International Partnership on Innovation

SAMS - Smart Apiculture Management Services

Deliverable N°7.2

Compendium of SAMS Newsletters

Work package 7

Dissemination and Communication

Horizon 2020 (H2020-ICT-39-2017)

Project N°780755

This project has received funding from the European Union´s Horizon 2020 research and innovation programme under **grant agreement N° 780755.** The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the EU.

Project information		
Lead partner for the deliverable	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH (Coordinator)	
Document type	Report	
Dissemination level	Public	
Due date and status of the deliverable	31.12.2020	11.12.2020
Author(s)	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH (Coordinator)	
Reviewer(s)	UNIGRA, UNILV, CV.PI, UNPAD, HOLETA, UNIKAS, ICEADDIS	

This document is issued by the consortium formed for the implementation of the SAMS project under Grant Agreement N° 780755.

SAMS consortium partners

Logo	Partner name	Short	Country
	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH (Coordinator)	GIZ	Germany
	University of Kassel	UNIKAS	Germany
	University of Graz (Institute for Biology)	UNIGRA	Austria
	Latvia University of Life Sciences and Technologies	UNILV	Latvia
	ICEADDIS – IT-Consultancy PLC	ICEADDIS	Ethiopia
	Oromia Agricultural Research Institute, Holeta Bee Research Center	HOLETA	Ethiopia
	University Padjadjaran	UNPAD	Indonesia
	Commanditaire Vennootschap (CV.) Primary Indonesia	CV.PI	Indonesia

List of Abbreviations

CB	Capacity Building
DSS	Decision Support System
DW	Data Warehouse
ICT	Information and Communication Technologies
IoT	Internet of Things
MCU	Microcontroller unit
PLC	Powerline Connection
2G/3G	second and third generation cellular network technologies
SD card	Secure Digital card
SDG	Sustainable Development Goals
SCM	Steering Committee Meeting
UCD	User Centered Design

Summary of the project

SAMS is a service offer for beekeepers that allows active monitoring and remote sensing of bee colonies by an appropriate and adapted ICT solution. This system supports the beekeeper in ensuring bee health and bee productivity, since bees play a key role in the preservation of our ecosystem, the global fight against hunger and in ensuring our existence. The high potentials to foster sustainable development in different sectors of the partner regions are they are often used inefficient.

Three continents - three scenarios

(1) In Europe, consumption and trading of honey products are increasing whereas the production is stagnating. Beside honey production, pollination services are less developed. Nevertheless, within the EU 35% of human food consumption depend directly or indirectly on pollination activities.

(2) In Ethiopia, beekeepers have a limited access to modern beehive equipment and bee management systems. Due to these constraints, the apicultural sector is far behind his potential.

(3) The apiculture sector in Indonesia is developing slowly and beekeeping is not a priority in the governmental program. These aspects lead to a low beekeeper rate, a low rate of professional processing of bee products, support and marketing and a lack of professional interconnection with bee products processing companies.

Based on the User Centered Design the core activities of SAMS include the development of marketable SAMS Business Services, the adaption of a hive monitoring system for local needs and usability as well as the adaption of a Decision Support System (DSS) based on an open source system. As a key factor of success SAMS uses a multi stakeholder approach on an international and national level to foster the involvement and active participation of beekeepers and all relevant stakeholders along the whole value chain of bees.

The aim of SAMS is to:

- enhance international cooperation of ICT and sustainable agriculture between EU and developing countries in pursuit of the EU commitment to the UN Sustainable Development Goal (SDG N°2) “End hunger, achieve food security and improved nutrition and promote sustainable agriculture”
- increases production of bee products
- creates jobs (particularly youths/ women)
- triggers investments and establishes knowledge exchange through networks.

Project objectives

The overall objective of SAMS is to strengthen international cooperation of the EU with developing countries in ICT, concentrating on the field of sustainable agriculture as a vehicle for rural areas. The SAMS Project aims to develop and refine an open source remote sensing technology and user interaction interface to support small-hold beekeepers in managing and

monitoring the health and productivity in their own bee colonies. Highlighted will be especially the production of bee products and the strengthening of resilience to environmental factors.

- Specific objectives to achieve the aim:
- Addressing requirements of communities and stakeholder
- Adapted monitoring and support technology
- Bee related partnership and cooperation
- International and interregional knowledge and technology transfer
- Training and behavioral response
- Implementation SAMS Business cooperation

Contents

Executive summary

The deliverable *Compendium of SAMS Newsletters* contains all nine SAMS Newsletter which were issued during the project duration. The first quarterly Newsletter was published 09.2018. The newsletters informed professionals of the apiculture sector and interested individuals about the upcoming events, the project's progress and country specific activities as well as results. Some highlights of the newsletters were:

Highlights of Newsletter 1 – 09.2018:

- LoRaWAN test in Latvia – wireless network technology for precision beekeeping
- Tests on swarming of bee colonies, Witzenhausen, Germany
- User Research Workshops in Indonesia and Ethiopia with an international project team
- Business development event in Indonesia – Mapping existing beekeeping business model and beekeeping industrial tree

Highlights of Newsletter 2 – 12.2018:

- Adapting SAMS technology to framework conditions and User´s needs
- The SAMSwiki database – a tool to extend your bee related knowledge for Ethiopia, Indonesia and Europe
- Experiences in UCD Research for SAMS

Highlights of Newsletter 3 – 03.2019:

- Evaluation of the economic importance of bee colony swarming detection
- SAMS data warehouse development
- In-depth UCD Research in Indonesia and Ethiopia
- Field testing of SAMS technology in Ethiopia and Indonesia

Highlights of Newsletter 4 – 06.2019:

- Implementation of SAMS prototype monitoring systems
- SAMS data for scientists
- Local advisory board meeting in Indonesia and Ethiopia
- Co-Creation Prototype Workshop in Indonesia with the international SAMS team and local stakeholders

Highlights of Newsletter 5 – 09.2019:

- Co-Creation Prototype Workshop in Indonesia with the international SAMS team and local stakeholder
- Initiation of the Bandung Bee Sanctuary – Center for awareness creation and strengthen beekeeping activities in West Java

- Honeybee Colony absconding – the case of beekeeping in Ethiopia

Highlights of Newsletter 6 – 12.2019:

- Progress of the SAMS hardware development
- 10 Rules of Honeybee Management – applicable around the world
- SAMS capacity building activities and capacity material

Highlights of Newsletter 7 – 03.2020:

- SAMS Hardware – adaption to local markets to make system affordable
- SAMS Decision Support System software prototyping progress
- Extension of the SAMSwiki knowledge hub
- Business development in Ethiopia and Indonesia

Highlights of Newsletter 8 – 06.2020:

- New SAMS sensor case prototypes
- Battery life calculator of SAMS monitoring system
- Economic evaluation of remote monitoring systems
- SAMS data warehouse – Evaluation of Responses and Support services
- Results of SAMS Market Survey

Highlights of Newsletter 9 – 09.2020:

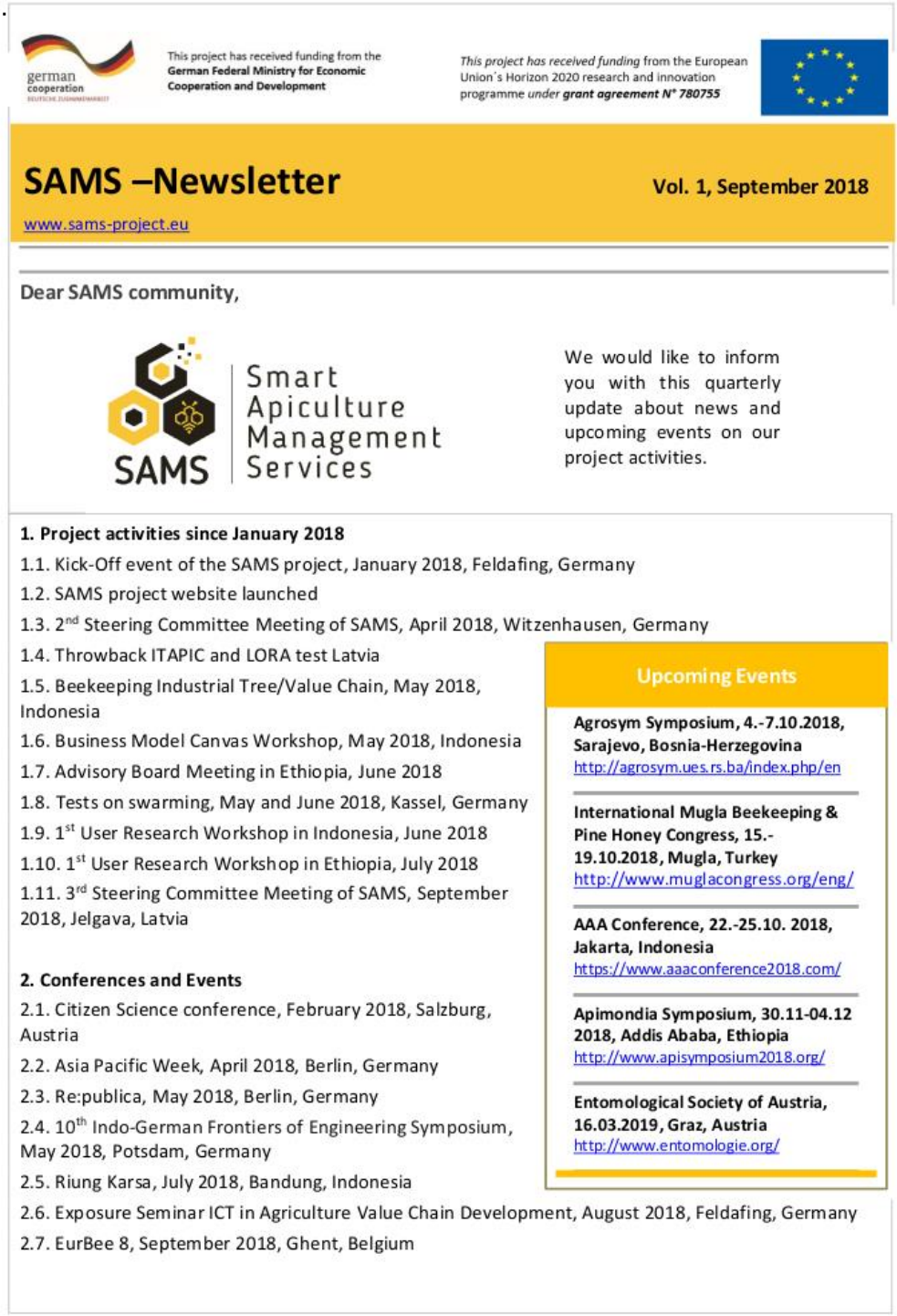
- Manual on SAMS Monitoring hive construction and operation incl. SAMS system improvement with NodeMCU
- Adaption of Sensor cases to regional settings - printable back plate, front plate, middle plate
- SAMSwiki Community – become a member to foster international knowledge exchange on beekeeping

Besides those mentioned highlights the newsletter contain even more interesting **facts of the SAMS project, its activities and its results**, such as:

- Manual on how to connect your system with the SAMS data warehouse
- SAMS Partnerships on (1) SAMS Business Development, (2) Bee Colony Data and Knowledge Exchange and (3) Apiculture Technologies and Services
- Decision Support System interface
- Publications

1. Newsletter Vol. 1

To access all hyperlinks in the newsletter, follow the link to the newsletter in the original version.



This project has received funding from the German Federal Ministry for Economic Cooperation and Development

This project has received funding from the European Union's Horizon 2020 research and innovation programme *under* ***grant agreement N° 780755***

SAMS –Newsletter

Vol. 1, September 2018

www.sams-project.eu

Dear SAMS community,

Smart Apiculture Management Services

We would like to inform you with this quarterly update about news and upcoming events on our project activities.

1. Project activities since January 2018

1.1. Kick-Off event of the SAMS project, January 2018, Feldafing, Germany

1.2. SAMS project website launched

1.3. 2nd Steering Committee Meeting of SAMS, April 2018, Witzenhausen, Germany

1.4. Throwback ITAPIC and LORA test Latvia

1.5. Beekeeping Industrial Tree/Value Chain, May 2018, Indonesia

1.6. Business Model Canvas Workshop, May 2018, Indonesia

1.7. Advisory Board Meeting in Ethiopia, June 2018

1.8. Tests on swarming, May and June 2018, Kassel, Germany

1.9. 1st User Research Workshop in Indonesia, June 2018

1.10. 1st User Research Workshop in Ethiopia, July 2018

1.11. 3rd Steering Committee Meeting of SAMS, September 2018, Jelgava, Latvia

2. Conferences and Events

2.1. Citizen Science conference, February 2018, Salzburg, Austria

2.2. Asia Pacific Week, April 2018, Berlin, Germany

2.3. Re:publica, May 2018, Berlin, Germany

2.4. 10th Indo-German Frontiers of Engineering Symposium, May 2018, Potsdam, Germany

2.5. Riung Karsa, July 2018, Bandung, Indonesia

2.6. Exposure Seminar ICT in Agriculture Value Chain Development, August 2018, Feldafing, Germany

2.7. EurBee 8, September 2018, Ghent, Belgium

Upcoming Events

Agrosym Symposium, 4.-7.10.2018, Sarajevo, Bosnia-Herzegovina
http://agrosym.ues.rs.ba/index.php/en

International Mugla Beekeeping & Pine Honey Congress, 15.-19.10.2018, Mugla, Turkey
http://www.muglacongress.org/eng/

AAA Conference, 22.-25.10. 2018, Jakarta, Indonesia
https://www.aaaconference2018.com/

Apimondia Symposium, 30.11-04.12 2018, Addis Ababa, Ethiopia
http://www.apisymposium2018.org/

Entomological Society of Austria, 16.03.2019, Graz, Austria
http://www.entomologie.org/

1. Project Activities since January 2018

01. 2018 - Kick-Off event of the SAMS project, Feldafing, Germany (hosted by GIZ)

From January 29 until 31 the official Kick Off event of SAMS – *Smart Apiculture Management Services* – took place in Feldafing, Germany. SAMS is a three-year project supported by the European Union's Horizon 2020 research and innovation program. The project started in January 2018 and is implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in collaboration with the University Kassel (Germany), Latvia University of Life Sciences and Technologies (Latvia), the University Graz (Austria), the University Padjadjaran (Indonesia), CV. Primary Indonesia (Indonesia), Oromia Agricultural Research Institute, Holeta Bee Research Center (Ethiopia) and ICEADDIS – IT-Consultancy PLC (Ethiopia). At least one representative of each institution participated in the event and introduced their work, background and expectations for the project. In line with the individual thoughts and expectations of the institutions, the individual work packages have been introduced by the lead partner and discussed to make sure that all partners are on the same level concerning the implementation of the project.

The idea behind the project is an appropriate and adapted ICT solution that allows the active monitoring and remote sensing of bee colonies to ensure bee health and bee productivity. The implementation of the Decision and Advisory Support Tool will give answers to the specific requirements of beekeeping in the target countries. Since the technology will be available open source, it is also intended to be transferred and used in other countries all over Sub-Saharan Africa, ASEAN and Europe.

Besides the official part of the Kick Off event, the partners got to know each other deeper during visits to Starnberg, Dinner and a bowling night.

SAMS Consortium


SAMS Consortium

By GIZ

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02. 2018 - SAMS project website launched

In February our partner Latvia University of Life Sciences and Technologies launched the official website of SAMS www.sams-project.eu.

Information about the Consortium and involved project staff as well as news, disseminations and project results can be found on the website.

In the near future, we will also add a description of the involved countries as well as on their current bee situations. In addition, a link to a wiki page with information on "key numbers of apiculture", "honey bee products and honey bee sector", "bee forage", "beekeeping", "bee pathology" and "possibilities for smart bee management" will be available on the SAMS website. The SAMS newsletter as well as relevant project material like flyer and posters can be found under "downloads" and an upcoming event calendar will be included.

By GIZ

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04. 2018 - 2nd Steering Committee Meeting of SAMS, Witzenhausen, Germany (hosted by UNIKAS)

From the 4th to the 6th of April the second consortium meeting took place in Witzenhausen, Germany and was hosted by the **University of Kassel**. New group members were introduced and heartily welcomed within the SAMS consortium. Prof. Dr. Hensel, the head of the Department of Agricultural & Biosystems Engineering, held a presentation about the beautiful place Witzenhausen, with its numerous amounts of cherry trees, and about its importance for the University of Kassel. The main objectives of the meeting were to discuss first work achievements of the working groups, the presentation of detailed working plans and the discussions about next steps and required inputs. During the 2nd SCM, another important meeting took place: the UCD (User Centered Design) Strategy Meeting. The participants developed a portfolio of possible stakeholders and user groups for the SAMS technology. They created a detailed working plan for the UCD process, including layout user research strategies, selection of methods, development of documentation strategies and user research workshops in the two target countries, Ethiopia and Indonesia.

Besides the official agenda, the partners had the chance to enjoy a personal tour through the local tropical greenhouse, a side visit to a test station of ITAPIC, which is a previous project developed in the EU program ICT-Agri-12, and a casual walk through the city of Witzenhausen.

ITAPIC technique

Green house visit

By University of Graz

Throwback: ITAPIC

The EU funded (within ICT-AGRI 2012 FP 7) project "Application of Information Technologies in Precision Apiculture" (ITApic) was implemented between 2013 and 2016. The project was mainly focused on adapting precision agriculture methods and principles in beekeeping by implementing existing and newest technologies in the field of information and communication technologies in order to identify different honeybee colony states. The project objectives included the development of a bee hive monitoring system and a web service system for data access (with measurement storage). As a result, the bee hive monitoring system were developed together with a web-based data system and integrated decision support. The open source technologies developed during the ITAPIC project are the fundamental blocks and forms the technological background for the SAMS project.

By Latvia University of Life Sciences and Technologies

04. 2018 - LORA test Latvia

Data sampling started in April 2018. The consortium members of the Latvia University of Life Sciences and Technologies in cooperation with the Latvian internet service provider and telecommunication company Lattelecom installed three temperature sensors supporting LORA technology within honeybee hives.

LoRaWAN technological solution allows low energy consumption devices to communicate with Internet-connected applications over long-range wireless connections for many years with only one battery. LoRaWAN network coverage and sensors were provided by Latvian company Lattelecom. Three bee colonies were equipped with LoRaWAN enabled temperature sensors. Measurements from sensors were

transmitted to the LoRaWAN network gateways and servers and access to collected data was provided through the Lattelecom IoT portal web application.

Three hives of *Apis mellifera mellifera* were equipped with temperature sensors for colony monitoring. The experiment took place at Strazdu iela 1, Jelgava, Latvia (N 56, 390, 4500 and E 23, 450, 1500). Sensors were installed on April 10, 2018. Norwegian-type hive bodies made of wood with external size 470 x 470 x 270 mm and internal size 380 x 380 x 270 mm, with a wall thickness of 45 mm, were used in the experiment. Sensors used were Adeunis Temp (see figure) with references: ARF8181BA, ARF8180BA, ARF8181FA (source: https://www.adeunis.com/en/produit/temp/).

Sensor Adeunis Temp

Application of LoRa sensor for bee colony temperature monitoring is theoretically possible, but considering economic aspects is not so attractive, because of the measurement unit price, which is about 70 EUR per unit (2 temperature sensors per unit – out/in). However, taking into account that usually new technologies becoming more affordable after some time, authors foresee that application of LoRa sensors will be also economically feasible in the future.

Still Precision Beekeeping is not only limited by the temperature measurements; next important parameter is weight of the colony. Equipping scales with LoRa technology would be a good solution, because in that case amount of LoRa radio chip price will be comparable with scales price. LoRaWAN network solutions could be applicable in regions, where mobile networks have poor coverage and quality of services (e.g., Internet), for example African region, where is a good potential for Precision Beekeeping, but new technologies are not implemented so quickly.

By Latvia University of Life Sciences and Technologies

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05. 2018 - Beekeeping Industrial Tree/Value Chain, Sumedang, Indonesia

Due to a lack of publications and references regarding derivative beekeeping products, **Universitas Padjadjaran** arranged a workshop and invited researchers with various different backgrounds. The aim of the workshop was to define the possible derivative beekeeping products such as honey, pollen, wax, propolis, royal jelly, bee venom, etc. The stakeholders from business, community (beekeepers), government and media were also invited to the workshop to obtain more perspectives. At the end of the day, we managed to draw an industrial map of Indonesian beekeeping products. The chart was still a draft version and needs another iteration to confirm and validate the data.

By Universitas Padjadjaran

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05. 2018 - Business Model Canvas Workshop, Sumedang, Indonesia

The business models of existing beekeeping activities are still unknown or not clearly recognized. So **Universitas Padjadjaran** invited beekeepers to discuss about their beekeeping activities, from colony management to beekeeping business, to represent the current condition of the beekeeping businesses in West Java, Indonesia. Four beekeepers from different places in West Java were invited to the workshop, they came from Bandung City, Ciamis Regency, Pangandaran Regency and West Bandung Regency. In the end of the day, we captured their business models through Business Model Canvas (BMC) one for each and we summed up their business models as the general business model of beekeeping in West Java, Indonesia.

Advisory Board UNPAD

To summarize the Advisory Board of the Universitas Padjadjaran, there are five big groups of partners: academics, government, community, business and media. Academic partners are Ir. Yadi Supriyadi, M.S, Dr. Drs. Wahyu Gunawan, Hj. Diana Sari, SE., M.Mgt., Ph.D, Prof. Dr. med. Tri Hanggono Achmad, Ida Widianingsih, S.IP., M.A., Ph.D and Rizky Abdulah, S.Si., Apt., Ph.D from Universitas Padjadjaran and Dr. Ir. Rika Raffiudin M.Si. from Bogor Agricultural University. Governmental partners are Aris Dwi Subiyantoro from the West Java Provincial Forestry Office and Tunggul Riksi Pamrih from the National Apiary Center. The community is represented by Deby Bustomi (beekeeper) from D'Bees and Didik Budi Purwanto from the Indonesian Apiary Association. M. Yusri Satriana from the State owned forestry company represents the business group and partners from media are Ade Karisman from Universitas Padjadjaran Media and Erik Palupi from Media Wave.

By Universitas Padjadjaran

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06. 2018 - Advisory Board meeting in Ethiopia

On the 19th of June 2018, the first Advisory Board meeting was conducted in Addis Ababa, Ethiopia on SAMS project with the view of collecting necessary input for successful project implementation. The following representatives from 7 different Advisory Board organizations were attended the Advisory Board meeting held for one day. Asefa Amaleddegn, Agricultural Transformation Agency (ATA), Markops Lema, Florian Mandescheid and Yemesrach Tadesse from ICEADDIS, Gemechis Jeleta from Netherlands Development Organization (SNV-Ethiopia), Gemechis Legesse, Taye Negera and Kibebew Wakjira from Oromia Agricultural Research Institute (Holeta), Juergen Greiling from Ethiopian Apiculture Board (EBA), Solomon Mengesha and Rita Nedif from GIZ-Ethiopia. Hailegeorgis Demissie from BEZA Mar excused from the unforeseen reason failing to participate on the Advisory Board meeting.

