ of the worst performers is very large.
- In order to get faster response then the efficiency of the algorithm is likely to avoid lowest performing individuals

# Thank You for Listening

ushaurikilimo.org/maswalimajibu.php

Most Visited Getting Started Suggested Sites (2) Suggested Sites Web Slice Gallery

Search TELEVISION FANATIC 85°F Kilimatinde Airport, Tanzania Testing Widget Widgets as menuitems

## Karibu kwenye maswali mbalimbali yaliyoulizwa na kujibiwa

Na.	Swali	Jibu	Mtaalamu aliyejibu	Siku lilipojibiwa
1	Sijajibiwa swali langu tafadhali.	swali lako kuhusu apple linatafutiwa jibu na wataalamu. Utatumiwa kwenye simu yako	C A S	2015-11-08
2	HABARI SAMAHANI NINA PAKA WANGU ANA TAT IZO LA KUWA NA FUNZA MPKA SASA NIMESHAA MTOA FUNZA WATATU NA ANAPATA MAUMIVU SA NA WAKATI WA JIONI MPKA ANAUSHIWA NGUVU KABISA SAS NASHINDWA KUELEWA TATIZO HAS A NI NINI KWA SABABU WAPO WAWILI MWENZIE HANA TATIZO KABISA GATA KIDOGO TAFADHALU NAOMBA MNISAIDIE	AHSANTE KWA SWALI LAKO, LAKINI KWA USHAURI ZAIDI MWONE AFISA MIFUGO ALIYE KARIBU YAKO AMWONE HUYO PAKA WAKO MARA NYINGI WANYAMA WANA MADHARA YA MINYOO WAFUGAJI WENGI HAWAJALI KINGA ZA MAGONJWA,	Mohammed Kadewele	2015-11-06
3	Nashukuru naomba msaada wenu	asante kwa kuomba ushauri kuhusu panya mwenye funza. Ushauri wako ukiwa tayari tutakutumia - wataalamu wanatafuta majibu fasaha	C A S	2015-11-05
4	Naomba Kufahamu, Ni Mbegu Ipi Ya Mpunga Yenye Soko Zaidi?	KALUBANGALA	Awadh Dizamile	2015-11-04
5	naomba kujua bei za nyanya Kilosa?	Bei ya nyanya Kilosa ni Tshs 12000/= kwa dala	Athumani Chibanga	2015-11-04