All participant board members introduced themselves, their organizations work and their responsibilities in their organizations. They also expressed their expectations for the day and also from project at large. Following introduction, warm welcome keynote by Markos Lemma from ICEADDIS was delivered. In line with the SAMS project: background, objectives, methodology, expected outputs overview presented by Kibebew Wakjira from Holeta and discussion conducted on the expected project results. Markos introduced the SAMS outlook on UCD and IOT and how they link and advance SAMS. He discussed how the current SAMS prototype is designed to identify the different states of a bee colony to prevent colony losses and boost production and productivities of beekeeping.

Ethiopian Advisory Board

Project implementation areas were also presented from the Holeta team. The board also discussed about proposed project implementation areas and selected 3 out of 5 regions for sustainability and easy of implementation: Addis Ababa, Oromia, SNNP. The areas are suggested for the reason that there are 40 active cooperatives supported by 24 development agents working on beekeeping and horticultural crops production across these 3 regions. The Advisory Board also agreed to hold a regular meeting every 6 months with the possibility to meet in between if there is a necessity for it and to allow new members to join the board as the project progresses. Finally, all the representatives signed the document acknowledged their respective organizations engagement with SAMS.

By Oromia Agricultural Research Institute, Holeta Bee Research

05/06. 2018 - Tests on swarming

The hardware development for the SAMS beehive monitoring system is proceeding successfully and according to plan. The team from the Department of Agricultural and Biosystems Engineering at the University of Kassel were prototyping a self-sufficient monitoring system that records acoustic signals from a beehive. First results could be gained to predict swarming events. These results will be used to develop a decisions support system for beekeepers.

Honeybee hives and the monitoring system at the study site

The acoustic signals of four honeybee colonies were recorded over 25 days during the swarming period in 2018. The results were analyzed using statistical forecasting methods. Dominant frequencies could be identified that largely coincided with the results of other studies. Characteristic changes, such as the

increase in sound intensity over time, which indicate the swarming behavior, were determined with high accuracy by predictive modeling.

Further steps are the implementation of additional sensors for temperature and weight, as well as reduction of the energy consumption using different microcontrollers for the HIVE monitor system.

By University of Kassel

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06. 2018 - 1st User Research Workshop in Indonesia

Indonesia is quite divergent in culture and other preconditions and since SAMS is a multi-national, interdisciplinary project to apply IoT technology in beehives located in tropical regions, the primary success factor for SAMS is to develop solutions that are understandable and useable for all user groups, beekeepers as well as scientists and commercial users. Furthermore, SAMS will be of high interest for political and commercial stakeholders in the countries. Their interests have to be taken into consideration to ensure their support during the project implementation as well as afterwards. Therefore, a team of local experts will continuously analyze, within the different user research phases, the requirements in Indonesia.

Since the methods of UCD are suitable to organize an effective and efficient collaboration between the partners and to ensure, that needs, demands and limitations of end users are in major focus during the development of the individual SAMS products.

As a part of the first user research phase a team consisting of GIZ members and a researcher from the University of Kassel has travelled to Indonesia to meet Advisory Board members, partner beekeepers and important stakeholders and to gain a deeper insight into the beekeeping situations in Indonesia and the requirements itself.

Indonesia - The Paradise for bees

According to Madu Bina Apiari (2015), Indonesia has huge natural and human resources for beekeeping with tropical rain forests of ca. 105 Mio ha and Mangrove forests of ca. 3.5 Mio ha, rubber (3.5 Mio ha), oil palms (6 Mio ha), coffee, tea, nuts, citric fruits, rice, maize, beans etc.

The evergreen ecosystem that you find in Indonesia has been mentioned by Mr. Purwanto (Indonesian Apiary Association), as *the paradise for bees* during the kick-off event of SAMS at the University of Padjadjaran.

From the currently nine honeybee species known, eight honeybee species as well as more than 20 stingless bee species are calling Indonesia their home. The European honeybee was introduced 40 years ago, but due to plantations (eucalyptus, palm oil and rubber), the domestic honeybees such as *Apis dorsata*, *Apis cerana* and the stingless bees like *Tetragonula laeviceps* are more common in this region.

But if the living conditions for bees are so good why is Indonesia not one of the main honey producers in the world?

Through a weak beekeeper rate, organization and sales due to a high price as well as through a low rate of professional processing, support and marketing the apicultural sector in Indonesia is developing slowly. Besides the funding for wider research and development activities the downsizing of honeybee populations, uneconomical costs of production, uncontrolled chemical use, insufficient technical support, unstable quality of products and changes in the forests, especially of the availability of bee forages, are seen as main challenges mentioned by beekeepers, the Indonesian Apiary Association, the National Apiary Center and the West Java Provincial Forestry Office during the Kick Off.

Official opening of SAMS – Bandung, Indonesia (June 25, 2018)

As evidence that the processing of honey has a big potential and could be a great income source for everyone our partner from the Universitas Padjadjaran developed together with the "Local Enablers" different honey products such as honey espresso, honey butter, honey cookies and chocolate as well as honey nut paste to taste during the break.

Honey products by UNPAD & local enablers

Since the end user is of major interest concerning the implementation of SAMS, our partners from CV.PI and UNPAD organized a trip to Ciwidey to meet one beekeeper, who already sells his honey as main income source. During the side visit, the beekeeper Mr. Debby gave us a deeper insight on what he experienced as major risk for beekeeping, what are possible management problems and how marketing and product selling works in his region.

Compared to the insights we have also gained during the side visit of the former and reactivated training center in Gunung Arca/ Sukabumi a wider and deeper look into the topic and potential challenges were possible.

Field trip to Ciwidey – meet the beekeeper D-Bees and his ladies

Apart from the side visits and conversations with beekeepers and trainer, the brainstorming with stakeholders along the value chain and from important institutions during the User Centered Workshop has been the main part of the trip. During a World Café Session it was possible to shed some light on the different point of views concerning management questions as well as on potential problems and their priorities.

User Centered Workshop

Based on the findings, the first Needs Assessment report with specific information on technical, regulatory and educational requirements as well as on management aspects and bee species has been developed and will be the baseline for the ongoing User Research process.

By GIZ

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07. 2018 - 1st User Research Workshop in Ethiopia

As already mentioned in the article about the User Research Workshop in Indonesia, Ethiopia is also quite divergent in culture and other preconditions, which leads us to the point that SAMS faces different challenges in Ethiopia than we do in Indonesia or Europe.

Political and commercial stakeholders as well as associations and beekeepers are also in Ethiopia of great importance for a successful implementation of SAMS. Therefore, a team of local experts will continuously analyze within the different user research phases the stakeholders and requirements in Ethiopia.

After we have conducted our first User Research workshop in Indonesia at the end of June GIZ, a representative of the University of Kassel and a representative of the University of Padjadjaran went on to Ethiopia. We have also focused on meet and exchange with important political and commercial stakeholders, Advisory Board members, potential partner beekeepers and connected projects to get a deeper insight into the current situation and to experience the conditions SAMS has to face during the project implementation.

Field trip to Hawassah – meet beekeepers

After a first side visit of possible partner beekeepers in the region of Hawassah / Wondo Genet (south of Addis Ababa) the official opening ceremony of the SAMS project has been held on July 16 2018 in Addis Ababa. Ms. Corinne Bansbach (GIZ Deputy Country Officer in Ethiopia) and Angela Zur (GIZ Feldafing, Project Coordinator) inaugurated the official opening ceremony. In addition to the consortium members from the University of Kassel, the University Padjadjaran, Holeta and Iceaddis, experts from the Ethiopian Apiculture Board (EAB), Agricultural Transformation Agency (ATA), Netherlands Development Organization (SNV), Apinec Agroindustry PLC., Babich Agroforestry PLC. and additional GIZ projects such as the Sesame and Avocado Alliance as well as from the Biodiversity and Forestry Programme attended the ceremony.

Official opening of SAMS- Addis Ababa, Ethiopia (July 16 2018)

During this ceremony Mr. Bekana from the Ethiopian Apiculture Board mentioned that the sector development can be boosted through ensuring a higher quality of honey and honey related products to fulfill standards, sector promotion and marketing, a better coordination and networking plan between all relevant actors, a strengthened policy environment and through capacity development. For this the Executive Committee of the EAB included actors from the ministries, the private sector, producer cooperatives and development actors who are interested in foster the apiculture development in Ethiopia.

Beekeeping has a long tradition and history in Ethiopia and it is Africa's leading honey and beeswax producer. Currently there are 5 honeybee sub-species of *Apis mellifera* in Ethiopia and approximately 2 Mio households with overall around 10 Mio honeybee colonies, which do beekeeping mostly as additional income. Despite the fact that Ethiopia is the 10th biggest honey producer in the world and that the honey production increased from 28,000 tons/ year in 2001 up to 53,000 tons/year until 2017, the Ethiopian apiculture sector is far behind his potential and cannot take advantage of its potential of 500,000 tons/ year.

The current performance is low due to a lack of beekeeping knowledge on all kind of beehives that are used in Ethiopia, a shortage of trained work forces and beekeeping equipment, as well as due to pests, predators and the usage of agricultural chemicals, which leads us to low quality of the products.

The Ministry of Agriculture (MoA 2013) also has recognized the unused potential, which could boost Ethiopia to become one of the main honey producers in the world and lead to a better main income for

farmers and beekeepers. Therefore, the MoA identified specific targets for the honey value chain they want to achieve by 2025:

- Increase of annual honey production from 50,000 t to 200,000 t (500,000 t potential)
- Increase of annual beeswax production from 3,800 t to 12,000 t (50,000 t potential)
- Increase of annual honey export from 400 t to 2,400 t and annual export revenues from 1.5 Mio US$ to 8 Mio US$
- Increase of annual beeswax export from 400 t to 1,000 t and annual export revenues from 1.4 Mio US$ to 5 Mio US$

To fulfill the targets of the MoA and the objectives of SAMS, capacity building and training are major points to improve the management of bee colonies and to shift beekeeping from the traditional beekeeping to the modern box hive beekeeping. This is especially so important since Mr. Bezabeh from the Oromia Agricultural Research Institute Holeta Bee Research Center mentioned that 90% of the bee colonies in Ethiopia are kept in traditional hives which have an annual yield of 5-7 kg crude honey/year. At the same time, the transitional hive could produce between 15-25 kg /year and the modern box hive could come up with 30-45 kg/ year. The transitional hives are currently just used by 3% of the national beekeepers while the modern hive system is used by 7%. As we learned, it is very important for Ethiopian beekeepers to learn more about the shift of hive systems and the management of the hives as well as to create the awareness that this sector has a huge potential to become a main income source for families.

Traditional Bamboo Beehive

Transitional Beehive

Modern Beehive

Claypot Hive for stingless bees

After a successful opening on Monday, a second field trip to the Bee Research Center of the Oromia Agricultural Research Institute in Holeta has given the experts a better insight on structures on Research Institutes all over Ethiopia, about technical requirements and the bee test sights.

Visit of the Bee Research Center Holeta and first day of the UCD Workshop with partners

With a mindset full of new information and implementation conditions a successful User Centered Design Workshop with partners and businesses, all interested in the SAMS products and bee related services has been conducted on Thursday.

Based on the findings, the first Needs Assessment report with specific information on technical, regulatory and educational requirements has been developed and will be the baseline for the User Centered Process.

By GIZ

09. 2018 - 3rd SCM of SAMS in Jelgava, Latvia (Hosted by UNILV)

The **Latvia University of Life Sciences and Technologies** invited the SAMS consortium members to the 3rd SAMS SC-meeting into the Jelgava Palace, Jelgava. The event took place from the 26th to the 28th of September. Dr. Gatis Vitols, the head of the Faculty of Information Technologies, welcomed the consortium members and introduced the LLU and the faculty. After the warm welcome of our hosts, an overview of the next two days' agenda was given and new SAMS members were introduced to the consortium. The main objectives of the 3rd SCM were to talk about each work package's progress and to discuss open questions and issues. A special focus was on the user research progress. We were talking about the outcome of the workshops in the two target countries Ethiopia and Indonesia and the assessment of local beekeepers' needs and requirements. The results of the so far submitted deliverables were presented and discussed. Oromia Agricultural Research Institute Holeta Bee Research Center (Holeta) submitted a manual on beehive construction and operation which will be suitable for the SAMS technology in Ethiopia and the University of Graz presented bee health management and bee health indicators of the two target countries. The deliverables will available for download at the SAMS project website.

Besides the official part of the event, the meeting participants had the chance to socialize during several side events, organized by our Latvian hosts. Not only an excursion to the Jelgava St. Trinity Church tower, but also a visit of the Jelgava palace's own museum and tombs were set up. The consortium members had also the chance to enjoy the city and local food in two very nice restaurants of Jelgava.

The participating consortium members in front of the Jelgava Palace and in the meeting room

The next SCM will take place in February 20 to 22, 2019 in Graz, Austria.

By University of Graz

Conferences and Events

02. 2018 – Citizen Science conference, Salzburg, Austria

The 4th citizen science conference held in Salzburg from February 1-3 was attended by more than 100 persons from different science disciplines. In his oral presentation, Dr. Robert Brodschneider, a SAMS consortium member from the University of Graz, focused on honeybee research and citizen science. Different ways of participation, but also peer review, publication and feedback to practice were discussed. In SAMS, citizens can contribute by collecting data for science, but gain also information on honeybee colonies, which influences their practical hive management work.

More information about the citizen science conference can be found under https://citizen-science.sbg.ac.at/index.php

By University of Graz

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04. 2018 - Asia Pacific Week, Berlin, Germany

Project partners from CV. Primary Indonesia, Adityo Pratomo, and the University of Padjadjaran, Dr. Dwi Purnomo, presented the EU funded project SAMS during the Asia-Pacific Week 2018 on April 24, 2018 at the Conference on Digitalization in Berlin.

The APW (https://apwberlin.de/) is one of Germany's most important platforms for dialogue and cooperation with Asian partners from business, culture, science and politics. The conference is based on an ever-growing network of partner institutions, like ministries, embassies, economic associations, cultural institutions, NGOs, universities and enterprises. Innovative events on crucial topics regarding global developments characterize the program. This year the focus laid on the global megatrend of the 21st century "Digitalization" with his great opportunities and challenges for companies and people in Europe and Asia. In an exchange between startups, corporates, and SMEs the most important trends of digitalization have been discussed, since Asia is one of the world regions with great dynamics and social acceptance of digital technologies.

Due the fact that bees play a key role in the preservation of our ecosystem, the global fight against hunger and in ensuring our existence the audience of the SAMS session got an answer on the question if bees & digitization match and how they match. As an overview of the EU-funded H2020 project the GIZ presented the framework & content of SAMS, which has been followed by a presentation on SAMS as an UCD driven and IoT research project (by Adityo Pratomo) and SAMS as a catalyst for social businesses (by Dr. Dwi Purnomo).

Dr. Dwi Purnomo (University of Padjadjaran), GIZ, Adityo Pratomo (CV.Primary Indonesia)

More information about the Asia Pacific Week can be found under https://apwberlin.de/

By GIZ

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05. 2018 – Re:publica, Berlin, Germany

How can ICT solutions contribute to make bees healthier?

Our partner from Iceaddis IT Consultancy PLC presented the EU funded project SAMS "Smart Apiculture Management Services" under the headline of "How to make bees healthier with IT solutions – the Ethiopian case" at the Tech Salon of the Federal Ministry of Economic Cooperation and Development stand on May 3.

The re:publica in Berlin is Europe's biggest conference on topics concerning digitization and society, while also being one of the world's most inspiring festival for the digital society.

The aim of the re:publica is to present the opportunities and advantages of digitization in the individual spheres of life, while at the same time critically examining them through a look behind the scenes. The direct exchange of knowledge and the simultaneous networking of experts, users, creative minds, multipliers and innovators is a crucial point of the re:publica & allowed Markos Lemma, Gustaff Ismandar (SAMS Advisory Board) and the GIZ team to connect with other like-minded people.

Markos Lemma Iceaddis, Ethiopia

POP: Angela Zur (GIZ), Stefanie Schädlich(GIZ), Markos Lemma (Iceaddis) and Indonesian Advisory Board Member Gustaff Iskandar (Common Room Network Foundation)

More information about the re:publica can be found under https://18.re-publica.com/de

By GIZ

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05. 2018 - 10th Indo-German Frontiers of Engineering Symposium, Potsdam, Germany

The SAMS project has been presented at the 10th Indo-German Frontiers of Engineering Symposium 2018 in Potsdam, Germany by the Department of Agricultural and Biosystems Engineering (University of Kassel).

The Indo-German Frontiers of Engineering Symposia (INDOGFOE) are a series of interdisciplinary, binational conferences which are co-organized by the Indian Department of Science and Technology (DST) and the Alexander von Humboldt Foundation. Funding on the German side is provided by the

Federal Ministry of Education and Research. The activity brings together outstanding, early-career German and Indian engineers and natural scientists from industry, universities, and other research institutions to introduce their areas of engineering research and technical work, thereby facilitating an interdisciplinary transfer of knowledge and methodology that could eventually lead to the development of cooperative networks of young scientists from both countries.

By University of Kassel

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07. 2018 - Riung Karsa, Bandung, Indonesia

Universitas Padjadjaran held a press gathering in order to socialize research-based products, invented by their researchers. The program was delivered in form of a talk show or a tea talk in the afternoon and named Riung Karsa (Riset Unggulan Unpad dan kerjasama Untuk Masyarakat Untuk Masyarakat Sejahtera) or in English it means UNPAD's Remarkable Research and Cooperation for Community's Wealth). Riung Karsa is a media brand for research and innovation results with impact to the local communities. This program is regularly held every Friday afternoon from 15:30 - 16:30 local time at Sixty two Cafe, Cisangkuy Street No. 62, Bandung.

For the beginning, Riung Karsa introduced Smart Apiculture Management Services (SAMS). Dwi Purnomo as the team leader of the Indonesian researcher team explained how the SAMS project can achieve EU's commitment to the UN Sustainable Development Goal (SDG No 2) "end hunger, achieve food security and improved nutrition and promote sustainable agriculture" through the ICT implementation in apiculture and through mainstreaming the data for researched based businesses that can be run by the community.

By Universitas Padjadjaran

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08. 2018 - Exposure Seminar ICT in Agriculture Value Chain Development, Feldafing, Germany

Expert Input "Open Source Strategies—IoT for bees & the SAMS UCD process" by Sascha Fiedler (University of Kassel) & GIZ

In 2015 the German Federal Ministry for Economic Cooperation and Development (BMZ) commissioned GIZ to implement the program "Green innovation centers for the agriculture and food sector". This program is running up until 2021 and its purpose is to support the development of specific agricultural value chains in 13 countries in Africa (Benin, Burkina Faso, Cameroon, Ethiopia, Ghana, India, Kenya, Malawi, Mali, Mozambique, Nigeria, Togo, Tunisia, Zambia).

Within the context that hunger is still primarily a problem that is related to poverty and that more than 800 million people face starvation while another two billion suffer from chronic malnutrition. Due to the fact that locally adapted innovations are needed in order to foster sustainable development throughout the agricultural and food sector the Green Innovation Center aim to boost production in agricultural systems, raise productivity, enhancing organization and improving marketing and processing along the entire agricultural value chain.

Given the recent dynamic advances in ICT for agriculture in Africa and BMZ's growing interest in the topic of digitalization and development, GIZ Feldafing organized a workshop in order to explore the potential of new technologies for value chain development. Due to this fact GIZ invited experts and service providers from various African and European countries to exchange ideas, experiences and insights concerning value chains.
The aim of the lecture on "IoT for bees and the SAMS UCD process" was to provide all participants a practical insight on the importance and use of Open Source technologies and User Centered Design (UCD) methods of prototyping and development within this framework in general and especially within our SAMS-project.

Sascha Fiedler (UNIKAS) explaining what the use of IoT and UCD could add for a value within the agricultural sector

The 30 participants were local GIZ employees, local entrepreneurs and initiatives as well as employees of national agencies or ministries from Benin, Tunisia, Mali, Togo, Ghana, Ethiopia, Zambia, Malawi and Burkina Faso. All of them were invited by the Green Innovation Centers to attend this 10-day Exposure Seminar in Bavaria, Germany.

By GIZ

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09. 2018 - EurBee 8, Ghent, Belgium

EurBee 8, the 8th congress of Apidology took place from 18th-29th of September in Ghent, Belgium. Dr. Robert Brodschneider from the University of Graz visited the most important get together of researchers studying different aspects of wild and managed bees. Topics of the conference include discussions about responding of bees to environmental changes, species conservation, pollination services, beekeeping management and colony losses. The SAMS project was presented to all interested conference participants in form of a scientific poster.

SAMS poster visitors

More information about the EurBee can be found under: http://www.eurbee2018.org/

By University of Graz

Upcoming Events

10. 2018 - Agrosym Symposium, Sarajevo, Bosnia-Herzegovina

AGROSYM is, for nine years, an annual platform for international scientific discussions on agriculture, food, rural development, environment and forestry. Multidisciplinary results reported during AGROSYM will contribute to the dissemination of knowledge and good practices to all actors of the agrofood chain (e.g. farmers, extension agents, researchers, policy makers) as well as the general public about the importance of agriculture and food science, one of the most important strategic areas of many national research strategies. Symposium will be held in hotel Termag on Jahorina mountain, near Sarajevo at October 4-7, 2018. SAMS partners from Latvia University of Life Sciences and Technologies will present topic about LoRaWAN technology "APPLICATION OF LORAWAN TECHNOLOGY IN PRECISION BEEKEEPING". As well a poster about the SAMS project will be presented during the event.

More information can be found under: http://agrosym.ues.rs.ba/index.php/en/

By Latvia University of Life Sciences and Technologies

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10. 2018 - Asian Apicultural Association conference, Jakarta, Indonesia

From 22th - 25th October 2018 @ Casa Grande Grand Ballroom of Merlynn Park Hotel, Jakarta – Indonesia. Dwi Purnomo and his team from Universitas Padjadjaran will promote the SAMS project through oral presentation. The topics that will be presented are 1) flowering plant calendar as basic data to support beekeeping, 2) the journey of beekeepers along their business and 3) SAMS project Indonesia; answering challenges of the industrial revolution 4.0 in beekeeping in Indonesia. He is also invited by the organizer of the conference as the leader of the SAMS project in Indonesia. The conference will gather beekeeper experts and stakeholders from around Asia and Indonesia itself, so we would like to utilize the opportunity to promote and obtain support and networks that will be useful in the SAMS implementation process.

More information can be found under: https://www.aaaconference2018.com

By Universitas Padjadjaran

10. 2018 - 6th International Mugla Beekeeping & Pine Honey Congress

Between the 15th and 19th October 2018 the team from Latvia University of Life Sciences and Technologies will attend the "6th International Muğla Beekeeping and Pine Honey Congress" at Liberty Hotels Lykia, Fethiye - Ölüdeniz, Turkey. Participants of the congress are researchers, scientists and shareholders of the beekeeping sector on the international level. Participants are gathered to discuss and share knowledge and ideas in the field of beekeeping including technical and economic challenges. SAMS partner team from Latvia University of Life Sciences and Technologies will present two posters: "SAMS-International Partnership on Innovation in Smart Apiculture Management Services" and "Application of LoRaWAN in Precision Beekeeping".

More information can be found under: http://muglacongress.org/eng/

By Latvia University of Life Sciences and Technologies

12. 2018 – Apimondia Symposium, Addis Ababa, Ethiopia

The Apimondia Symposium event will be held from 30th of November to 4th of December 2018, at the United Nations Economic Commission for Africa (UNECA) conference center in in Addis Ababa, Ethiopia, which is known to be the heart of the political city of Africa. The Ethiopian Apiculture Board (EAB) in collaboration with the Apimondia and other apicultural sector stakeholders will organize the event. The symposium is the second of its kind in Africa and the first one in Ethiopia. About 300 actors from Ethiopia and abroad are expected to display their products.

The objective of the symposium is to facilitate the exchange of information and discussions between beekeepers, scientists, honey-traders, development practitioners, policy makers, NGOs, bilateral agencies and regional organizations on the pollination role of bees, bee health, environmental services and transformation of the beekeeping sector. The title of this year's symposium is "The Role of Bees in Food Production" with the theme: "Significance of Bees' Pollination for Improved Food Production". The topic is meant to highlight the less understood and underexploited role of bees in crop pollination in Africa. Attention will also be given to their role in ecosystem services and poverty reduction.

More information can be found under: http://www.apisymposium2018.org

By Oromia Agricultural Research Institute, Holeta Bee Research

03. 2019 - Entomological Society of Austria conference, Graz, Austria

The SAMS poster will be presented at the Austrian Entomological Colloquium on March 16 in Graz. The event takes place at the University of Graz and is focusing on reports and poster contributions, to share new research results with interested parties. The Austrian Entomological Organization was founded in 1975 and is situated in Vienna. Their goal is the promotion of entomology in Austria through socializing of Austrian experts and with the public, as well as the representation of Austrian entomologists at international events and committees.

More information can be found under: http://www.entomologie.org

By University of Graz

Imprint

This document is issued by the consortium formed for the implementation of the SAMS project under Grant Agreement N° 780755 by the following partners:

GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (Germany)
UNKAS	University of Kassel (Germany)
UNILV	Latvia University of Life Sciences and Technologies, Latvia
UNIGRA	University of Graz, Austria
UNPAD	University Padjadjaran, Indonesia
CVPI	CV.PRIMARY INDONESIA-
HHOLET	OLETA OROMIYA AGRICULTURAL RESEARCH INSTITUTE
ICEADDIS	ICEADDIS IT CONSULTANCY PLC

Project website: www.sams-project.eu

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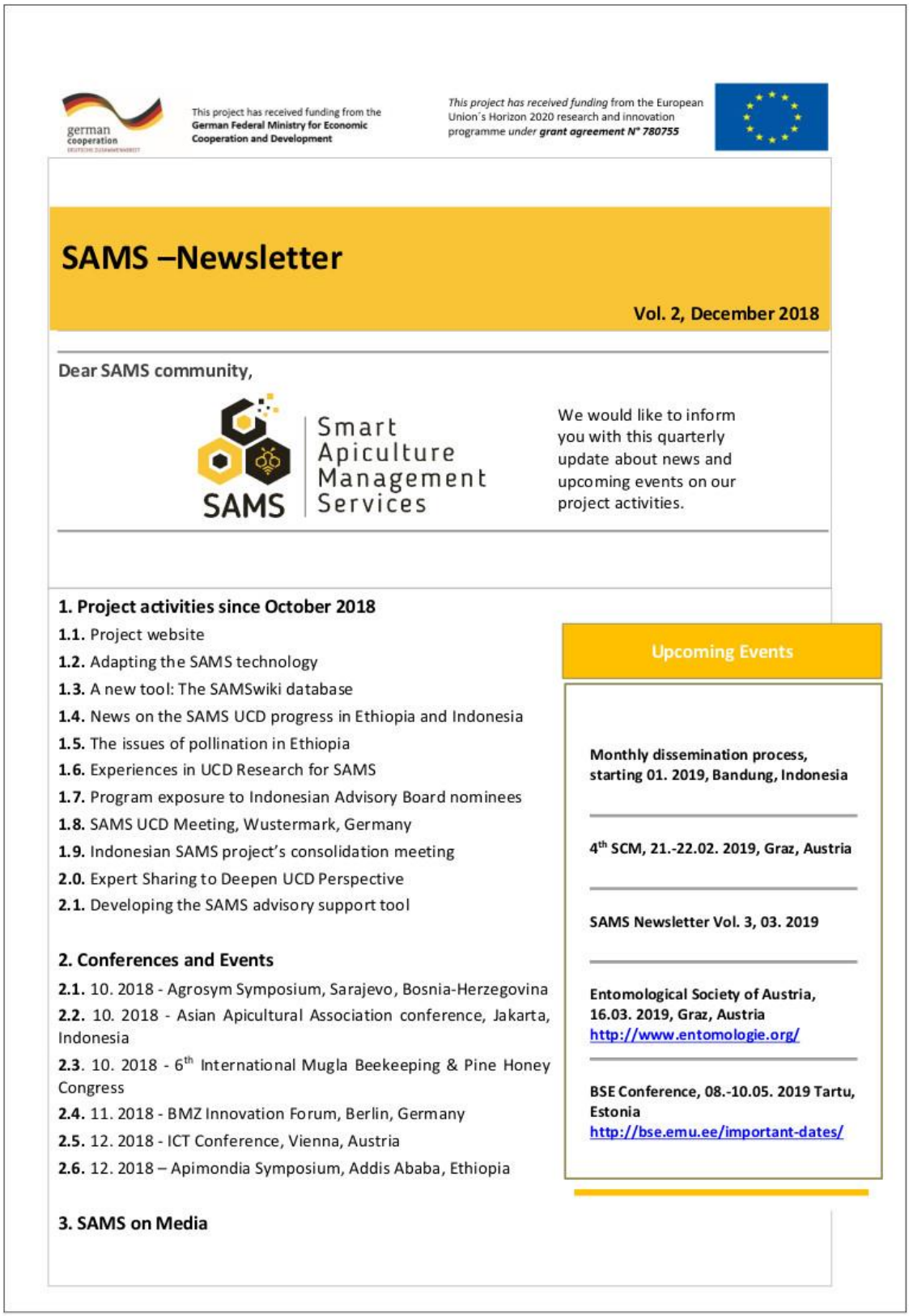
2. Newsletter Vol. 2

To access all hyperlinks in the newsletter, follow the link to the newsletter in the original version.



german cooperation

This project has received funding from the German Federal Ministry for Economic Cooperation and Development

This project has received funding from the European Union's Horizon 2020 research and innovation programme *under* ***grant agreement N° 780755***

SAMS –Newsletter

Vol. 2, December 2018

Dear SAMS community,

SAMS Smart Apiculture Management Services

We would like to inform you with this quarterly update about news and upcoming events on our project activities.

1. Project activities since October 2018

1.1. Project website
1.2. Adapting the SAMS technology
1.3. A new tool: The SAMSwiki database
1.4. News on the SAMS UCD progress in Ethiopia and Indonesia
1.5. The issues of pollination in Ethiopia
1.6. Experiences in UCD Research for SAMS
1.7. Program exposure to Indonesian Advisory Board nominees
1.8. SAMS UCD Meeting, Wustermark, Germany
1.9. Indonesian SAMS project's consolidation meeting
2.0. Expert Sharing to Deepen UCD Perspective
2.1. Developing the SAMS advisory support tool

2. Conferences and Events

2.1. 10. 2018 - Agrosym Symposium, Sarajevo, Bosnia-Herzegovina
2.2. 10. 2018 - Asian Apicultural Association conference, Jakarta, Indonesia
2.3. 10. 2018 - 6th International Mugla Beekeeping & Pine Honey Congress
2.4. 11. 2018 - BMZ Innovation Forum, Berlin, Germany
2.5. 12. 2018 - ICT Conference, Vienna, Austria
2.6. 12. 2018 – Apimondia Symposium, Addis Ababa, Ethiopia

3. SAMS on Media

Upcoming Events

Monthly dissemination process, starting 01. 2019, Bandung, Indonesia

4th SCM, 21.-22.02. 2019, Graz, Austria

SAMS Newsletter Vol. 3, 03. 2019

Entomological Society of Austria, 16.03. 2019, Graz, Austria
http://www.entomologie.org/

BSE Conference, 08.-10.05. 2019 Tartu, Estonia
http://bse.emu.ee/important-dates/

1. Project activities since October 2018

Project website

Our project website https://sams-project.eu is constantly growing and updated. So, since the last newsletter, we were able to add new content for our interested readers. Now you have the possibility to download our deliverables, follow SAMS on media, or look up the SAMS' Advisory Board members. If you cannot wait until the next newsletter in March, you are able to read about the latest events, SAMS was participating in.

The SAMS project website

By University of Graz

Adapting the SAMS technology - Estimation of honey chamber weight by using beehive impulse response data

A monitoring system should incorporate the minimum of hardware (e.g. controllers, sensors, scale) as possible. Some preliminary measurements of the acoustics of a beehive brought the team of the University of Kassel to the idea to use acoustic information to estimate the size of the honey chamber, i.e. the compartments in which bees store collected pollen and nectar.

Acoustically, a beehive can be treated as a linear and time invariant system. The fairly simple rectangular shape of a beehive may amplify certain wavelengths within the beehive according to the dimensions. Presumably, a growing honey chamber will affect location (frequency) and magnitude (relative strength) of these resonances. Thus, a relative reduction may be used as a cue to estimate honey chambers size.

The figure below shows a 16-hour spectrogram taken from a single beehive, starting immediately after opening the hive and removing some honey supers. Bee arousal as indicated by the relative shift of the peaks at 250~Hz and 500~Hz, declines after approximately 4 hours. The spectrogram shows low frequency traffic noise in the evening from 5 to 8 pm as well as in the morning hours starting at 5 am.

Relevant for the estimation of honey supers' size is the structure of harmonics in the frequency region between 1 kHz to 4 kHz. These harmonics are not linked to bee activity (as it remains constant over time) but to the resonances of the beehive. Some simulations and impulse response measurements of empty hives are in progress. A long-term study of the change of acoustic patterns with respect to the honey chamber size and weights is planned. If the experiments are conclusive, a correlation between acoustic pattern and weight of the honey supers may be drawn. A subsequent step will be to investigate whether the beehive impulse response can be deduced without predefined excitation. In other words, whether

the acoustic excitation driven by bee sounds, wind- and environmental noise is sufficient to estimate the resonance pattern of the hive.

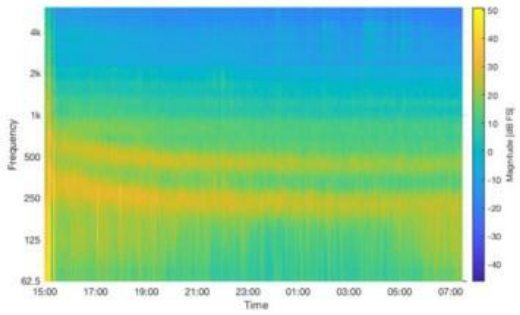


Figure: Spectrogram of the acoustic recordings in a beehive at the Department of Agricultural and Biosystems Engineering from the University of Kassel

By University of Kassel

A new tool: The SAMSwiki database

As mentioned in the last newsletter (Vol. 1, September 2018), the University of Graz (UNIGRA) contextualized the situation of honey bees and beekeeping in the two target countries Ethiopia and Indonesia in a scientific literature study, complemented by expert opinions from the two countries. The intermediate results of this ongoing process are publicly available as "D5.1 – Bee-Management and Bee-Health indicators" on our website. The last few months UNIGRA worked on transferring the findings of the deliverable in a glossary style database - the SAMSwiki. The SAMSwiki is an open access knowledge source and allows every interested person to participate with their own content. An excerpt of topics: the countries' key numbers of apiculture, honey bee products and beesector, bee forage, hive management, honey bee health, or smart bee management.

For more information visit our SAMSwiki database: https://wiki.sams-project.eu/index.php/Main_Page

By University of Graz

News on the SAMS UCD progress in Ethiopia and Indonesia

In the first SAMS newsletter, we already have drawn the attention on a central component of the SAMS project - the User Centered Design – which will enable the SAMS project team to develop a solution, which is understandable and useable for all user groups - beekeepers as well as scientist and commercial users – and which is the primary success factor of SAMS. To meet this success factor, the SAMS project relies on all project partners, especially on the local partners when it comes to the user proximity.

Driven by our local partners, Labtek Indie (ID), University Padjadjaran (ID), iceaddis (ET) and the Holeta Bee Reasearch Institute (ET), much more has happened after the successful UCD workshop implementation in Indonesia (06.2018) and Ethiopia (07.2018).

In-depth interviews with different beekeepers have been carried out in Indonesia to narrow down Real Profiles and Insights in order to acquire Persona Profiling for the further human-centered research process towards finding the user (or early adopter) and user requirements for SAMS technology.

Based on these interviews three different personas have been developed which represent the most recent practitioners in beekeeping in Indonesia:

1. The traditional Veteran Beekeeper who does beekeeping as side job in combination with farming or gardening activities;

2. The Gatekeeper of traditional beekeepers who has a great network and is really passionate about beekeeping but still does beekeeping as a side job; and

3. The next generation of beekeepers who are full-time beekeepers with a wider access to information and resources and which are able to adapt to current and new technologies.

In Ethiopia in-depth interviews were carried out in the towns of Holeta, Gedo and Bako. Six technical staff members of our partners at the Agricultural Research Institute and affiliated sites were interviewed. Since these technicians will be the first caretakers of SAMS hives in Ethiopia, the research's aim was here to learn their current beekeeping practices in order to identify existing gaps and how SAMS system can be best integrated into their activities and enhance their experience.

The elaboration of these personas as representatives of the Indonesian and Ethiopian beekeepers as well as further interviews will shape the interface of the SAMS Advisory Support System technology, identify specific requirements to be able to serve specific needs towards the users and point out similarities and differences between the user groups.

It is especially important for the current ongoing hardware adaption of the SAMS system to avoid error-prone. The first hardware prototypes will be implemented in Ethiopia and Indonesia in spring 2019. Collected data will then be thoroughly analyzed respective its scientific potential the before it will be used as basis for the Decision Support System.

By GIZ

The issues of pollination in Ethiopia

Literature and field inquiry studies have been conducted from September to November 2018 to identify the current situation in Ethiopia related to pollination and sustainable agriculture. Based on the assessment, from 76 food crops grown in Ethiopia, 53% are pollinator-dependent but pollination is an overlooked "free" ecosystem service. The societies fail to recognize the importance of pollinators and 70% of 30 beekeepers and 100% of 30 non-beekeeper farmers, contacted during a survey, had no awareness on pollinators and the contribution of bees in food production. From literature studies and current field inquiries, agronomists recommended different fertilizer rates to minimize the yield gaps in oilseed and pulse crops but the effort failed, because pollination was never or only rarely considered as agronomic factor. Even, the national biodiversity strategy didn't clearly incorporated pollination as ecological service due to a lack of awareness of the role of pollination in agricultural production and plant conservation. So, in SAMS business development, the pollination issue must be mainstreamed into agriculture policies, national biodiversity conservation strategies, environmental impact assessment plans and national adaptation plans for climate change in Ethiopia.

By Oromia Agricultural Research Institute, Holeta Bee Research

08. - 12. 2018 - Experiences in User Centered Design Research for SAMS

It has been quite a journey for Indonesia's User Centered Design Research team, since the dry season up to the rainy season, we have been going back and forth to a couple of areas where we conducted our research. Our research started with very broad objectives and with an access to do a homestay in a beekeeper's house to feel firsthand experience how he and his family live daily. We then had the

opportunity of several in-depth conversations with several beekeepers in Sukabumi, Indonesia. When we were building rapport, we acted as sponges and deeply listened to their stories that were mostly about motivations, life struggles, family, and hopes as beekeepers. We were invited to visit their homes, shared meals, and we were able to observe the beekeepers' interactions with their bees, including their beekeeping practices.

We continued our research with a bridging phase to deeper introduce SAMS as a technology that could benefit them in such that they are going to be involved in this research process. At first the beekeepers thought that we only were interested in their bees and hives, but after explaining that we actually were interested in them as beekeepers and their behaviors, they were on the same level of understanding why we, as the design researchers, want to spend more time with them.

At the moment, we have a better perspective in giving recommendations on who will be the early adopter of SAMS, and currently we are extracting detailed behavior and pain points on each behavior that will eventually be transformed into a User Story instead of User Requirements.

Left: Mr. Usep, a member of the Indonesian UCD team, demonstrates his method to harvest Trigona honey and to transfer Trigona colonies from bamboo to wooden box hives. Right: Mr. Usep shows how to recognize queen cells.

By CV. Primary Indonesia

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10. 2018 – Program Exposure to Indonesian Advisory Board nominees

Universitas Padjadjaran (UNPAD) and CV. Primary Indonesia, the SAMS project's beneficiaries in Indonesia, hosted a program exposure with the Advisory Board. Strategic institutions were asked for their expert advices regarding additional possibilities for SAMS implementation in Indonesia. This action was necessary to ensure that the international SAMS project can be, based on local requirements and knowledge, implemented in Indonesia.

The aim of this event was to nominate Advisory Board members, contributing to the SAMS project implementation in Indonesia with their expert opinions, inputs and additional visions on utilization in context with local beekeeping activities. Within this event, participants also tried to elaborate the competences from the involved institutions. Furthermore, UNPAD was trying to expand the impact of the SAMS project among the local community. The event was held on 21st of November 2018 at the UNPAD campus, Jatinangor, Sumedang. The invited institutions and nominated/asked Indonesian Advisory Board members were Lulu Labida from West Java Research and Development Agency (Badan Penelitian dan Pengembangan Daerah (BP2D) Provinsi Jawa Barat), Didik Budi Purwanto and Yusri Satriana from

Indonesian Apiary Association (Asosiasi Perlebahan Indonesia), Ramadhani Eka Putra as an expert in insect and pollination from School of Life Sciences & Technology Institut Teknologi Bandung, Gustaf Iskandar from Common Room. Indonesian SAMS beneficiaries in this event were represented by Anas Bunyamin and his research team from UNPAD and CV. Primary Indonesia represented by Amanda Mita.

The updates and findings of the implementation process were confirmed and validated in a meeting with the Advisory Board and the same method was also applied to define solutions on the SAMS project's technology adaption process in Indonesia. In a next step, an exposure meeting was planned.

Left: Bridging SAMS project's value and elaboration points to the audience. Right: Group discussion.

The Indonesian SAMS project team and Advisory board nominees.

By Universitas Padjadjaran

11. 2018 - SAMS UCD Meeting, Wustermark, Germany

Due to the fact that our partner from ICEADDIS, Yemi, participated in the World Food program Bootcamp in Munich, GIZ, University of Kassel and ICEADDIS were able to schedule a meeting in Wustermark to discuss further UCD steps for the SAMS implementation in Ethiopia, Indonesia and Europe.

For the User Research in Ethiopia, ICEADDIS will get into a strategy building, select sides and make a focusing for the first implementation for development. In addition, they will involve the partners of the honey project 'Yenemar', a design investment, into the SAMS project. Yemi introduced the Ethiopian beekeeping community structure, including extension worker – individual farmer – cooperatives (e.g. coffee cooperatives).

For the upcoming UCD-requirement Workshop 2019, we discussed how we can organize a workshop that is easily accessible to all partners and where it can take place. Everyone agreed that the workshop should be held in Indonesia, as CV. Primary, Laptek Indie and UNPAD have an excellent expertise and facilities. Before this, UNIKAS will start their first implementation trips to Ethiopia and Indonesia in early February

2019 to set up the adapted IT monitoring hive-system. Maybe they can already present first results on the next Steering Committee Meeting in Graz, February 21-22.

Participants of the UCD meeting: S. Fiedler (UNIKAS), A. Zur (GIZ), A. Eckey (UNIKAS), Y. Tadesse (ICEADDIS).

By GIZ

12. 2018 – Indonesian SAMS project's Consolidation Meeting

Common Room hosted a consolidation meeting together with Indonesian SAMS project beneficiaries, UNPAD and CV. Primary Indonesia (Labtek Indie) to review the so far reached milestones of the SAMS project implementation process in order to define future milestones for 2019. The event was held on 2nd of December 2018 in Cigadung, Bandung. Participating people were: Dwi Purnomo, Marlis Nawawi, Fajar Susilo and Yeti Yuli from UNPAD, Aditya Sumarlan, Adityo Pratomo, Amanda Mita and Tanti Sofyan from CV. Primary Indonesia (Labtek Indie), and Gustaf Iskandar from Common Room.

The latest research results showed that the local beekeepers are divided into two groups: beekeepers practicing traditional beekeeping and the new generation of beekeepers. Within this meeting, we also discussed the possibilities of how we could approach both groups, in West Java – Indonesia. At the moment, defining how to encourage beekeeper groups whether through beekeeping itself or its derivative products and services are taken into account. The major challenges are to translate and assess the true needs from existing and new generation beekeepers. This process will determine the early output and/or recommendations concerning the SAMS hive prototype and its early implementation process.

Indonesian SAMS project beneficiaries after the consolidation meeting in Cigadung (December, 2018)

By Universitas Padjadjaran

12. 2018 – Expert Sharing to Deepen UCD Perspective

UNPAD was invited by CV. Primary Indonesia to participate in a mini seminar, aiming the dissemination of bee species specific beekeeping methods and better framework for the further research regarding the SAMS implementation process. The topic involved bee ecosystem and beekeeping methodology in Indonesia. Therefore, Mr. Yadi Supriadi, a lecturer from Faculty of Agriculture, Padjadjaran University, and Mr Ramadhani Eka Putra, an insect expert from Bandung Institute of Technology, were invited to speak in front of the audience. The event was held on December 11, 2018 at Jalan Titiran. The participants were mostly design researchers, who are involved in the User Centered Design Research process of SAMS in order to gain a better perspective on the standardized methodologies and to better understand the beekeepers' behaviors. Besides, the event was also open for public, mostly young millennials who have environmental awareness participated. This event was based on intense informally discussions between the speakers and participants. This event attended by more or less 15 youngsters with passion and curiosity about bees' ecosystem and their characteristics. It was a small, yet intimate and heartfelt discussion with deep engagement between the speakers and attendees. The discussions served as objectives for the design researchers to enrich their 360° perspectives, increasing their awareness on the bee issues, and the SAMS technology implementation possibilities for wider audience. At the end of the event Mr. Ramadhani donated his Trigona colony, including the beehive to one of our participants to be taken care in his urban farm area, signed by all discussion participants as a symbol of community ownership.

Left: Yadi Supriadi from UNPAD teaches proper beekeeping methods. Right: Mr. Ramadhani explains the differences between bee species.

Left: Mr. Ramadhani is showing his Trigona colony to the participants. Right: The organizers, speakers and participants of the mini seminar.

By CV. Primary Indonesia and Universitas Padjadjaran

Developing the SAMS advisory support tool

The UNILV team is working on developing a data warehouse for the bee colony data storage and analysis. Architecture of the warehouse is developed and work on user interface development is ongoing. Special design data storage is created for time-based series values. Also work on connecting remote SAMS hives monitoring system to the warehouse is in progress, including access token testing with machine to machine application.

By Latvia University of Life Sciences and Technologies

Conferences and Events

10. 2018 - Agrosym Symposium, Sarajevo, Bosnia-Herzegovina

IX International Agriculture Symposium "AGROSYM 2018" was held in the hotel Termag on Jahorina mountain, near Sarajevo at October 4-7, 2018. SAMS partners (Aleksejs Zacepins, Armands Kviesis and Vitalijs Komasilovs) from the Latvia University of Life Sciences and Technologies presented the topic LoRaWAN technology and its possible application in Precision Beekeeping. In addition, the scientific SAMS project poster was presented during the event (http://agrosym.ues.rs.ba/index.php/en/).

We were particularly pleased, when it was announced that the SAMS poster presentation was awarded as the "**best poster presentation**" of the symposium.

Left: LLU team are presenting the SAMS poster. Right: Best poster presentation award winner SAMS

By Latvia University of Life Sciences and Technologies

10. 2018 - Asian Apicultural Association conference, Jakarta, Indonesia

14th Asian Apiculture Association Conference

On 22nd - 24th of October, the team from UNPAD attended the 14th Asian Apiculture Association Conference "Bees, Environment and Sustainability" at Merlynn Park Hotel, Jakarta, Indonesia. The participants of the event were researchers, scientists, beekeepers and shareholders from across Asia, Indonesia, Philippine, India, China, Korea and Japan. The participants were gathering to discuss about their previous researches, trends, challenges and derivatives products of beekeeping.

The team from UNPAD were presenting three posters: "Mapping the Journey of Beekeepers along Their Business with Customer Journey Approach", "SAMS Project Indonesia: Answering Challenges of the Industrial Revolution 4.0 in Beekeeping in Indonesia" and "Flowering Plants Calendar of West Java Area as basic Data in Supporting Beekeeping Activities". UNPAD also opening a booth in the expo. SAMS poster draw some attention to the visitors and some visitors said that they're interested to cooperate and utilize the SAMS technology at their farm when the product is ready.

Left: UNPAD's Booth on AAA 2018 Expo. Right: The visitors tasting our honey derivative products

Left: Explaining the SAMS project to the visitors: Right: UNPAD's team on the 14th AAA conference.

By Universitas Padjadjaran

10. 2018 - 6th International Mugla Beekeeping & Pine Honey congress

Between the 15th and 19th of October 2018, the team from Latvia University of Life Sciences and Technologies (Aleksejs Zacepins, Armands Kviesis and Vitalijs Komasilovs) attended the "6th International Muğla Beekeeping and Pine Honey Congress" at Liberty Hotels Lykia, Fethiye – Ölüdeniz, Turkey. Participants of the congress were researchers, scientists and shareholders of the beekeeping sector on the international level. Participants are gathered to discuss and share knowledge and ideas in the field of beekeeping including technical and economic challenges. SAMS partner team from Latvia University of Life Sciences and Technologies presented two posters: "SAMS-International Partnership on Innovation in Smart Apiculture Management Services" and "Application of LoRaWAN in Precision Beekeeping" (http://muglacongress.org/eng/).

Left: At the International Mugla Beekeeping & Pine Honey Congress. Right: LLU team presenting posters

By Latvia University of Life Sciences and Technologies

11. 2018 - BMZ Innovation Forum, Berlin, Germany

With the guideline "new digital tools for global impact", practice-oriented examples for the use of digital innovations were presented and discussed at the Innovation Forum in Berlin. The forum was initiated by the German Federal Ministry for Economic Cooperation and Development (BMZ) to present new innovative approaches to the public and to highlight technologies, that are helping to shape successful development today. Under the title: "global partnerships for promoting digital innovations for sustainable development - explore interdisciplinary approaches in ICT4ag for small-holder farmers ", SAMS was presented as one of the showcase projects of the GIZ Innovation factory at the BMZ Marketplace.

The UNIKAS and Iceaddis Ethiopia teams are presenting the SAMS poster. Left: S. Fiedler (UNIKAS), A. Eckey (UNIKAS), Y. Tadesse (ICEADDIS). Right: J. Theis (GIZ), A. Eckey (UNIKAS), S. Fiedler (UNIKAS), Y. Tadesse (ICEADDIS)

By University of Kassel and GIZ

12.2018 SAMS as part of ICT 2018 Networking Session, Vienna, Austria

"ICT 2018 – Imagine Digital – Connect Europe" took place in Vienna on 4-6 December 2018. As research and innovation conference with networking opportunities, an exhibition and an Innovation and Startup forum, the European Union's priorities in the digital transformation of society and industry were presented and discussed.

The project goal of SAMS and its objectives, as well as the partners and the implementation stage of SAMS have been presented in the network session "Building Research Partnerships addressing African Societal Challenges" on December 5 2018.

More information about the "ICT 2018 – Imagine Digital – Connect Europe" Conference can be found under: https://ec.europa.eu/digital-single-market/en/events/ict-2018-imagine-digital-connect-europe

More information on the networking session " "Building Research Partnerships addressing African Societal Challenges" can be found under: https://ec.europa.eu/digital-single-market/events/cf/ict2018/item-display.cfm?id=21528

By GIZ

12. 2018 – Apimondia Symposium, Addis Ababa, Ethiopia

APIMONDIA is the International Federation of Beekeepers' Associations and other organizations working within the apiculture sector and was funded in 1949. APIMONDIA exists to promote scientific, technical, ecological, social and economic apicultural development in all countries.

Over 800 delegates from more than 25 different countries attended APIMONDIA Symposium organized by Ethiopian Apiculture Board together with APIMONDIA and other key stakeholders in Ethiopia from 30 Nov – 04 Dec 2018 in Addis Ababa, Ethiopia. The participants of the event were researchers, scientists, commercial beekeepers, honey-traders, agents for development, technicians and legislators from African, Asian, European, North and South American countries.

SAMS was presented within the "Commercialization and Transformation of Beekeeping" session. As SAMS is an ongoing project, several important feedbacks and inputs for future development were collected from the participants. One key objective related to SAMS is building national and international networks of knowledge and technology transfer through developing ICT in the field of sustainable apiculture. Towards this, a hot discussion was opened on how different national platforms and sector associations take part in the development process so that SAMS will deliver quality services in a sustainable manner after the project phaseout. One of the technical tour programs was the visit of Holeta Bee Research Center facilities and a model beekeeping cooperative farm located in Holeta, run by a group of female beekeepers, which produce, process and market honey and beeswax to local communities.

Generally, SAMS and especially the UCD approach to develop precision farming draw attention of participants from different disciplines. Some visitors from Zimbabwe and Uganda expressed their interest to follow the SAMS development process right away. Therefore, SAMS products can be easily adapted to be a solution for bees and beekeepers to overcome the challenges in a smart way and no more in a state of "business as usual".

Left: H.E. Mr. Umer Husen, Minister of Ministry Agriculture of Ethiopia on opening speech of APIMONDIA Symposium 2018. Right: Part of the Holeta team participated the APIMONDIA Symposium 2018.


Left: presenting SAMS on one of the parallel sessions. Right: part of the audience.

By Oromia Agricultural Research Institute, Holeta Bee Research

3. SAMS on Media

The SAMS project made it also into international media. Due to the length of the texts, articles and corresponding translations can be found on our website: https://sams-project.eu/dissemination

The **Ethiopian Apiculture Board** mentioned the SAMS project in their newsletter "The API News" (Volume 5, Number 3, August 2018). Kibebew Wakjira, a member of the SAMS consortium, introduced the SAMS project and its objectives to The API News readers.

As already mentioned in the SAMS newsletter volume 1 (September 2018), the Universitas Padjadjaran presented the SAMS project at the **Riung Karsa**, a press gathering in order to socialize research-based products to local communities. This program is regularly held every Friday afternoon.

SAMS and its technology was also introduced in the "**Pikiran Rakyat**" newspaper on July 23, 2018. In total four articles mentioned the SAMS project.

1) "**Bees are not merely honey producers**" ("Lebah Bukan Sekadar Penghasil Madu"):

The article deals with honey bees and their role as honey producers and important pollinators for plants in general and agricultural crops specifically, and UNPAD's efforts to actively conduct social innovation research in social entrepreneurship activities. Authors mentioned the importance of bringing together social innovation, bees and digital technology for sustainable development goals, like fighting poverty.

2) **"Encouraging the Real Impact of Research on the Community"** ("Mendorong Dampak Nyata Riset bagi Masyarakat"):


SELASIK
Mendorong Dampak Nyata Riset
bagi Masyarakat

The SAMS project and its collaboration of various European and non-European countries, and its pentahelix model (businesses, public authorities, civil society, the knowledge sector and capital + finance) was discussed and seen as a role model for an innovative and fruitful research process.

3) "**The Processed Products of Honey; Added Value for Keeping Sustainability**" ("Olahan Madu, Nilai Tambah, bagi Penjaga Kelestarian"):


SELASIK
Olahan Madu, Nilai Tambah
bagi Penjaga Kelestarian

The article deals with honey and its economic importance as well as its ingredients and benefits. To demonstrate the high value of honey and its derivate products, UNPAD developed a list of 15 every day products (from food to hygienic use) containing honey. The list focuses on products, easily can be home-made by locals or by beekeepers with local available materials and processing equipment. In a consequence, honey bee products may help to establish businesses, especially for young people and women.

4) **"Lessons from Honey Bees"** ("Pembelajaran dari Lebah Madu"):


Pembelajaran dari Lebah Madu

In this article, the SAMS project and its objectives were introduced in detail and the general importance of ICT solutions to fight Colony Collapse Disorder of honey bees was described.

By University of Graz

4. Upcoming Events

From 01. 2019 - Monthly Dissemination, Bandung, Indonesia

In order to raise awareness on bees, beekeeping, and eventually SAMS, CVPI and UNPAD is going to conduct a regular dissemination each month. We will invite experts of bees, beekeeping, and beekeepers (senior and newbies). The objectives are to raise awareness and to support the introduction of SAMS as a technology that supports the movement. This event will be conducted around Bandung, Indonesia, in different places with different hosts, aiming to reach wider audience within and in a next step outside of the city of Bandung.

By CV. Primary Indonesia

02. 2019 - 4th SCM of SAMS in Graz, Austria

From February 21-22, the 4th SAMS steering committee meeting will be hosted by the University of Graz in Graz. The event will take place at the campus of the university and as in every SCM, each work package's progress will be discussed. UNIGRA is looking forward to host the meeting and to introduce Austria to our partners. Subsequently the SCM, the partners have also the opportunity to visit the "Fachtagung des österreichischen Erwerbsimkerbunds 2019" (Symposium of the Austrian Erwerbsimkerbund), a fair where Austria's professional and semi-professional beekeepers get together and network. Each year, visitors can expect a large trade fair exhibition for beekeeping articles and a variety of lectures.

By University of Graz

03. 2019 - Entomological Society of Austria conference, Graz, Austria

The SAMS poster will be presented at the Austrian Entomological Colloquium on March 16 in Graz. The Austrian Entomological Organization, founded in 1975, has the goal to promote entomology in Austria through socializing of Austrian experts and with the public, as well as the representation of Austrian entomologists at international events and committees (http://www.entomologie.org).

By University of Graz

05. 2019 BSE (Biosystems Engineering) - Conference, Tartu, Estonia

Two abstracts were submitted by Latvia University of Life Sciences and Technologies for the BSE conference in Estonia. The Biosystems Engineering conference is organized by Estonian University of Life Sciences and deals with fields related to traditional and modern engineering techniques and technical solutions applied to biological systems (http://bse.emu.ee).

By University of Graz

3. Newsletter Vol. 3

To access all hyperlinks in the newsletter, follow the link to the newsletter in the original version.

This project has received funding from the German Federal Ministry for Economic Cooperation and Development

This project has received funding from the European Union´s Horizon 2020 research and innovation programme *under* ***grant agreement N° 780755***

SAMS –Newsletter Vol. 3, March 2019

www.sams-project.eu

Dear SAMS community,

Smart Apiculture Management Services

We would like to inform you with this quarterly update about news and upcoming events on our project activities.

1. Project activities since January 2019

@SAMS_EU_H2020

Upcoming Events

Monthly Dissemination, Bandung, Indonesia

03. 2019 - First Step of Prototype Implementation with Uni Kassel in Indonesia

03. 2019 - SAMS Talk Show – Tap into modern beekeeping - with Uni Kassel in Indonesia

03. 2019 - Survey and Assessment 2nd Phase to *A. mellifera* and *A. cerana* Beekeepers

BSE Conference, 08.-10.05. 2019 Tartu, Estonia
http://bse.emu.ee/important-dates/

07. 2019 Co- creation - User Requirements Workshop, Bandung, Indonesia

07. 2019 Indonesian Development Forum (IDF) 2019, Jakarta, Indonesia

2. Conferences and Events

2.1. 03. 2019 - Entomological Society of Austria conference, Graz, Austria

1. Project activities since January 2019

A wrap up of SAMS & it´s first implementation year

Taking stock of SAMS first implementation year: After we´ve conducted our first project meeting in January last year in Feldafing the year has passed by very quick and the consortium has grown together through several other project meetings and field trips to Indonesia and Ethiopia.

Within the last months, the SAMS project made some major steps starting from the former ITAPIC project idea towards initiating first steps to the individual SAMS products. As it has been described in our former newsletter a main success factor for enabling us to get closer to the final products is the User Centered Design, which helps us to understand the local conditions, beekeeping behavior and needs way better than we would have done it without it. Strong and reliable partners in the countries are the backbone for this process and for establishing trust to the local beekeepers and stakeholders! Based on that we were able to prepare the ground by conducting first user needs assessments and research activities combined with international user centered design workshops in Indonesia and Ethiopia, where Advisory Board members, policy makers, beekeepers and other stakeholder had the chance to step actively in this international community of SAMS. This were solely possible due to the efforts of our local partners: iceaddis, the Oromia Agricultural Research Institute Holeta Bee Research Center, Universitas Padjadjaran and CV. Primary Indonesia.

In addition to the user centered process, which is a living process and goes on over the whole project duration of SAMS, other partners started different studies and test. The University of Kassel did e.g. a test on prevent swarming of colonies, while our partner from Latvia University of Life Sciences and Technologies did studies on using different devices to find out which one can fulfill the planned SAMS requirements and is in addition easy to use as well as stable enough and low in purchasing and maintaining costs. These efforts have been accompanied by the research on available bee related literature in Indonesia and Ethiopia by our partner University of Graz and brought together into the SAMS wiki. This SAMS wiki is for sure also a living document, which is now open for the public and will grow further in the future. And as we all know all of the mentioned effort means nothing if we do not share our findings, failures and lessons learnt with the world – so SAMS took also part in different conferences and is present on twitter to spread the word!

So as you can see each partner and its expertise is of great value for the future and ambitious activities we have planned to fulfill our SAMS goals and create individual SAMS products, which meet the needs of beekeepers in Indonesia and Ethiopia but also all over the world. For sure that applies also for all other experts who share their knowledge with us.

So thank you to all Advisory Board members, beekeepers and stakeholders who have taken part in SAMS and followed us on our journey during the first year! We hope we will keep going way further from this!

& for sure also a big thank you to all of our partners for deciding on being a part of the project, for sharing your thoughts and views with us, for doing a great work and for the great times we´ve spend together and where we´ve shared so many laughs! Let´s work hand in hand together for a second great implementation year of SAMS with many more outstanding memories and a further growing team spirit!

By GIZ

SAMS project poster & flyer

In addition to our project flyer, the final SAMS project poster is now available on our SAMS website. If you are interested check out our official SAMS promotion material under Dissemination.

By GIZ

SAMS on twitter

Follow us and be always up to date on the SAMS project, our activities and on other bee related topics – follow us on twitter

By GIZ

SAMS Wiki database - News

Our open access knowledge source on beekeeping and the beekeeping sectors in Ethiopia and Indonesia is now officially open for access. There are still plenty of knowledge gaps to fill. If you are interested, please feel free to create an account and to add new information to our SAMS Wiki. You know someone, who is also interested in bees and beekeeping and wants to share his/her knowledge with us? SPREAD THE WORD! You find all the relevant instructions on the website.

By University of Graz

Evaluation of the economic importance of the bee colony swarming detection

Latvian team together with support of other project partners are investigating the economical aspect of possible automatized and remote detection of swarming events in honeybee colonies. The basic idea behind this research is that if a colony has swarmed, beekeepers still have some time (from few hours to more than a day) to catch the swarm and place it back into the hive or a new box. By catching the swarm, beekeepers can minimize the financial losses caused by unwanted bee colony swarming. The aim of this research is to present an approach of calculation of the benefit of catching a bee swarm. Different scenarios are compared and economical importance of the remote bee colony swarming detection will be evaluated. The outcome of this research will be published in a scientific publication.

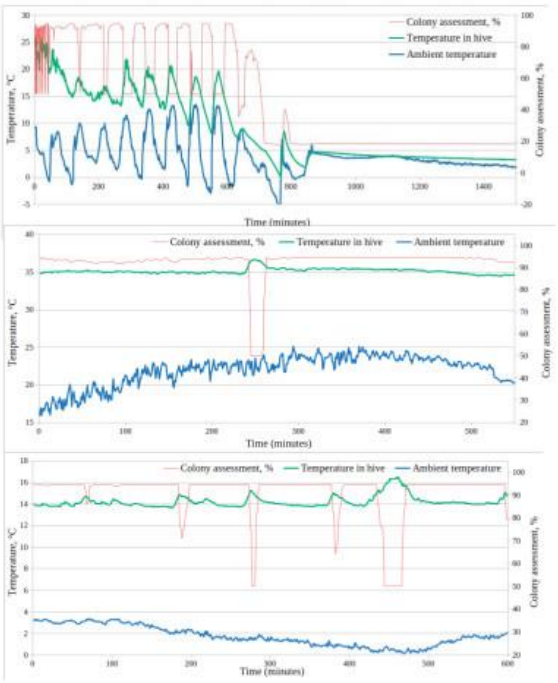
To ease the process of calculation of all formulas and evaluate the economic feasibility of going to the remote apiary to catch the swarm, an online web tool (application) was developed and published for public use. To login simply use your Google account or sign up.

By Latvia University of Life Sciences and Technologies

DSS development progress

In the past few months, we observed that IF…THEN statements become more complicated, if other monitoring parameters, such as humidity, audio or weight were included. Therefore, Fuzzy logic was introduced. It is a generalization of a standard logic and uses so called "degree of truth" between the values 0 and 1 (Boolean logic uses complete values 0 or 1). One of Fuzzy logic's advantages is the rule definition – it allows to define rules in a linguistic form, easing the way to add new or to modify existing rules.

First results were promising, showing that the FIS is capable of distinguishing between normal state,



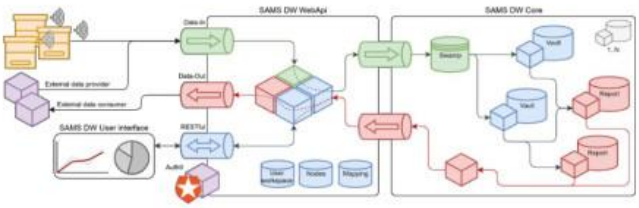
colony death (see picture on top), swarming state (see pic. center) and abnormalities (see pic. bottom) in various seasons.

Figures: on top: Colony death state detected by FIS; center: Colony swarming state detected by FIS; bottom: Abnormalities during winter detected by FIS.

By Latvia University of Life Sciences and Technologies

DWH development progress

Data warehouse (DW) can be considered as a universal system, which is able to operate with different data inputs and have flexible data processing algorithms. Within the SAMS project DW is implemented as a cloud based data storage and processing unit with capabilities to combine different data sources like existing systems and available on-apiary generated data. SAMS DW architecture is as follows and will be published in BSE 2019 conference proceedings in May 2019:



DW consists of three modules: a) Core – main data storage and processing unit; it receives data about various beekeeping objects in predefined format and distributes it through number of vaults and reports, which apply needed transformation to the data (e.g. aggregation, modelling, decision making); b) WebApi – intermediary unit between "outer world" and DW Core; c) Graphical user interface – single-page web application provides user convenient way for managing the sources of incoming data (e.g. hives with monitoring devices) and getting insights into produced outputs (e.g. reports).

By Latvia University of Life Sciences and Technologies

02. 2019 – NEW Open Access Publication

To assess the current beekeeping situation in Indonesia and to discuss the relationship between beekeeping with native and introduced honeybees, partners from UNIGRAZ, Universitas Padjadjaran and University of Kassel cooperated and successfully published a literature-based article in Bee World Volume 96. The publication is open access and ready to download.

By University of Graz

02. 2019 – 4th SCM in Graz, Austria (hosted by University of Graz)

From February 21 to 22 the 4th Steering Committee Meeting took place in Graz and was hosted by the University of Graz. Since the SAMS project runs for 13 months now, the beneficial partners had a lot to discuss. Four new project members were introduced to the consortium and progress was made within every work package, from SAMS hive development, software design, our SAMS wiki database to UCD or management-topics. On SCM day two, Walter Haefeker, the president of the European Professional Beekeepers Association and member of the European SAMS advisory board, held a keynote speech on beeXML - a project, aiming the development of a self-describing data format to exchange data from bees and beekeeping. The successful meeting ended casually on Friday afternoon with a tour through the city of Graz and a visit of the most important sightseeing spots.

Pictures: top: group picture of the SAMS consortium at the meeting venue, center and bottom: sightseeing activity of the group/visit of Graz' oldtown.

By University of Graz

SAMS Monitoring System, Implementation Workshops ET & IN - Update

The second prototype of the SAMS Hive Monitoring System was successfully completed at the University of Kassel. A control unit manages the energy supply by using a photovoltaic system and delivers power for up to 15 monitoring units, which are installed in the beehives (see first figure below). The installation takes place in one third of a brood frame. In the future, the SAMS Hive System could not only acts as an

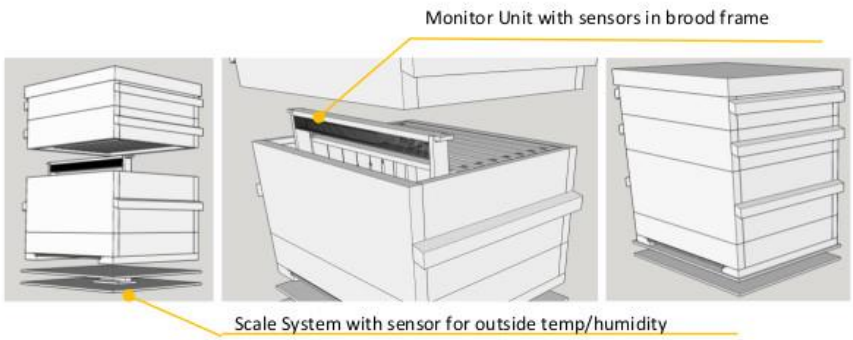


Figure: Scale System as well as Sensor and System placement within a broodframe of a standard Beehive

important tool for monitoring and research for beekeepers and scientists, but also for bee breeders, who could be able to carry out breeding selections on the basis of different parameters in greater detail. The sensors are set up and calibrated via a simple app for the smartphone (see second figure). In March a first SAMS Monitoring System installation workshops took place in Bandung, Indonesia to introduce the second prototype to the project partners. The Ethiopian installation workshop will take place beginning of April in Holeta, Ethiopia together with our local partners. A video tutorial will also be created to train multipliers for the basic installation of the monitoring system.

By University of Kassel

Country activities - Ethiopia

UCD Ethiopia - in-depth interviews

In-depth interviews serve to understand the users from personal and professional aspect. Focus was on the documentation on the users' daily work, challenges, aspirations, opportunities and the local context they are operating. User group in-depth interviews with three participants were conducted: Debel Gerbi (Bako Agriculture Center, East Wollega, Oromia), Girma Beyene (Gedo center, West Shewa, Secondo, Oromia) and Fekadu Alemu (Holeta research , Ulmera, Oromia & Bako research center). Based on the site visits in two different regions in Ethiopia and in-depth interviews with selected user groups, the next step would be defining the user requirements and designing a solution based on them. As iceaddis focuses on the SMEs development, the next user group in-depth interviews will focus on SMEs in the beekeeping sector, and the scientific community in Ethiopia.

By iceaddis

Panel discussion on facilitating mainstreaming pollination issues to existing national policies and strategies

In order to increase the awareness of the importance of pollination by insects and to help bridging the existing policy gap related to pollination and pollinator management, Holeta has planned to organize a day panel discussion with the title **"Facilitating mainstreaming pollination issues to existing national policies and strategies"** in the upcoming 3 to 4 months of the project time. The panel discussion is designed in such a way that it allows all actors and policy makers to analyze the gaps and forward ways to overcome the challenges. A technical paper dealing with the policy gaps and experiences related to pollination and pollinator management will serve as discussion points. The panel discussion will be led by at least two selected renowned discussants. Based on the discussions, an action plan will be developed on how to close the gap between the scientific community (both environmental and agricultural) and the policy makers.

By Oromia Agricultural Research Institute, Holeta Bee Research

Identification of beekeeping constraints in Ethiopia based on UCD analysis

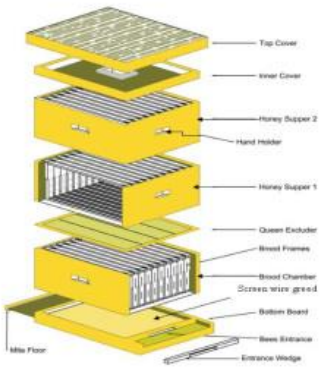
Information required for the UCD analysis were obtained through individual interviews, a field survey study/contextual inquiry, a scientific literature study, expert opinions from the project target areas, advisory board meetings and from other similar networks. Accordingly, information on beekeeping constraints and production system and productivity were identified and categorized into four types of constraints:

- **Biological constraints:** aggressive behavior of the bees, absconding of colonies, honeybee diseases, pests, predators, pesticide use, as well as unstable environmental conditions. Of these constraints, the most serious one is colony loss due to absconding due to a lack of continuous colony follow-ups.
- **Technical constraints:** lack of knowledge of appropriate methods for managing bees, lack of appropriately skilled trainers, materials and training possibilities, and lack of dissemination of new research information related to beekeeping in general.
- **Trade constraints:** The major constraints faced by beekeepers is a lack of market for their products. According to the different sources, the amount of honey sold to from 2008 to 2017 is not more than 2% of the total production.
- **Institutional constraints:** these include the weakness of producer organizations, a weak extension system to support the industry, a lack of certified organizations to analyze and certify products for export and only few organizations have capacity to identify diseases and parasites of bees. Infrastructure to monitor, certify and enable trade in honey and beeswax is also lacking.

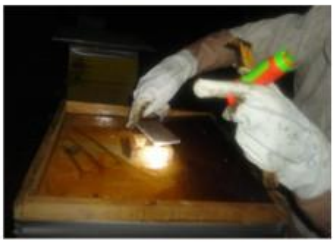
By Oromia Agricultural Research Institute, Holeta Bee Research

Preparation for field testing and evaluation of the SAMS Hive system in Ethiopia

Preparation for testing the SAMS hive system under field conditions is on good track. Ten honeybee colonies were transferred to modern beehives, constructed according to the "Manual on Beehive Construction and Operation" (deliverable D 3.1). Right now, the bee colonies are well established and well managed at Holeta and ready for conducting the field testing of the HIVE system prototype under real environmental conditions.



As IT adaptation requires sim cards, Ethio telecom agreed to provide GSM sim cards for facilitating data transfer to the remote data server for testing and validating the SAMS Hive system.



Pictures: top: A complete assembled beehive sketch; bottom: sugar syrup provided to a beehive with established colonies

By Oromia Agricultural Research Institute, Holeta Bee Research

Country activities - Indonesia

01. 2019 - UCD Research Part 2

We continued our research to an in-depth interview which resulted in two new personas. One is **the new generation beekeeper**, and the other is **urban beekeeper**. They are quite different form two others we've already created in the previous research phase. One of the respondents is Mr. Iyas who breeds *Apis mellifera* bees. When we visited Mr. Iyas, we could see clearly that he is a very active and busy beekeeper, as honey production from *A. mellifera* bees is higher than it is for *A. cerana*. Mr. Iyas used more modern methods, compared to other beekeepers whom we interviewed before, though few ways are still very analog.

Picture: Research team is in-depth interviewing Tani Kota as real profile who represents the persona "urban beekeeper".

It was a very interesting UCD Research experience for our team since we were able to see the contrast difference of behavior among beekeepers. One of the most interesting findings is, that proximity to the city can affect the beekeeper's behavior, mindset, and network. We are hoping, that our future process will leverage our understanding on how they can benefit through SAMS' implementation.

By CVPI

01. 2019 – Survey and Assessment: *Apis mellifera* Beekeepers - Laduni Mutiara Lestari and KTH Karya Lestari

In January, UNPAD surveyed the beekeeper group "**Laduni Mutiara Lestari**", located in Cianjur. Central Java provides natural bee forage and to maximize the honey yield, the interviewed beekeepers migrate their *A. mellifera* colonies from area to area of the region and they prefer to keep migrating their colonies instead of bringing them to their homes. Nevertheless, they always consider the operational costs, efficiency and effectivity of colony management. We observed a unique cooperation among *A. mellifera* beekeepers when it comes to managing the colonies. Local beekeepers look after each other's beehives while the owners go back to their home base or look for the next migration destination. This group has a dream of developing migration sites next to their homes in Cianjur.

Also in January, UNPAD interviewed Mr. Iyas Nuryamin (61), one of the migratory beekeepers on West Java. He was the founder of „**KTH Karya Lestari beekeeping**", located at Koranji Village, Purwadadi District, Subang Regency, West Java. He managed to split his colonies by migrating them to two different areas, Central Java region and West Java (especially around Subang Regency). The division of the migration territory aimed to discover additional migration sites in the area

of West Java. Currently, he was able to migrate his colonies to mangrove plants in coastal areas in Northern Subang.

Pictures: On top: Team picture in front of KTH Karya Lestari homebase; center: Unpad's Assessment team with Maduni Mutiara Lestari at their prospective site for beekeeping; bottom: KTH Karya Lestari's Apis mellifera beekeeping site.

By Universitas Padjadjaran

01. 2019 - UCD Workshop: from Findings to User Stories

As we have gathered deeper information of the User Groups, who are represented by different Personas, we downloaded and crafted those findings into meaningful information. Each persona has different and clustered findings, stories and motivations. We held a co-creation workshop to transform those findings into insights that could produce refined problem statements and user stories. For this workshop we invited people with different backgrounds, from our UCD researchers, designers, and developers. By having a cohesive team, we hope that we have better perspectives on the user stories and in a brother sense on user requirements.

Picture: Team is trying to map interconnected Problem Statements before producing related

By CVPI

01. 2019 – Transferring of Bee Colonies

We were invited to participate in the bee colony transfer from Majalengka Regency to Bandung Regency (23-24 January 2019) by Mr. Yadi Supriadi, beekeeping expert from Faculty of Agriculture, Universitas Padjadjaran. The transfer process had been done at night to not disturb the bee colony. The hive was covered by used newspapers and tied up to avoid the possibility of being damaged or exposed to the external environment. The transferred hive also consist of 3 to 5 frames filled with honey as food deposits for the colonies during their adaptation period.

Pictures: left: Transferring beehive to preferred location; center: Team taking picture at preferred location at Arjasari District, Bandung Regency; right: Frames filled with honey in transferred beehive

By Universitas Padjadjaran

02./03. 2019 - Indonesia Team's Monthly Meeting

Every month, the Indonesian team consisting of CVPI (Labtek Indie) and UNPAD host monthly meetings to update and synchronize each other's plans of the next activities. And if there's any task or administrative needs that we need to coordinate, we shall have the chance to look into it within this monthly meeting. For February edition we focused ourselves to prepare our presentation material for 4th SCM, therefore we draft the presentation together and also share our latest work results. For March edition, we share the results and information from 4th SCM to the rest of the team and then plan for Uni Kassel's visit for the prototype implementation that will happen by mid-March 2019 in Bandung, Indonesia.

Picture: Indonesian team is having its monthly meeting.

By CVPI

03.2019 – Establishing of a YouTube Channel

UNPAD established a YouTube channel named **SAMS-Indonesia**. Implementation activities and other appropriate content related to SAMS' Indonesian team will be published through this YouTube channel. Feel free to visit the channel.

By Universitas Padjadjaran

Conferences and Events

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03. 2019 – Entomological Society of Austria conference, Graz, Austria

The SAMS poster was presented at the Austrian Entomological Colloquium on March 16 in Graz. Approximately 100 interested visitors attended the conference. We were able to present the SAMS project and to establish new, promising contacts.

If you are interested in our German SAMS abstract, please read the conference proceedings:

Beiträge des ÖEG-Kolloquiums in Graz, 16.03.2019: Kurzfassungen der Vorträge und Poster

By University of Graz

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4. Newsletter Vol. 4

To access all hyperlinks in the newsletter, follow the link to the newsletter in the original version.

german cooperation

This project has received funding from the German Federal Ministry for Economic Cooperation and Development

This project has received funding from the European Union's Horizon 2020 research and innovation programme *under* ***grant agreement N° 780755***

SAMS –Newsletter

Vol. 4, June 2019

www.sams-project.eu

Dear SAMS community,

SAMS Smart Apiculture Management Services

We would like to inform you with this quarterly update about news and upcoming events on our project activities.

1. Project activities since March 2019

1.1. Implementation of prototype monitoring systems
1.2. SAMS website news
1.3. Bee colony monitoring at the test site of University of Kassel
1.4. Doctor Thesis of SAMS Latvian partner finalized
1.5. Scientific Survey
1.6. Beehive showcase
1.7. Publication news
1.8. DWH development progress
Country Activities - Ethiopia
1.9. Business Development
1.10. 2nd Advisory Board Meeting
Country Activities - Indonesia
1.11. SAMS Prototype implementation workshop
1.12. Mini Talkshow and Discussion Vol. 2,
1.13. Meetings

@SAMS_EU_H2020

Upcoming Events

Monthly Dissemination, Bandung, Indonesia

07. 2019 Öko FELDTAGE 2019, 3. - 4.7., Germany (UNIKAS)

07. 2019 SAMS Co-Creation workshop, 1. – 8.7., Bandung Indonesia

07. 2019 Indonesian Development Forum (IDF) 2019, 22. – 23.7., Jakarta, Indonesia

09. 2019 – Apimondia, 8. – 12.9., Montreal, Canada

09. 2019 – 5th SAMS Steering Committee Meeting, 19. – 20.9., Brussels, Belgium

2. Conferences and Events

2.1. 2nd World Bee Day Celebration Event in Addis
2.2 Agribusiness4change conference in Addis
2.3. BMZ Policy Paper "Digital Development" in Bonn

3. Look out – project activities and conferences

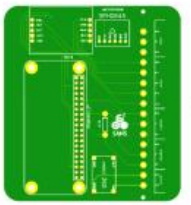
3.1. 07. 2019 Co- Creation Prototyping Workshop, Bandung, Indonesia

1. Project activities since March 2019

Implementation of prototype monitoring systems

First prototypes of the SAMS Monitoring System were built during a workshop with the team of the University of Kassel in Indonesia and Ethiopia in March and April and have been set up in five bee colonies in each country. Now bee acoustics as well as weight, temperature and humidity of the bee colonies are monitored and the data are transferred to the web server of our project partners from the LLU in Jelgava, Latvia. There, the data is stored and organized in a data warehouse designed by LLU.

Pictures: Implementation of the first SAMS Monitoring System in Ethiopia and Indonesia



New ideas for further development could be collected from the problems and conditions on site, which are currently being implemented at the University of Kassel. For example, they have been seeking simple connectors which are also available in Ethiopia. A PCB design was also developed which uses as few solder connections as possible to reduce soldering times under difficult conditions such as power cuts (left picture). The implementation of PCBs in Indonesia and Ethiopia will take place at the beginning of July. In each country 10 more monitoring systems will be installed and data will be sent. One of the further steps will be the development of a robust case for the monitoring system. In the future, it will be possible to print the case easily using a 3D printer.

Pictures: Printed circuit board (PCB) for SAMS Monitoring System

By UNIKAS

SAMS website - News

New sections were added to the website: “SAMS related topics”, a video section, a calendar and the latest tweets are shown in the right sidebar.

By UNILV

Bee colony monitoring at the test site of University of Kassel

A further study on bee monitoring started in May at the UNIKAS: colonies are monitored with the second prototype. The acoustic information (frequency, relative strength), the temperature in the hive and its weight in a certain interval are recorded (figure below) and acoustic monitoring with high-performance microphones runs in each bee colony (24/7). Together with the data obtained from bee monitoring in Ethiopia and Indonesia, a DSS will be developed by the LLU Jelgava, Latvia. Next steps will be initiated within a co-creation workshop with all project partners in Bandung, Indonesia in July this year. For data evaluation and accurate logging of the behaviour and the health condition of the bee colonies, an enhanced requirement is set for the beekeeper during the weekly inspection. To simplify logging, a smartphone application was developed, called "SAMS Beehive-Protocoll".

Pictures: Left: SAMS test site at UNIKAS; right: Smartphone app for protocolling behaviour and health status of bees.

By UNIKAS

Doctor Thesis of SAMS Latvian partner finalized - Congratulations Armands!

The SAMS Latvian partner Armands Kviesis (LLU) has finalised his doctoral thesis with the title "Application of decision support system in control of multiobject biological system". The summary is available on our SAMS website.

By UNILV/ GIZ

SAMS scientific survey – first impressions and extended deadline

Presently the SAMS UCD team is conducting an online-survey among scientists in EU countries, Ethiopia and Indonesia. Purpose of this survey is to learn how scientists of different disciplines would use SAMS data in order to accomplish a user centred interface- and interaction-design approach for future data provision and representation. We invite every researcher interested in beehive data to participate:

https://www.soscisurvey.de/sams_survey

The survey is online until 31 July 2019. It is available in English and Indonesian.

By GIZ

Beehive showcase

A showcase with the SAMS Monitoring System was built for demonstration purposes. It was already presented at the BMZ event on "Digital Development" at the beginning of June in Bonn and will be exhibited next at the Organic Field Days in Grebenstein, Germany (see below)

Pictures: Beehive with SAMS Monitoring System and transparent face as well as scale unit as showcase

By UNIKAS

Publication news

"When it pays to catch a swarm - evaluation of the economic importance of remote honey bee (*Apis mellifera*) colony swarming detection" is prepared and submitted to the Journal of Economic Entomology (https://academic.oup.com/jee). Paper preparation was a collaborative work of partners from Latvia, Austria, Indonesia and Ethiopia.

Another scientific paper with the possible title "Evaluation of the economic gains of the bee colony remote monitoring" is in preparation process. The main idea is, to calculate and describe possible benefits of IT system implementation to the beekeeping practice.

By UNILV

DWH development progress

Data warehouse is operating and data from several devices are coming to it. DWH user interface is updated and modified. Device data is demonstrated to the end user in a user friendly way. Next step of the DWH development is implementation of several rules for data analysis and bee colony state identification and the implementation of Fuzzy logic. For better user experience, it is planned to implement workspaces within SAMS DWH. The idea behind it is: to provide functionality for grouping user defined objects like apiaries, devices and reports, and to implement sharing of such groups with other DWH users for collaborative work (under development).

A swarm economy calculator is implemented as a web tool to the SAMS DWH system and is publicly accessible at sams.science.itf.llu.lv. The tool is used to evaluate the economic benefit of going to the remote apiary and catching a swarm. User can change several parameters to adapt the calculation model to the local peculiarities.

By UNILV

Country activities - Ethiopia

Situation of Beekeeping and its Implication for SAMS Business Development

As mentioned in one of our previous newsletters, beekeeping in Ethiopia is a longstanding tradition. If beekeeping would be properly supported and if the huge potential would be tapped, business development/commercialization of beekeeping activities would be relatively easy in Ethiopia.

Pictures: left: Tej in special glass, ready for consumption. Right: Purified table honey.

HOLETA plans to play a strong role for the private sector in establishing business relationships and commercialization of different SAMS products. In this approach, private sectors will take the lead in mobilizing beekeepers and providing training and other embedded services. HOLETA's complementary support services include: enhancing the capacity of private companies to establish business relationships and develop export competitiveness, strongly work with other local and international partners in facilitating and developing SAMS businesses and the extension of SAMS techniques, promoting the increased engagement of youth and women.

By Oromia Agricultural Research Institute, Holeta Bee Research

04. 2019 - 2nd Local Advisory Board Meeting, Addis Ababa, Ethiopia

Representatives from 9 different organizations were attending the 2nd local Advisory Board meeting: Asefa Amaleddegn (Agricultural Transformation Agency; ATA), Markos Lemma, Florian Mandescheid and Yosef Alemayehu (ICEADDIS), Yetnayet Girmaw (SNV-Ethiopia), Gemechis Legesse, Taye Negera and Kibebew Wakjira (Holeta), Juergen Greiling and Negas Bekana (Ethiopian Apiculture Board; EBA), Rita Nedif (GIZ-Ethiopia), Hailegeorgis Demissie (BEZA Mar), Demisew Wakjira (Ministry of Agriculture, Honey) and representatives of Sericulture Directorate.

Project activities since the 1st local advisory board meeting and future perspectives were presented by Kibebew Wakjira. Markos Lemma presented a SAMS technology overview and expected output and progress in local UCD activities. The presentation on experience of the ASPIRE project on value chain development (previous project) by Yetnayet Girmaw (Sector Lead- Apiculture Development Programme, SNV Ethiopia) gave important lessons on the role of the government support for successful project implementation and in creating environment and facilitating collaboration among different government and non-government institutions. He also faced out on the importance of agro-dealers, lead farmer beekeepers as input suppliers and extension

agents and embedded services through lead firms for sustainable technology transfer, access to market and quality inputs supply.

Pictures: left:some Advisory board members; right: presenting and explaining the SAMS project activities

By Oromia Agricultural Research Institute, Holeta Bee Research

Country activities - Indonesia

03. 2019 - Prototype Implementation Process in Indonesia, Ciwidey, West Java

Picture: top: D'Bees team help us install the prototypes; right: one of the detected cicadas

After conducting several stages of UCD research, it was time to implement the prototype. We chose Mr. Debby (D'Bees Apiary in Ciwidey) as the subject of the prototype implementation because his characters were in accordance with the Persona of **New Generation Beekeepers**. In Ciwidey, Mr. Debby's bee colonies are spread on a hill, with uneven ground contours, and very tight vegetation. This has made it a little difficult, to install some prototype parts such as solar panels and electric wires. It was also nice that Mr. Debby and his team took a lot of parts in helping us while on the site, as well as actively took part in this project phase. During the prototype implementation process, we also observed and discovered **another interesting thing; the presence of cicadas, a noisy insect**.

This can be a challenge for the prototype, specifically for the sound sensors. Despite the presence of other sound sources from the ecosystem are buzzing loud around the colony, we hope that the sound sensors inside, can still detect the sound of the bees.

By CVPI

03. 2019 - Mini Talkshow and Discussion Vol. 2, Bandung, West Java

On March 23rd, Labtek Indie organized for the 2nd time a Mini Talkshow and a corresponding discussion entitled "Tap Into Modern Beekeeping" and Sascha and Andreas from University of Kassel became speakers.

Located at FISIP A Building - Padjadjaran University, Bandung, Sascha talked about urban beekeeping in Berlin and how it gained popularity since the rise of environmental awareness movements. Berlin as a big city also has a good garden and park ecosystem, so the bees have no trouble producing honey. Andreas explained about Smart Apiculture, where the existence of sensor technology that measures sound, weight, and temperature can help to maintain the ideal condition of the beehive and the health of bees.

This Mini Talkshow also became a session of Dwi Purnomo and Tanti Sofyan for sharing process, concerning the importance of the stages of UCD research and social engineering in this project. Although the audience that came to this event were not big, we managed to capture new people, interested in beekeeping and startup businesses.

Pictures: left: Sascha and Andreas were talking about smart and urban beekeeping; right: group picture after discussion

By CVPI

Meetings

04. 2019 – UNPAD and SITH ITB, Bandung, West Java

On 1 April 2019, UNPAD Team conducted a meeting with the School of Life Sciences and Technology, Bandung Institute of Technology (SITH ITB) to include the view from external experts in the project activities. This meeting was held to win over SITH ITB, with their experts on insects and pollination, at our SAMS Indonesian Advisory Board. The results of the meeting also opened various possibilities for other collaborations in apiculture research and technology that can support environmental conservation and business. Among them were, the utilization of educational forests around Geulis Mountain which indirectly becomes the headwaters/upper course of the Citarum River through beekeeping, community Empowerment through training in processing honey derivative products for residents around Geulis Mountain and the involvement of ITB and UNPAD students in the research process.

Picture: SAMS team and SITH ITB group picture.

04. 2019 – UNPAD and Research and Development Agency, West Java

On 23 April 2019, UNPAD Team conducted a meeting with the Research and Development Agency of West Java Province (BP2D Provinsi Jawa Barat). They agreed on joining the SAMS Indonesian Advisory Board. Other than that, they will support our project and make collaborations in the research of honeybees, they will analyse data from the SAMS technology which can be used for climate research, integration of agriculture, plantation (farming) and beekeeping. They also said that this project could be used as a regional innovation and requested a schedule of research to be conducted.

Pictures: top: UNPAD and BP2D participants during the meeting, bottom: group picture of the participants.

05. 2019 – UNPAD and CVPI, Sumedang Regency, West Java

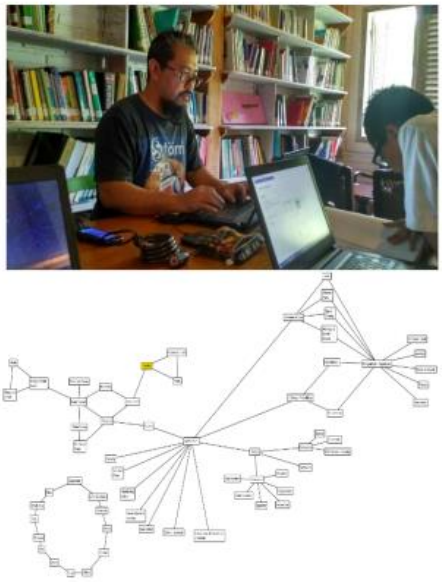
On 1 May 2019, the Indonesian SAMS team's (UNPAD and CVPI) monthly meeting was held in Jatinangor, Sumedang. During the meeting, UCD activities were discussed and the upcoming implementation workshop from 1 July to 7 July was planned.

05. 2019 – UNPAD and Common Room, Bandung, West Java

UNPAD Team held a meeting with Common Room to discuss the business plan and business development of SAMS. Meeting topics were the supply chain of beekeeping to determine the target users and possible consumers segment of the SAMS technology and to brainstorm about products that can be produced by SAMS. Mapping of stakeholders was carried out based on the position of each stakeholder that play a role in the supply chain of beekeeping products.

Several possible business opportunities:

- Brainware: Data Analyst, Data Collector, Operator, Assembler, Programmer, and Designer
- Software and Hardware: Sensor, Geolocator, AWS/remote sensing
- Honey product and derivative product



Pictures: top: Working on the business development of SAMS, bottom: supply chain mapping.

05. 2019 – UNPAD and Indonesian Apiary Association, Bandung, West Java

On 15 May 2019, UNPAD Team conducted a meeting with the Indonesian Apiculture Association of West Java Region (APIDA Jabar) represented by Mr. Rasjid. They agreed on joining the SAMS Indonesian Advisory Board. In addition, this meeting resulted in several research and collaboration ideas related to the development of Apis mellifera in Central Java. The results of this meeting will be followed up by the signing of the MOU between UNPAD and APIDA and a visit to the honey bee farm in Central Java in July.

Picture: Group picture of the SAMS team and Mr. Rasjid (Indonesian Apiary Association)

By Universitas Padjadjaran

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05. 2019 - Mini Seminar "Bees the Pollinators: Unnoticed Heroes", West Java

On 27 May 2019, UNPAD and CVPI held a mini seminar with the topic: "Bees the Pollinator: Unnoticed Heroes". Speakers were Dwi Purnomo (Unpad) and Ramadhani Eka Putra (Institut Teknologi Bandung). They talked about the important role of pollinators, especially those of bees, and their influence on human life. The participants who came were from several circles, including students, lecturers, local government, West Java of Forestry Service and beekeepers.

Pictures: top: speakers and moderator of the mini seminar, bottom: group picture of the participants

By Universitas Padjadjaran

Conferences and Events

05. 2019 – 2nd World Bee Day Celebration Event, Addis Ababa, Ethiopia

Holeta team participated and presented SAMS to the audience (presentation and poster). The panel discussion was attended by over 200-delegated participants from the whole Ethiopian Apiculture sector, including actors from all segments of the value chain, public, private sector partners and donors. The discussion was honored by the presence of the State Minister Dr. Gebreigiziaber Gebreyohanis (Federal Ministry of Agriculture, MOA of Ethiopia), Mr. Daba Debele (Head Bureau of Agriculture, Oromia State) and other higher political officials.

Presentations and discussions dealing with the current threats of bees around the globe, Ethiopian and worldwide perspectives and current technological advancements in beekeeping were held during the event. The state minister as well as other participants emphasized the 20 minutes presentation about SAMS but also pointed out their expectations and concerns related to capacity building for sustainability after the project phase out. "Looking forward" calls for concrete action were a major point of reflection during the following discussion.

Pictures: top: H.E. Dr. Gebreigiziaber Gebreyohanis, State Minister of Ministry Agriculture of Ethiopia and other officials; bottom: presenting SAMS

By Oromia Agricultural Research Institute, Holeta Bee Research

05. 2019 - AGRIBUSINESS 4 Change, Addis Ababa, Ethiopia

Picture: The Ethiopian SAMS team presents SAMS to the audience at the Agribusiness 4

The conference took place from May 7 to 9 and was organized by GIZ in partnership with Green Innovation Centre and the Ethiopian Agricultural Transformation Agency. More than 175 persons attended it from different parts of the world. The focus was on maintaining emphasis on entrepreneurship in agribusiness, with particular attention on youth, related policy, and large-scale action. The Ethiopian SAMS partners from HOLETA and iceaddis participated in this International event and presented SAMS in the innovation market with banner, poster, flyer, newsletters and SAMS technical aspects to the conference participants.

By Oromia Agricultural Research Institute, Holeta Bee Research

05. 2019 BMZ Policy Paper "Digital Development", Bonn, Germany

SAMS has participated at the official presentation of the BMZ policy paper "Digital Development" in Bonn May 29, 2019 and presented the second pillar "Local Innovations". The paper outlines five pillars as strategic framework for addressing challenges effectively and exploiting the potentials powerfully.

By GIZ

LOOK OUT: 07. 2019 - Co- Creation Prototyping Workshop, Bandung, Indonesia

After the first prototype monitoring systems have been set up in Indonesia (03.19) and Ethiopia (04.19) SAMS has to define next steps in regards to the software. Next steps are now to review the user and to prioritize the user requirements for the development of the SAMS software products: (1) the Decision Support System and (2) the Advisory Support System.

Therefore, all SAMS partners will participate in the CO-Creation Prototyping Workshop in Bandung, Indonesia in July. The overall goal is to create prototypes of the Decision Support System and the Advisory Support System with focus on user centred design.

By GIZ

5. Newsletter Vol. 5

To access all hyperlinks in the newsletter, follow the link to the newsletter in the original version.

This project has received funding from the European Union´s Horizon 2020 research and innovation programme *under* ***grant agreement N° 780755***

SAMS –Newsletter **Vol. 5, September 2019**

www.sams-project.eu

Dear SAMS community,

Smart Apiculture Management Services

We would like to inform you with this quarterly update about news and upcoming events on our project activities.

1. Project activities since July 2019

1.1. UCD Preparation Meeting in Bandung

1.2. UCD Prototyping Workshop in Bandung

1.3. Implementation of SAMS Monitoring Systems, Bandung, Indonesia

1.4. Initiation Bandung Bees Sanctuary

1.5. Beekeepers Engagement in Ciwidey and Babussalam

1.6. SAMS Review Meeting and 5th SCM in Brussels, Belgium

1.7. Survey Market Preparation

1.8. SAMS Product Development Story

1.9. Quality Standards for Honey from Ethiopia

1.10. Honeybee Colony Absconding: The Case of Beekeeping in Ethiopia

1.11. Capacity Building: Trainings for Stakeholders in Ethiopia

1.12. News from iceaddis

1.13. News from LLU:

1.14. DW development progress:

@SAMS_EU_H2020

Upcoming Events

Monthly Dissemination, Bandung, Indonesia

11.2019 - SAMS system INSTALLATION TRAINING AND WORKSHOP with students @Jelgava by UNIKAS

03.2020 - 6th SCM in Jelgava, Latvia

2. Conferences and Events

2.1. Öko FELDTAGE 2019, Grebenstein, Germany

2.2. TV report - Hessenschau - Bees collect data for research, Witzenhausen, Germany

2.3. 46th Apimondia Conference, Montreal, Canada

2.4. Researchers' Night event at the Latvia University of Agriculture, Jelgava, Latvia

1. Project activities since March 2019

06. 2019 - UCD Preparation Meeting in Bandung

During an intensive but fruitful week (June 22-30) with perfect collaboration and good progress, the UCD working group (CV.PI, ICEADDIS, GIZ and UNPAD) met in Bandung to prepare the upcoming UCD Prototyping Workshop. Among the preparation work was the refinement of the User Research with beekeepers and scientists. Thus, personas and As-Is scenarios for inspection of beehive and harvesting were visualized and the observations with beekeepers and other user research activities were documented in an UX Nuggets Air table. Based on the well-designed personas and As-Is scenarios the SAMS partners then started to prototype on SAMS products during the UCD Prototyping Workshop in July.

Pictures: UCD team during its work

Moreover, the methodology for the workshop including a better understanding of UCD via an UCD introduction game, energizers as well as different techniques was defined. The UCD working group enjoyed the workflow, and was looking forward to meet the SAMS consortium, during the UCD Prototyping Workshop the week after, to keep the work in progress.

By GIZ

07.2019 - UCD Prototyping Workshop in Bandung

The intercultural and interdisciplinary SAMS consortium came together in Bandung from July 1 to 8 to review the SAMS User Research and to start prototyping on the SAMS products following the User Centered Design principles. The event was organised by CV.PI with collaboration of Labtek Indie and Universitas Padjadjaran

Picture: Signing of the SAMS Indonesia Advisory Board.

The workshop started with an official day mandatory in Indonesian culture at UNPAD. During this event, Indonesian representatives of several institutions signed a document, announcing their willingness to be part of the Indonesian Advisory Board. Followed by this event, the SAMS team had the opportunity to visit two

beekeeping sites. During the site-visits at Tani Kota and Ciwidey, where the first SAMS HIVES were installed, the SAMS consortium got an impression and better understanding of beekeeping in Indonesia. Within the next four days, the SAMS consortium brainstormed and prototyped on digital solutions to improve the beekeepers' work. As a result, it was agreed to focus on an online marketplace and on a data application for beekeepers. The UCD Prototyping Workshop in Bandung ended officially with a beekeeping seminar for start-ups and students. After presentations of the SAMS experts (HOLETA, UNIGRA, UNIKAS, UNPAD) and an Indonesian beekeeping specialist, the start-ups and students worked on developing SAMS business ideas during a hackathon.



Pictures (from top left to bottom right): Group picture of the participants; prototyping during the workshop, Andika Sastrawiguna and his father Mr. Debby during a site visit at their apiary in Ciwidey ("D'Bees") and Apis cerana honeybees in front of their hive entrance.

By GIZ, CV.PI and UNPAD

07.2019 - Implementation of SAMS Monitoring Systems, Bandung, Indonesia

A second installation training took place following the SAMS Co-Creation Prototyping Workshop in Bandung, Indonesia. The most recent experiences and know-how regarding the construction, installation and maintenance of the SAMS monitoring systems were exchanged and the participants were trained as multipliers. Ten further monitoring systems could be built under the supervision of our project partners from the University of Kassel. More prototypes follow soon.

Pictures: Implementation of SAMS monitoring hive systems

Also in Ethiopia, ten more systems were built and already installed at the Bee Research Center in Holeta at the end of July. With the support of the University of Kassel, essential expertise on the construction, installation and maintenance of the monitoring systems could also be shared there. Further multipliers were trained. The systems already provide data on the temperature, weight and acoustics in the bee colonies. In addition, the outside temperature and humidity are recorded and is also transmitted online to the SAMS Data Warehouse.

By UNIKAS

07.2019 - Initiation Bandung Bees Sanctuary

Initiation of new beekeeping areas in the education area of UNPAD, Dago, Bandung. This area was prepared as a center for bee development and SAMS implementation and formed a new start in beekeeping and is expected to be one of the beekeeping centers that not only serve as bee farms but also as bee tourism sites, beekeeping information, and research in West Java especially in Bandung. Activities undertaken at this time are land suitability surveys and focus group discussions in planning ideas about business models to be carried out. In the focus group discussions, the participants involved stem not only from beekeepers but also from academics and creative communities in the UNPAD area.

Pictures: Land Suitability Survey for Bandung Bees Sanctuary (BBS); middle: satellite image of the BBS location.

By UNPAD

07.-09.2019 -Beekeepers Engagement in Ciwidey and Babussalam

Several cycles of UCD research and the implementation of the SAMS hardware prototype version 1 and 2 were carried out. Through another user feedback round, Mr. Debby (Ciwidey Beekeeper) gave feedback to the SAMS project and told us about his the needs. During the meeting with Debby, we also had the chance to extend the network **"Lebah Madu Indonesia"**. This group brings together hundreds of beekeepers in various regions in Indonesia. The formation of it was an initiative of Debby as he saw that the existing beekeeping associations had not been able to accommodate the interests of grassroots beekeepers.

Picture: Maintaining relationship with Kang Debby.

We also had the chance to engage with another beekeeper, namely Kelompok Budidaya Lebah Ciburial located in Babussalam, Bandung. Ciburial beekeepers are led by Aepudin (Aep). Aep has dozens of *Apis cerana* and *Trigona* colonies. The beekeeping methods of Aep are quite interesting, since he's constantly experimenting with the habitus of the beehive boxes ranging from cylindrical, cube, combed and not combed ones. Aside from beekeeping, Aep also cooperates with the Babussalam Islamic Boarding School to distribute honey and herbal medicine approaching the Apitherapi method. For the Ciburial beekeepers, we plan to implement hardware prototype version 3. Therefore, we intend to invest more time to form a long-lasting and mutual- benefit relationship with Kang Aep rather than short and transactional relationship.

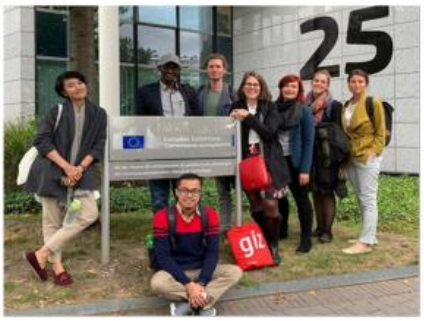
Picture: Oki from Labtek Indie with Pak Tami, a representative of the Ciburial Beekeeper Group.

By CV.PI

09.2019 - SAMS Review Meeting and 5th SCM in Brussels, Brussels

In June 2019, the SAMS project had crossed the half line of the project duration. Therefore, the consortium prepared the mid-term report with all activities, which ensures the cooperative working environment of the team as well as the successful and impactful implementation. On September 18, all SAMS partners were invited to DG Connect, European Commission to discuss the mentioned progress report of the first 18 implementation months. Based on the questions and recommendations of the EU Project Officer E. Carlson and the three external experts R. Chaabouni (Université de Tunis El Manar, Ecole Nationale d'Ingénieurs de Tunis), C. Joyce (Connemara Programme), M. C. Seijo-Coello (University of Vigo) the consortium received a great feedback and good advices for the implementation of the following 18 months.

The 5th Steering Committee Meeting was organized by the GIZ in cooperation with the University of Kassel and took place on September 19 and 20. The SCM complemented the review and gave the SAMS partners the chance to internally review the meeting, discuss aspects and plan further actions.



Pictures (from left to right): the SAMS team enjoying its dinner after the fruitful and exciting review meeting at GD Connect, European commission.

By GIZ

09.2019 - Survey Market Preparation

Market survey is an activity, carried out by the UNPAD team in the context of describing the market conditions for bee products, especially for honey, in Indonesia. The description of the processes occurring in the beekeeping product market will be explored by conducting survey activities. The surveys will not target only consumers of bee products but also target breeders and business people or the bee products industry in Indonesia. The preparations carried out for this market survey activity are the creation of a questionnaire form that is reviewed by a team of SAMS beneficiaries, research, and communication with the bee product industry.

By UNPAD

SAMS Product Development Story

So far, SAMS hives were implemented in Tani Kota, Babusalam and in Ciwidey. We also decided to implement a system near our office to monitor and do conduct troubleshooting easily. In this implementation we tried to iterate the hardware with some values to keep in our mind:

Picture: Hardware Prototype Implementation in Babussalam.

1. **More user friendly for the beekeepers:** new cases for the devices; restart button including a lamp
2. **Easier to assembly:** Use of a prototyping circuit board to make the components more compact to replace components more easily; modification of the system to need fewer device parts per system
3. **More frequent data delivery:** Device sends data every hour instead of every 6 hours

4. **More reliable hardware:** Debbuging the programming code of the microcontroller to improve data transfer to the data warehouse

More improvements of the SAMS hive are planned.

By CV.PI

Quality Standards for Honey from Ethiopia

Identification of quality standards of honeys from different origin is one of the basic requirements to affect marketing of the products. As an important approach to promote the products and attract investment in the beekeeping sector of Ethiopia, analysis of different quality parameters on *Schefflera abyssinica*, *Croton macrostachyus*, *Coffee arabica* and *Vernonia amygdalina* honey samples collected from South Western parts (including UNESCO delignated forest) was conducted to compare their compounds with national and international standards. The results of analysis showed that on average the honey samples contained 18.5 g/100 g, 69.48 g/100 g, 38.6 g/100 g and 35.5 g/100 g moisture, sucrose, glucose and fructose, respectively. Further and on average the honeys consisted of proline = 210.1 g/kg, pH =4.05, free acid =7 meq/kg and HMF values = 1.2387 mg/kg, electrical conductivity = 0.16mScm^{-1} and invertase activity = 140.7 (according to Schade) for the honey samples. This assessment showed that all analyzed parameters of the honey samples meet the basic honey quality standards both national and international specifications and therefore for this region, there are no more obstacles for a potential collaboration between investors, local buyers and local beekeepers.

Pictures (from left to right): Honey samples of Croton macrostachyus labeled for analysis; sugar profile analysis by using HPLC at Holeta Bee Research Honey Quality analysis.

By HOLETA

Honeybee Colony Absconding: The Case of Beekeeping in Ethiopia

Honeybee colony losses due to absconding in Ethiopia is a serious concern amongst the beekeeping community and policy makers. To understand the major causes and recommend possible solutions to this problem, 160 honeybee colonies were subjected to four different colony management groups over four seasons under Gedo and Bako conditions. The management groups were: providing colonies with dearth period food and hive shade (A), providing colonies with no dearth period food but hive shade (B), providing colonies with dearth

period food but no hive shade (C) and providing colonies with no dearth period food and no hive shade (D). The results showed that there were significant differences among the management groups regarding absconding with the highest (90.6%) recorded under D compared to C (32.8%), B (31.3%) and A (10.9%). Differences were also high among the groups for honey yield per year, with averages of 44.2, 24.6, 25.1 and 9.1 kg/colony for A, B, C and D, respectively. However, the yield record in Gedo and Bako under treatment A was 46.7 kg/year and 45.8 kg/year, respectively. Highest incidences of diseases (Amoeba and *Nosema*) and pests (Wax moths, small hive beetles, *varroa* mite were recorded frequently under D, while only few cases were reported for A. The study found that major causes of colony absconding and low productivity of honeybees in the country were absence of hive shade and failure to feed colonies in dearth periods. To overcome the problem and enhance output from beekeeping, providing colonies with regular dearth period food and permanent hive shade are recommended as a solution to improve the productivity of honeybees in the country. Additionally, continuous monitoring to assess variables associated with honeybee colonies should be adapted as regular necessity for successful beekeeping.

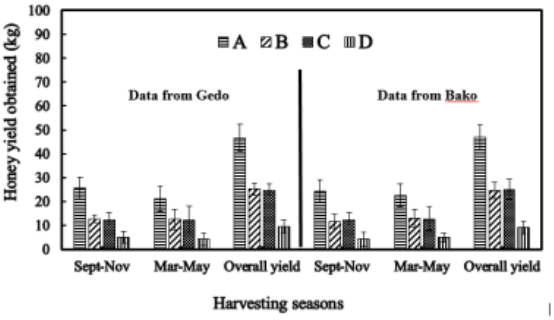


Figure: Effect of different treatments on annual honey yield at Gedo and Bako apiary sites

By HOLETA

Capacity building: Trainings for stakeholders in Ethiopia

Capacity building trainings on Bee-Management and Bee-Health Services including topics like beekeeping equipment, basic beekeeping management, bee product diversifications, post-harvest management of bee products, etc. for beekeepers were conducted in Ambo, Wolmera, Holeta and Ginchi in the months of April, May and June 2019. Each training lasted 5 days (=40 hours each). In total, within 120 hours of training 104 beekeepers have been trained by HOLETA, of which 64 were female beekeepers and the remaining 44 male beekeepers of which 24 of them belonged to the youth. Within the trainings, the beekeepers were also motivated in marketing their bee products and in establishing local market places.

Besides, training on application of the hive monitoring system was conducted by the experts from UNIKAS in April and July 2019. A total of 11 participants were trained on topics including functionality, sensors, used data, hardware and software. Further, 15 and 45 participants attended the theoretical and practical training on building the monitoring system prototype.


Pictures (from left to right): Beekeepers learn how to identify the varroa mite and other pests from brood in Ambo animal health laboratory; experts from ICT startups on how to build and application of hive monitoring system in Holeta.

News from iceaddis

1) Designing of market research questionnaires and revising them with the international UCD team. It is expected to publish them by October 1st.
2) Developing of startup growth strategy for the *Honey or Money* project
3) Participating in the second high fidelity prototype installation at Holeta Bee Research Center in Ethiopia.

By iceaddis

News from the LLU:

1) Scientific paper with title "Application of fuzzy logic for honey bee colony state identification" is prepared and submitted to the Journal of Biosystems Engineering (https://www.journals.elsevier.com/biosystems-engineering).
2) Work on scientific paper about challenges of Precision Beekeeping implementation in Ethiopia and Indonesia has started.
3) SAMS website is updated and new sections were added.
4) Deliverable D4.1 (Report on data management) is prepared and submitted to the EU.

In near future, a workshop for LLU students is planned where SAMS monitoring systems will be assembled and tested. The workshop will be organised in cooperation with Sascha Fiedler from the University of Kassel in Germany.

By UNILV

DW development progress:

The data warehouse is fully operating and data from the SAMS monitoring systems are coming to it. The data warehouse user interface is updated and modified for better usability.

For better user experience and data sharing between end-users, so called workspaces are implemented within SAMS DW. It is planned to continue work on DW user experience improvement by adopting the interface for

mobile devices, implement decision support module which will help to identify the most important bee colony states.

By UNILV

2. Conferences and Events

07.2019 - Event - Öko FELDTAGE 2019, Grebenstein, Germany

SAMS was presented at the Organic Field Days in Grebenstein on July 3 2019 by our partner University Kassel. The SAMS technology for bee monitoring was demonstrated with a showcase on site. More than 11,000 visitors experienced the innovative power and diversity of organic agriculture on the 3rd and 4th of July at the Hessische Staatsdomäne Frankenhausen, the teaching and testing facility of the University of Kassel. This event combines a unique combination of practice and research in organic farming and animal husbandry. It is the ideal platform for exhibiting innovations and discussing current topics with farmers and representatives from politics and business. More informations: https://www.oeko-feldtage.de/?lang=en

Picture: https://www.oeko-feldtage.de, 20.09.2019

By UNIKAS

07.2019 - TV report - Hessenschau - Bees collect data for research, Witzenhausen, Germany

Researchers from the University of Kassel were interviewed for television. The test site of the Agricultural and Biosystems Engineering department in Witzenhausen was visited and the SAMS technology was demonstrated. An overview of the project was given by the project coordinator Angela Zur. Hessischer Rundfunk Frankfurt broadcasted the recordings under the title: "Bees collect data for research" in the Hessenschau TV showed on 5 July 2019 at 8:17 pm. The show is available on the Hessenschau website. The report can be watched here:

https://www.youtube.com/watch?v=kosuO11RK6Q.

By UNIKAS

09.2019 - 46th Apimondia Conference, Montreal, Canada

The SAMS poster was presented by the University of Graz at the Apimondia International Apicultural Conference, which took place from September 8 to 12 in Montréal, Canada. Approximately 5000 interested visitors attended the conference. We were able to present the SAMS project and to establish new, promising contacts.

If you are interested in our SAMS abstract, please read the conference proceedings


46th APIMONDIA – International Apicultural Congress | ABSTRACT BOOK

production security. It emphasizes some specificities of beekeeping compared to other agricultural sectors and provides an overview of the main current issues of professional beekeeping. This sustainability framework is the first step to develop an assessment tool at farm level. It could be used to communicate about current issues of professional beekeeping, to identify strengths and weaknesses of a bee farm or to analyse and discuss the sustainability of a farm establishment project.

[P.06.135] The SAMS Project: International Partnership on Innovation in Smart Apiculture Management Services

R. Brodschneider [1], K. Gratzer [1], M. Wulansari [2], A. Paramita [2]

[1] University of Graz, Institute of Biology, Graz, AUSTRIA, [2] Lebah Indo, Bandung, INDONESIA

SAMS is a project funded by the European Union within the H2020-ICT-39-2016-2017 call. SAMS enhances international cooperation of ICT (Information and Communication Technologies) and sustainable agriculture between EU and developing countries in pursuit of the EU commitment to the UN Sustainable Development Goal "End hunger, achieve food security and improved nutrition and promote sustainable agriculture". The project consortium comprises four partners from Europe (two from Germany, Austria and Latvia) and two partners each from Ethiopia and Indonesia. Beekeeping with small-scale operations provides perfect innovation labs for demonstration and dissemination of cheap and easy-to-use open source ICT applications in developing countries. SAMS allows active monitoring and remote sensing of bee colonies and beekeeping by developing appropriate ICT solutions supporting management of bee health and bee productivity and a role model for effective international cooperation. SAMS addresses requirements of end-user communities on beekeeping in developing countries. It includes technological improvements and adaptation as well as innovative services creation in apiculture based on advanced ICT and remote sensing technologies. SAMS increases production of bee products, creates jobs (particularly youths/women), triggers investments, and establishes knowledge exchange through networks. To find out more visit our project website https://sams-project.eu/.

By UNIGRA

09.2019 - Researchers' Night, Jelgava, Latvia

On 27th of September, the Researchers' Night took place at the University of Life Sciences and Technologies. In concept European Researchers' Nights are public events dedicated to bring researchers closer to the public. The idea is to showcase the diversity of research and highlight the impact of research on our daily lives.

During this event Vitalijs Komasilovs presented the SAMS project by demonstrating the project poster and by giving a talk. More than 100 visitors were interested in the SAMS project and got information about the developed system and colony monitoring. Visitors were mostly interested in beekeeping in Ethiopia and Indonesia. One of the mainly asked questions by beekeepers was about practical implementation costs and system maintenance.

By UNILV

6. Newsletter Vol. 6

To access all hyperlinks in the newsletter, follow the link to the newsletter in the original version.

SAMS-NEWSLETTER

*This project has received funding from the European Union's Horizon 2020 research and innovation programme under **grant agreement N° 780755***

www.sams-project.eu

@SAMS_EU_H2020

Vol. 6, December, 2019

PROJECT ACTIVITIES

EVENTS

UPCOMING EVENTS

DEAR SAMS COMMUNITY,

SAMS Smart Apiculture Management Services

We would like to inform you with this quarterly update about news and upcoming events on our project activities.

Our newsletter has a new style

A WARM WELCOME TO OUR NEW AB MEMBERS

The final touches to an idea or product always rely on external views from experts. These external views also influence the SAMS project and the related product development. Therefore, SAMS welcomes the following new members in the Advisory Board.

Ethiopia

Bees for Development Ethiopia

Meat and Dairy Development Institute – Ministry of Industry

Ethiopian Honey and Beeswax Producers and Exporters Association (EHBPEA)

Indonesia

Labtek Indie

Lebah Madu Indonesia

Local Enablers

West Java Provincial Forestry Service

EU

Bees for Development

Bees Abroad

icebauhaus e.V.

Thanks to all Advisory Board members for your willingness to let the SAMS idea and products grow. For more information about the Advisory Board visit https://sams-project.eu/advisory-boards/

If you also want to be a partner of the SAMS project (AB member, business partner, ...), please visit our homepage and fill out the application form.

By GIZ

SAMS Hardware Update ...

SAMS HARDWARE CHALLENGES AND SOLUTIONS

Regarding the SAMS system operation in Indonesia, various difficulties were encountered – sensor placement inside the hive, measurement device network connection problems, data upload stability, configuration problems. A new version of Raspberry Pi software has been prepared that also targets some of the mentioned issues.

Operation of SAMS systems in Ethiopia are constantly disrupting due to Internet connection problems and availability of mobile network in rural areas. Different scenarios are currently being discussed to reduce the data loss due to the network interruptions.

By UNILV

SAMS HARDWARE DEVELOPMENT & DATA DISPLAY, INDONESIA

Picture: Fakhri from Labtek Indie works on the interactive mockup for the DSS mobile app.

Initially we have installed 2 early prototype systems at the collaborating beekeeping site in Ciwidey, but now we plan to install nine more robust systems. First, we were assembling the systems in our office in Bandung prior to taking them to the location, which is a 2-3 hours ride away from our office. Approximately, in December 2019, the systems will be implemented at the apiary. Currently, we are waiting for the apiary to be stabilized, since in the last months many of the bee colonies were absconding caused by a lack of bee forage. One of the outputs of the UCD workshop in July was an early stage design for the interface for the Decision Support System (DSS) app on mobile devices. We digitalized the paper prototype into an interactive digital mockup to test how it looks and interact as a prototype. Then, together with GIZ, UNILV and UNIKAS, we reviewed and improved it. The designing process is quite challenging, as the aim is to produce an easy and useful interface for all of our beekeepers, including the traditional ones. Through the iterative development process, we are confident, that at the end the product will meet their needs and solve their problems.

By CV.PI (+ Labtek Indie)

Further SAMS Update and Activities ...

D 4.2 – REPORT ON DATA ANALYSIS AND INTERPRETATION

October 2019. Deliverable D4.2 – report on data analysis and interpretation was prepared and submitted to the EU. The report covers description of various bee colony states and the possibilities to detect/ recognize them. Deliverable D4.2 also includes description of different data analysis algorithms, methods and models applied to detect abnormalities in the bee colony behavior and to identify different colony states, including death, swarming etc.

By UNILV

D 5.3 - FINAL BEE MANAGEMENT & BEE-HEALTH SERVICES & REPORT

Picture: Bee management scenario.

December 2019. The final report on bee management and bee-health services of the SAMS project covers the objectives and main project creations of the last two years of work package 5 "Api management". It fulfils the task 5.1 "contextualizing of local systems" including bee management and bee-health management. The report includes results of the literature study complemented by expert opinions from the two target countries Indonesia and Ethiopia as well as an introduction and a manual to the SAMSwiki database, smart bee management scenarios (left picture) and a floral calendar of important bee plants.

By UNIGRAZ

TRANSFERABILITY STUDIES WP 6, ETHIOPIA

The work on transferability studies started as planned after 16 months of project implementation. As an approach, capitalizing on existing data sources is followed. Cooperatives and unions are among the identified best platforms for technology and knowledge transfer. On top, different stakeholders were contacted to collect important inputs for transferability studies. Empowering the beneficiaries through training, the delivery of SAMS BEEHIVES and promoting entrepreneurships are also another dimension of the work. ICIPE and ApiTrade Africa are linked to SAMS to address cross-regional SAMS-Business development. ICIPE recently launched a five-years project to reach a larger beekeeping community and eager to distribute SAMS products to beneficiaries. ApiTrade Africa promised to bring on board key stakeholders organisations across Africa to participate in SAMS. As part of this commitment, ApiTrade decided to host the Apiexpo Africa 2020 in Ethiopia in October. This is a great opportunity to bring SAMS to real life, as the entire continent will participate in the expo.

By Holeta

BIMONTHLY DISCUSSIONS – ROUND 3: IoT EXPERT, BANDUNG

Pictures: The IoT expert Budi Rahardjo sharing his ideas (top); group picture (bottom).

14 November, 2019. Labtek Indie organized the 3rd SAMS Bimonthly Discussion entitled "Hacking IoT Ecosystem". Budi Rahardjo, an IoT expert and a lecturer from the Electrical Engineering Department was a speakers at this event. Located at the Labtek Indie office, Bandung, the expert shared his knowledge on IoT ecosystems (landscape of policy and regulations related to the implementation of IoT) in Indonesia. During the discussion, there were interesting questions raised by the audience, starting from data privacy, to business models and the challenges of IoT development in Indonesia. In order to develop an optimal IoT in Indonesia, it can be concluded that it is necessary to create a proper ecosystem or hub that is open and egalitarian, which connects IoT engineers and IoT experts to learn from each other. Further, IoT engineers (e.g. data analysts, data scientists, economic or social experts) are important stakeholders. On the business side, raw data produced by the IoT technologies is important; how could we interpret and utilize the data to support other needs and businesses? The discussion process went well and was casually moderated by Gustaff from Common Room.

By CV.PI (+ Labtek Indie)

MARKET SURVEY, INDONESIA

November, 2019. The Market Survey is one of the activities being carried out by the Indonesian and Ethiopian SAMS teams. This survey activity was carried out to illustrate consumer preferences in the market. The first stage of this survey is a survey of honey consumer preferences.

Picture: Language selection page in the online survey.

For Indonesia, the UNPAD team prepared a questionnaire involving several experts from various fields (from food experts who have experience with honey, to economics and management, and statisticians who are experienced in carrying out surveys). The market survey on honey consumer preferences is planned to take place from mid-November to early December, with the distribution of respondents coming from Java, Sumatra, Bali, and Nusa Tenggara. The choice of locations was chosen because they are the largest honey-producing regions in Indonesia. The survey method used was an online questionnaire survey.

The link for online survey can be found at: https://www.soscisurvey.de/SAMS_Kuesioner_SurveiPasar_01/

By UNPAD

10 RULES OF HONEY BEE MANAGEMENT

November, 2019. Ten important "rules" for honey bee colony management were published and are available on the SAMSwiki. They serve as a guideline for beekeepers to increase the quality of their honey bee products (e.g. honey) and to improve the health of their honey bee colonies. The "rules" were evaluated by our SAMS experts and collaborating beekeepers from Ethiopia, Indonesia and Europe to guarantee their validity for these regions.

By UNIGRAZ

VISIT AN APIS MELLIFERA BEEKEEPING SITE IN SUBANG, INDONESIA

Pictures: UNPAD team with the leader of KTH Karya Lestari & KTH Madu Lestari (top); Filtering honey with a gauze (bottom).

03 December, 2019. The UNPAD team visited "*Apis mellifera* KTH Karya Lestari" in Subang to maintain the partnership and to learn more about the quality of honey, the harvesting process and honey packaging. In addition, the visit also had the purpose to raise the awareness of the importance of good quality bee products and how important it is to maintain the quality of honey. UNPAD learned, that the beekeepers working at this apiary use gauzes to filter the honey twice after the harvest to improve the quality of the product.

Also, the UNPAD team was invited to visit the beekeeping site of the KTH Madu Lestari group that keep 50 *Apis mellifera* colonies at their apiary.

By UNPAD

Meetings Meetings Meetings ...

Picture: SAMS Indonesia team monthly meeting with Common Room.

Picture: SAMS Indonesia team monthly meeting with Common Room.

... MONTHLY TEAM MEETING, BANDUNG

On 15th October 2019, the Indonesian team met with the Common Room to discuss the results of SCM 5 Brussels, the task of UNPAD on business plans and market surveys, the development of the implementation of SAMS in Indonesia by CVPI, and also further Talkshow plans.

Based on the meeting, the results obtained were:

- 20 business plans that must be prepared by the UNPAD team do not have to be startups, but can be in the form of ideas
- market surveys will be carried out by distributing online questionnaires using beekeepers who have/have been involved in SAMS activities
- SAMS implementation locations that have been implemented: D'Bees in Ciwidey, Tani Kota in Bandung, Ciburial Bandung;
- at the end of the year 10 SAMS modules will be implemented;
- SAMS Talkshow will be held on the Internet of Thing (IoT) with the theme of Implementation and Regulation of IoT in Indonesia.

By UNPAD

Picture: UNPAD with Dr. Vincent Piket

… WITH DR. VINCENT PIKET FROM EU, BANDUNG

12 October, 2019. The UNPAD team had the opportunity to meet Dr. Vincent Piket. Dr. Piket visited the EU Ambassadors in Indonesia and Brunei Darussalam.
The UNPAD team presented the SAMS project to Dr. Piket and he was appreciating the project and offered his support for further actions.

Picture: Ramadhani Eka Putra, Ph.D from SITH ITB

… WITH THE AB MEMBER SITH ITB, JATINANGOR

15 November, 2019. UNPAD met the AB member SITH ITB at the ITB campus to discuss the partnership between the SAMS beneficiaries and the local Advisory Board members. The team presented SAMS latest developments, especially those from Indonesia. Further, to improve the understanding of the world of beekeeping, the UNPAD team also explained some important biological definitions which were also implemented in the SAMSwiki.

By UNPAD

… WITH THE WORKING GROUP BEEXML, MUNICH

16./17. December, 2019. BeeXML is an international working group for bee data standardization and one of the SAMS' collaboration partners. In order to create a XML standard, which is a self-describing data format that allows the exchange of data, the first working group meeting took place in Munich on December 16 and 17, 2019.
GIZ joined the beeXML meeting on behalf of SAMS. Together with Walter Haefeker, the founder of the group, as well as other researchers, scientists and beekeepers, e.g. from the Associate Research Fellow at Appalachian State University, the BeeHub project, the BeeKing project, the Austrian Beekeeping Association, the Latvian Beekeeping Association and the Upper Bavarian State, the unambiguous storage of certain data (e.g. time, date and location) have been discussed. Besides, the strategic next steps incl. promotion and implementation of beeXML have been focused.

By GIZ

SAMS Capacity Building Activities

Pictures: New SAMS beehive constructed by the TOT participants (right) and some TOT participants assembling the bottom board of the beehive (left).

CB ACTIVITIES ETHIOPIA

October, 2019. Feedback on SAMS BEEHIVE quality collected after the first capacity building (CB) training conducted for 15 beehive builders. The major drawback identified from the report was the strength of the hive supers because of lack of proper overlapping between the sides with lengths of 505 and 365 mm. In order to correct the problem, the side of 365 mm was increased to 390 mm and new hives were constructed, tested and checked for the required quality. Based on the improvement made, capacity building to six TOT trainees selected from HOLETA and Bako Agricultural Engineering Centre was conducted at HOLETA from 07/10/2019 to 13/10/2019. The participants' selection criteria were experience and capacity to interpret the new design into meaningful concepts in the future CB activities. During the training, 10 new complete SAMS beehives were constructed and CB for different beehive producer workshops was planned to be conducted by categorizing into three clusters with the help of these TOT participants.

By HOLETA

Picture: Robert Brodschneider from the University of Graz gives a training on pollen diversity and bee health in Carinthia, Austria.

Picture: Group picture of the participating biology teachers.

CB ACTIVITIES AUSTRIA

October, 2019. With a total of 60 participants in the two workshops organized in October, the capacity building of the University of Graz in in full progress.

Lecture on honey bee pollen availability and bee health: fifty-two beekeepers in Völkermarkt were trained in the monitoring of the environment, pollen diversity, bee health and available pollen sources in Austria. Lessons learnt were not only the monitoring but also the importance of the environment for bee colony development and bee health. Additionally, the small hive beetle and the wasp *Vespa velutina* and their roles as bee health threats were discussed.

SAMS honey bee monitoring, importance of honey bees and pollination (TOT workshop): eighteen biology teachers were attending the workshop in Graz to learn more about the SAMS project and the importance of honey bees for the society, including their role for income gaining and rural development, and for ecosystems (pollination). Further, the participants were trained on SAMS honey bee monitoring and ecosystem services.

By UNIGRAZ

CB ACTIVITY IN LATVIA

November, 2019. A workshop was organized on November 25, during which SAMS project was introduced to the IT students to demonstrate different hardware and software solutions developed within the project, including topics, such as SAMS project in overall, Precision Beekeeping, bee colony monitoring, SAMS hardware and data warehouse. Workshop was more focused on practical hands-on exercises and therefore practical objective was to develop prototype of the SAMS hardware for bee colony main parameter monitoring and connecting hardware to the SAMS data warehouse for data observation and visualisation.

By UNILV

SAMS on events and conferences ...

EUROPEAN RESEARCH DAY 2019, SURABAYA

29 October, 2019. Padjadjaran University was one of the universities invited to share its experiences with international cooperations, especially with consortium involving European universities/projects at the European Research Day event organized by Euraxess and the European Union in Surabaya.

Some of the speakers presented included; Indonesian Academy of Sciences, and Director of the Eijkman Molecular Biology Institute, European Funding Alumni Program, Padjadjaran University, Nuffic-Neso Indonesia, Institut français

d'Indonésie, Spanish CDTI, DAAD, ASEAN EURAXESS, Marie Sklodowska-Curie Actions (MSCA), Science Fund Indonesian Knowledge.

By UNPAD

HABIBIE FESTIVAL 2019, JAKARTA

16 October, 2019. Labtek Indie was invited to participate at the Habibie Festival in Jakarta. The festival was designed to inspire, educate and motivate broader people on technology and innovation. In its 7th year, "the future of learning, work, play and living" was the main theme. Aside from the exhibition, various seminars, workshops and discussions were held. Labtek Indie took part to exhibit the SAMS hardware prototype in the "Makerland zone", as well as to speak during the

Pictures: Mita on stage holding a silent talk (left); the SAMS Labtek Indie team (center); SAMS booth at Habibie Festival 2019 (right).

"Makertalk session". Amanda Mita presented "Bee The Change: The Challenges of Smart Beekeeping in West Java" as a "silent talk". Mita spoke through a microphone, but only participants using headphones heard the output. Both slots were a hit with many interested people attending. Their backgrounds varied from high school and IT students, NGO and tech startup workers, tech communities, as well as ecology and agriculture practitioners. Besides networking with other local IoT creators took was possible.

By CV.PI (+ Labtek Indie)

AGRITECHNICA 2019, HANNOVER

Pictures: Sascha Fiedler and colleagues in the exibition area.

10 to 16 November, 2019. According to the organiser's concluding report, around 450,000 visitors came, 130,000 of whom came from abroad. Agritechnica in Hanover is the world's largest agricultural technology trade fair and is organised by the German Agricultural Society (DLG). Agritechnica is the innovation exchange for the entire agricultural sector. With its range of agricultural equipment and new developments, it represents a comprehensive information forum for solving problems in agriculture and agricultural technology. The SAMS Bee Monitoring System was on display throughout the entire exhibition period. The developers of the University of Kassel were available for questions and presented the latest project results.

By UNIKAS

EXPOSURE SEMINAR FOR ICT IN AGRICULTURE VALUE CHAIN DEVELOPMENT, FELDAFING

09 December 2019, SAMS was featured during the Exposure Seminar for ICT in Agriculture Value Chain Development of the Green Innovation Centres for Agriculture and Food Sectors, which took place from December 3rd to 12th in Feldafing. As part of the German Federal Ministry for Economic Cooperation and Development´s (BMZ) special initiative ONE WORLD - No Hunger, the Green Innovation Centres operate in 15 partner countries to promote innovations that increase farmer incomes, boost employment, and improve local food supplies.

During the Exposure Seminar, Sascha Fiedler from University Kassel presented the SAMS concept and prototype to local actors from the programme´s partner countries. Amongst others, participants were from the political, private and social sectors of Mali, Burkina Faso, Ghana, Ethiopia and India. The goal of the event was the presentation of SAMS as an ICT solution for agricultural value chain development, as well as fostering strategic discussions and identifying cooperation options.

By UNIKAS

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7. Newsletter Vol. 7

To access all hyperlinks in the newsletter, follow the link to the newsletter in the original version.

PROJECT ACTIVITIES

UPCOMING EVENTS

DEAR SAMS COMMUNITY,

SAMS Smart Apiculture Management Services

We would like to inform you with this quarterly update about news and upcoming events on our project activities.

Project activities from Dec. 2019 to March 2020

SAMS AND THE GLOBAL COVID-19 CRISIS

The new corona virus hit the whole world, but we do everything in our power to go on with the daily SAMS-business. For our readers, there is also no need to get bored during your time at home - we offer you some interesting SAMS-related reading material.

- **Visit** our Twitter account to stay updated all the time.
- **Data Warehouse:** UNILV developed a basic instruction on how to connect any bee monitoring hardware to the SAMS Data Warehouse.
- **Hardware:** Want some information on the second SAMS – prototype hive? The deliverable is accessible through our project website.
- **10 Rules of Honeybee Management:** Have you already read our SAMS - management rules in English, Amharic and Bahasa?
- **Flowering calendars of bee plants in ET and IN:** Have you ever been interested in what local plants are important bee forage in Ethiopia and Indonesia and when they bloom? Visit our SAMSwiki and find out.
- **Newsletter in Bahasa Indonesia:** CV.PI published a newsletter of the project activities in Indonesia starting from the beginning of the SAMS-project (01.2018) until 12.2019.

We want you! For our SAMSwiki, we are looking for people who want to become part of our community, share their knowledge and actively contribute to the growth of SAMSwiki.

By UNIGRA

Looking for Partners – International SAMS project

LOOKING FOR BUSINESS PARTNERS – INTERNATIONAL SAMS PROJECT

SAMS is currently developing three international partnership networks on 1) Business Management and Trade, 2) Data Management and Utilization and 3) ICT Technology and Services. The aim of the partnerships is to foster international cooperation and knowledge exchange between Asia, Africa and the EU in the long term as well as to ensure sustainability of SAMS and its impact. The partnerships will support the use and accessibility of SAMS modules such as the Data Warehouse and the SAMS System and serve as a knowledge exchange network on issues related to data-research, bee hive monitoring, and business implementation.

To stay up-to-date with the project and find a way to collaborate, contact us through the **Partnership Application Form**. Interested parties can apply in a few easy steps to the SAMS partnerships.

By GIZ

SAMS Hardware, Software and Data Warehouse Updates ...

FIFTEEN NEW SYSTEMS AT UNI KASSEL AND NEW EQUIPMENT FOR ID AND ET

Components for further 37 HIVE systems have been shipped to Indonesia and Ethiopia. Fifteen new systems are under installation at the test site of Uni Kassel. The system has been improved including PCB design, better energy management, 3D printable sensor case, more stable software with error report on GitHub, even more user-friendly user interface. Furthermore, costs for the systems have been reduced by 20%.

Picture: SAMS hardware.

By UNIKAS

Pictures: Interns from Polytechnic of Bandung assembling the Node MCU).

SAMS HARDWARE TESTING BY THE INDONESIAN DEVELOPMENT TEAM

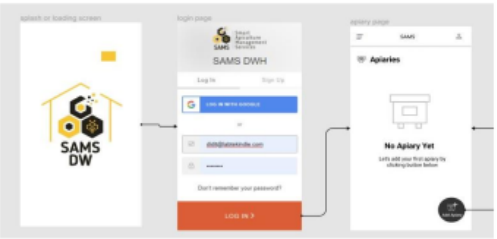
Earlier this year, the CV.PI development team was welcoming students of Polytechnic of Bandung.

While waiting for the improved RaspberryPi firmware, we tried to experiment with different kinds of computers to try potential cheaper systems, comparing the quality of the created monitoring systems and to work on general improvements based solely on the user needs gained during our UCD research. Our research told us that beekeepers in West Java mostly care for colony absconding, whether it relates to climate or forage. This can be detected minimally only with weight scale, temperature and humidity sensors, which can be handled with Node MCU. Node MCU is also a potential alternative firmware despite its small and compact dimensions, and they come with WIFI features. Also, the lower price compared to RasPi makes it easier to be localized.

Currently, there are 3 Node MCU modules that are being tested by the development team, namely Node MCU V3, Mini D1 and esp32

module. To use more sensors for the same microcontroller, the development team also examined one wiring for the ds18 temperature sensor on the Node MCU. We also conducted a stress test by running the Node MCU system with each sensor, using a code made by Armand Kviesis, from UNILV. The problems arise from the test results being analyzed through troubleshooting activities. Most problems that occur include inability to reignite after deep sleep, emit smoke and damage in certain circumstances, inability to function using batteries, unread sensors, persisting reboot loop, and so on. During January to February, the exploration and development of 2 Node MCU packages to be implemented was also done.

By CV.PI (+ Labtek Indie)



Picture: Interface of the SAMS DSS software.

SAMS DSS software prototyping in progress...

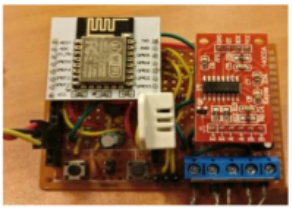
The SAMS Decision Support System (DSS) software prototype making has also progressed significantly. Starting from a simple sketch and scribble, it has currently evolved to be a hi-fi prototype with a clickable (interactive) version. The interactive prototype is also planned to be tested through a series of Usability Testing on beekeepers' respondents in April 2020.

By CV.PI (+ Labtek Indie)

TWO TEST SYSTEMS INSTALLED AT LLU

LLU team started testing and evaluation of SAMS hive monitoring devices. Two systems are installed at the specific bee wintering building for bee colony monitoring. Measurement interval is set to 2 minutes. Findings about detailed food consumption by the colony will be made after this experiment.

By UNILV


Picture: Alternative SAMS hive monitoring system.

UNILV DEVELOPED ANOTHER SAMS HIVE MONITORING DEVICE

LLU team developed a simplified SAMS hive monitoring device based on ESP8266 microchip for bee colony weight and temperature monitoring. This monitoring system is developed considering locally (in Ethiopia and Indonesia) available components. Moreover, the overall price of the SAMS system is decreased and energy efficiency is increased.

By UNILV

DATA WAREHOUSE UPDATES

Data Warehouse is fully operating and data from installed SAMS hive monitoring systems is stored there.

- Additional option to register a SAMS hive with default configuration and sensors is added to the warehouse, thus the process of configuring/registering devices has become more user friendly.
- Logs from monitoring systems now are accessible in the warehouse for faster diagnosis of hardware or data transfer problems.
- Data Warehouse user interface and dashboard view is updated, adding some visual improvements and modifications for better usability.
- User access tokens now are managed by the Data Warehouse.
- Some back-end improvements include update on data processing. Thus, data can be accepted without timestamp and several measurements with a known measurement interval can be processed.

By UNILV

Meetings Meetings Meetings ...

03.2020 - 6TH STEERING COMMITTEE MEETING IN JELGAVA, LATVIA

The 6th SAMS Steering Committee Meeting took place from March 4-6 and was hosted by the Latvia University of Life Sciences and Technologies (LLU) in Jelgava. As SAMS is approaching the last project phase, the project beneficiaries discussed the progress of the last months as well as next steps ahead towards project end in December 2020. Each work package´s progress was discussed and specific topics concerning SAMS business modeling, data use and management, SAMS partnerships and the SAMS Final Conference were addressed in round table discussions in order to develop strategies and solutions for the next months. The round tables were held in the manner of a World Café, providing opportunity to all project beneficiaries to provide input to each topic. The successful event was topped with an ice-skating session nearby the university campus, where some of the project members enjoyed their first experience on ice.

By GIZ

SAMS Capacity Building Activities

Pictures: Introducing participants about business development and marketing of bee products (top); demonstrating installed beehive monitoring to some training participants (bottom).

02.-03.2020 - CB activities in Ethiopia

Three CB trainings were conducted to 106 participants of which 40 people were beekeepers and 66 were apiculture researchers or/and beekeeping experts. Out of those 106 training participants, 44 were females (38 beekeepers, 4 researchers and 2 beekeeping experts). CB trainings were planned to introduce participants to the SAMS monitoring system and to increase the knowledge of the participants on the ten bee management rules, bee health related issues and business development on beekeeping activities. During the training, we focused on the topics how to increase production and productivity of beekeeping and the use of the SAMS monitoring system in different disciplines of beekeeping (queen breading, honey yield improvement, pollination services). The approach and gained knowledge were evaluated as very good. However, the trainees underlined the need for future capacity building to raise knowledge and awareness of beekeepers, extension agents and all concerned groups on how to get more practical knowledge on the application of the beehive monitoring system and how to integrate the utilization in to different beekeeping systems.

By Holeta

01.2020 - Co-creation workshop

On January 17, 2020 iceaddis organized a co-creation workshop for apiculture stakeholders in Ethiopia. It was attended by several startups and experts in the apiculture industry. The main goal of this co-creation workshop was to develop sustainable business prototypes on top of the SAMS technology, which is designed for further development by local startups and adoption in the industry. The second aim of this co-creation workshop is to collect feedback from the apiculture stakeholders on how to improve SAMS's services for future development in the contexts of Ethiopian beekeepers.

Picture: iceaddis hold a SAMS co-creation workshop.

By iceaddis

Other Exciting News and Project Activities


Biosystems Engineering

Application of fuzzy logic for honey bee colony state detection based on temperature data

NEW SCIENTIFIC ARTICLE AVAILABLE

Scientific paper with title "Application of fuzzy logic for honey bee colony state detection based on temperature data" is accepted to the Journal of Biosystems Engineering and is published online.

By UNILV

NEW ARTICLE IN AUSTRIAN BEEKEEPING MAGAZINE

UNIGRA published a travel report of the prototyping workshop in Bandung in Austria's biggest beekeeping magazine Bienenaktuell. The article is not open access, but it was allowed to publish it for all interested readers on bienenstand.at.

By UNIGRA

SAMSwiki SOON AVAILABLE IN ENGLISH, BAHASA AND AMHARIC

The SAMSwiki grows further and further... UNPAD, Holeta, iceaddis and UNIGRA are working together to translate the English content, which was already published on the SAMSwiki, into Bahasa and Amharic. Some progress was already made. Currently, there are 20 sub-chapters available in Bahasa Indonesia – the number will further increase in the next weeks.

By UNIGRA

IN SEARCH FOR BEEKEEPER PARTNERS IN INDONESIA

There are at least 45 hardware prototypes that need to be implemented as soon as possible. Surely, to reach these numbers there are some efforts that need to be done. Therefore, the CV.PI research team began to look for more potential beekeepers as research and implementation partners, who are willing to collaborate by allowing SAMS to monitor their colonies. To support this, the research team re-approached our beekeeper partners who have been collaborating with SAMS, and actively seek for other potential beekeepers.

Picture: Mr. Koswara working at his apiary.

Our first step began with visiting Mr. Aep from the Babussalam apiary in Ciburial, Bandung. We have installed two prototypes there and plan to install 2 more. However, Mr. Aep asked us to make preparations more carefully in the future implementation. One of the intended preparations is to select specific places for the colony with less threat of pests, given the previous two implemented colonies were attacked by ants.

In a further step, we approached Mr. Koswara, a beekeeper from Madu Maribaya Apiary – he has 200 colonies of *Apis cerana* and *Trigona laeviceps*. Considering a lot of research has been done at the apiary by other universities, Mr. Koswara claimed to feel the various benefits gained from these studies and therefore supports our plan. He hopes that the SAMS technology could also benefit him both in terms of knowledge, and in the practice of beekeeping. At Mr. Koswara's apiary, we plan to install 8 SAMS prototypes.

Through the processes above, we have secured a plan to implement 10 prototype installations. But searching for the other 35 colonies is not easy for us, considering the lack of institutions to unite beekeepers in West Java. Since existing associations are more dominated by honey brokers and middlemen, rather than the beekeepers who do real beekeeping. In the near future, we plan to search for new beekeeper partners through the interpersonal beekeeper network of Mr. Aep and Mr. Koswara.

By CV.PI (+ Labtek Indie)

MARKET RESEARCH SURVEY - ETHIOPIA

iceaddis conducted a market survey between Nov 2019 - Jan 2020 on honey consumers' behaviour, specifically on their motivation to buy honey and on the factors that lead to the decision to buy honey. The survey was published online and on a printout paper for those who don't have access to internet. In total, the survey was responded by 53 honey consumers sharing their preferences and purpose use for the honey they buy.

By iceaddis

Picture: Main market research results.

MARKET RESEARCH - INDONESIA

Market survey activities are carried out in 2 categories, honey consumers market survey and technology products. The consumers market survey aims to determine consumers behavior in buying honey, while the technology market survey aims to determine the SAMS technology market segment.

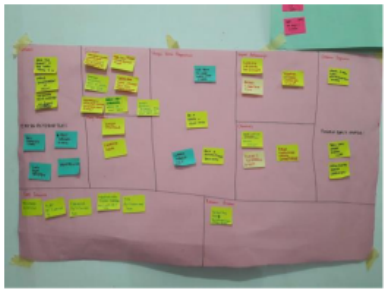
This research was conducted from October 2019 to March 2020 using qualitative and quantitative methods. The tools used are questionnaires for both market surveys (honey consumers and technology). Distribution of honey consumer market survey questionnaires was done both online and offline to honey consumers. Like the honey consumer market survey, technology questionnaires are also distributed both online and offline through interviews, telephone calls, WhatsApp, and FGDs.

From the results of this survey of 445 respondents, it was found that 92% were honey consumers, and 8% were not honey consumers. Honey consumers intend to share with others or consume honey with their family at home. The frequency of consumption is quite low (once a month). The most popular type of honey is the forests' honey, and most of them are bought from retail stores. Respondents prefer to purchase honey from local producers and trust domestic honey more than imported honey. The most desired information the consumers want to find on the honey packaging label is the best before date. Many honey producers still put very limited information about the product on the packaging label, and some of them even do not include the packaging label at all.

By UNPAD

STATUS OF BUSINESS DEVELOPMENT IN INDONESIA

In Indonesia, the business development model has been designed since 2018 through the development of honey-derived products. It was followed by the event "SAMS - International Seminar & Ideathlon" on July 7, 2019. In this event, the UNPAD team has screened eight new business ideas in beekeeping. These business ideas will then be reviewed to see market needs and sustainability as part of the ten business ideas that will be offered in the SAMS project. Apart from the Ideathlon results, business ideas will also be arranged referred on the results of an earlier market survey analysis.



Picture: Lean Canvas for SAMS Business Development.

In parallel, the CV.PI team has also begun making business plans in an effort to follow up SAMS technology development going forward. This business planning began with a workshop on making Value Proposition Canvas and Lean Canvas to provide a clear definition of the value that the product or service should offer. Compared to the Value Proposition Canvas, the mapping outlined in Lean Canvas is more detailed. Here, we were not only identifying the value of the products we offer, but also map the problems experienced by potential customers, the solutions we offer with key metrics, what sales channels are strategic, and of course the mapping of cost structures and possible revenue. Of course, making this canvas is still an early step in the SAMS business development process going forward. However, the ideas expressed in these canvases are a contribution to the execution of SAMS business in Indonesia, which will be more implemented by the UNPAD team.

By UNPAD and CV.PI (+ Labtek Indie)

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8. Newsletter Vol. 8

To access all hyperlinks in the newsletter, follow the link to the newsletter in the original version.

SAMS-NEWSLETTER

www.sams-project.eu

Vol. 8, June 2020

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 780755

@SAMS_EU_H2020

PROJECT ACTIVITIES

LOOKING FOR PARTNERS
CORONA INFLUENCES SAMS
WEBSITE RESTRUCTURED
D2.3 AND D4.3 AVAILABLE FOR DOWNLOAD
NEW SENSOR CASE PROTOYPES
ESP8266 BASED MONITORING SYSTEM
BATTERY LIFE CALCULATOR
SWARM ECONOMY CALCULATOR
ECONOMIC EVALUATION OF REMOTE MONITORING SYSTEMS
DSS TESTING IN ETHIOPIA
COVID-19 IN ETHIOPIA
COVID-19 IN INDONESIA
PARTNERSHIPS
CB ACTIVITIES IN ET, ID AND AUT
NEW VIDEO ON YOUTUBE
SAMSWIKI HAS A NEW MAIN PAGE
10 HONEY BEE MANAGEMENT RULES ILLUSTRATED

UPCOMING EVENTS

MONTHLY DISSEMINATION, BANDUNG
FINAL CONFERENCE, 11. 2020

DEAR SAMS COMMUNITY,

SAMS Smart Apiculture Management Services

We would like to inform you with this quarterly update about news and upcoming events on our project activities.

Project activities from April to June 2020

STILL LOOKING FOR BUSINESS PARTNERS – INTERNATIONAL SAMS PROJECT

The development of three international SAMS partnership networks is progressing as first cooperations are being established. The aim of the partnerships is to foster international cooperation and knowledge exchange between Asia, Africa and the EU in the long term as well as to ensure sustainability of the SAMS technology and concept and its impact. Therefore, we are looking for interested beekeepers, start-ups, researchers, data management associations and experts! Main activities of the partnerships comprise:

1.) Partnership on Business Development: mutual learning, knowledge exchange on modern beekeeping and business development as well as trade of SAMS products.

2.) Partnership on Data Management and Utilization: research and mainstreaming of the SAMS Decision Support System and knowledge exchange on beekeeping:

- Data Warehouse (DW): receive support in accessing and using the SAMS DW with your own monitoring device and exchange knowledge on data management and utilization issues and mainstreaming of the SAMS System.
- SAMSwiki: knowledge exchange on issues of bee health and bee productivity through SAMSwiki content creation and management as well as development of the platform.

3.) Partnership on Technology and Services: testing and development of the SAMS technology for bee-management and health services.

For more information on the partnerships and for finding a way to collaborate, visit the SAMS website and contact us through the Partnership Application Form.

By GIZ

SAMS AND THE GLOBAL COVID-19 CRISIS

Even in an international project like SAMS, where regular meetings via video conferencing and digital work are daily business, the effects of the corona-related circumstances are strongly felt.

Picture: Virtual SAMS-meeting on all work packages on June 3, 2020.

Curfews and limited infrastructure are hampering the regular inspection of the hives and the automatic transfer of data. The latter problem has now been remedied by local data storage. However, with this strategy, the project is dependent on more frequent visits to the test areas for data collection and hive monitoring - which is difficult to implement in times of corona curfews.

The planned training measures in bee management, bee health and business design in the honey value chain, had to be suspended, are held online or open-air due to corona restrictions. While on the hardware and training side, logistical problems are exacerbated by the corona measures, the development of the software continues. The project benefits from the digital international cooperation in the development of the Decision Support System (DSS), which provides beekeepers with information on the current health of their bee colonies and suggestions for optimizing bee management. Based on the first data sets of monitored bee colonies, a data processing model was developed that provides beekeepers with the relevant information on their hives. A first version of the Decision Support System is now available online to the participating beekeepers. According to the digital principle "Design with the user", the test version is being tested by Ethiopian and Indonesian beekeepers. After this test, the Decision Support System will be adapted again according to the needs of the users on site.

By GIZ

SAMS Homepage

NEW MENU STRUCTURE ON THE SAMS HOMEPAGE

For a better usability and a faster overview for the website's visitor, the menu structure of the SAMS homepage was streamlined. In the new version, the number of riders is reduced to seven and some riders were renamed. The newly named riders "About the Project" and "Material and Publications" are main categories, under which many riders of the old structure group now as sub categories. For example, the SAMS Newletter, "Sams on media" and all project reports are now available via the category "Material and Publications". Information about funding providers and open-access capacity building material will be soon available under the same category.

Picture: SAMS website.

By GIZ

NEW REPORTS AVAILABLE ON THE WEBSITE:

- **Deliverable N° 4.3: Evaluation of Responses and Support Services**

  Authors: Zacepins, A., Komasilovs, V., Kviesis, A., Komasilova, O. (UNILV).

  Summary: All bee colony monitoring data coming from the SAMS monitoring devices is accessible globally using a web-based application – the SAMS Data Warehouse. Deliverable N° 4.3 describes the new web user interface for the SAMS Data Warehouse (DW) and the clickable version of the front-end for mobile devices. Issues related to the bee colony monitoring data transfer and system installations are addressed, as well. The sustainability aspect of the SAMS data warehouse is described and DW deployment process is summarized. The response and support actions are elaborated for different regional settings in the target countries.

- **Deliverable N° 2.3: Results of Market Surveys**

  Authors: Purnomo, D., Bunyamin, A., Nawawi, M., Sukri, N., Danuwidjaja, T.G., Al Faizah, N. (UNPAD), Alemayehu, Y., (ICEADDIS), Kviesis, A. (UNILV).

  Summary: Deliverable N° 2.3 gives an overview on findings of the current honey and apiculture market in Indonesia and Ethiopia. Next to honey and other bee products, the market results target especially SAMS related fields like data usability and SAMS technology modules. An overview is provided on the following aspects:

  - Target market
  - Bee product landscape
  - Competition
  - Pricing and forecast

Picture: Results of Market Survey – Overview.

By GIZ

SAMS Hardware, Software and Data Warehouse Updates …

PROGRESS IN PROTOTYPE DEVELOPMENT

At the University of Kassel, the development of the final prototype as well as the sensor case continued under difficult conditions during the Covid-19 lockdown. For the sensor case, different printing materials as well as wire mesh and printed plastic grid were tested. This resulted in the latest prototype, which is currently used in the bee colonies for data collection at the bee experimental site of University Kassel.

Pictures: 3D printing the sensorcase, (Printer: ZMorph VX, Material: ABS; left); Insert sensor honeycomb in hive (centre); Mounted components SPH0645, DHT22, DS18B20 (right).

By UNIKAS

ALTERNATIVE CASE FOR THE MONITORING SYSTEM BY UNILV

LLU team created a 3D model of the case to safely use the SAMS monitoring system in the open environment. All the details and dimensions of the case will be available on the SAMS website in near future.

Design and assembling of the casing for the SAMS bee colony monitoring system is in progress to test it in the real environment.

Pictures: Vitalijs Komasilovs working on the sensor case (left); 3D printed sensor case (right).

By UNILV

ESP8266 BASED MONITORING SYSTEM

Picture: ESP8266 based monitoring system.

Considering the user needs, the SAMS team is constantly upgrading and improving the SAMS bee colony monitoring hardware.

Now, an energy efficient system based on ESP8266 Wi-Fi microchip is developed, which can be used for individual colony weight, temperature and humidity monitoring. It is possible also to add additional temperature sensors for ambient temperature monitoring.

This module can be powered from rechargeable standard AA batteries and depending on measuring intervals system can operate for several months.

By UNILV

BEE COLONY MONITORING SYSTEM'S BATTERY LIFE CALCULATOR, SWARM ECONOMY CALCULATOR AND ECONOMIC EVALUATION OF REMOTE MONITORING SYSTEMS

UNILV developed three calculation models and implemented them in the SAMS DW. The calculators are publicly available on our website.

Bee colony monitoring systems`s battery life calculator allows to estimate battery life depending on different monitoring system´s operation states.

The swarm economy calculator calculates the costs of catching an absconded or swarmed bee swarm.

The economic evaluation of remote monitoring systems calculates the profit when using a monitoring system.

By UNILV

SAMS DSS implementation tests in Ethiopia and Indonesia

IMPLEMENTATION AND DSS USABILITY TESTS - ETHIOPIA

The last couple of months we were focused on how to implement the SAMS system in five new locations, giving the usability test for beekeepers and maintaining the existing SAMS prototypes in Holeta and Menagesha site back to a fully working condition. Yet the epidemic has become the number one challenge all around the world and also here in Ethiopia, putting us in a certain delay. Traveling in and out of Addis Ababa and other places in Ethiopia were banned by the government for some time to stop the spreading of Covid-19. When we got the chance to be mobile, with great precaution we managed to give the DSS usability test for beekeepers for those that have access to the internet and for those which use smartphones. We are working on retrieving old data logs offline and updating the SAMS prototype system in Holeta and Menagesha site.

Iceaddis executed the DSS UI test on 4 experienced beekeepers at Holeta on Jun 4 and 6. Four of the beekeepers are closely working with Holeta institution and have at least one year experience in beekeeping practice.

Pictures: Iceaddis team working in times of corona.

By iceaddis

RESEARCH AND IMPLEMENTATION AMIDST COVID-19 PANDEMIC - INDONESIA

Since the first case was announced in early March, cases of Covid-19 transmission have continued to increase exponentially in Indonesia. The Government of West Java has launched large scale social restrictions; people are encouraged to stay at home, traveling across regions is not permitted, this situation certainly forces us to think creatively. There are actually three agendas that need to be done from last March up to these months. They are user research, DSS usability testing, and SAMS monitoring system's implementation. Up to this date, we've done user research remotely and usability tests are on its way. Our interview sessions are mediated using tools such as WhatsApp Video Call and

Lookback. Luckily for the user research, there are no significant challenges. Our beekeeper respondents were already quite familiar with smartphones and Whatsapp Video Call. The DSS interface usability testing will take place this week (3rd week of June 2020), we hope there will be no significant challenges. The biggest challenge is certainly on the monitoring system's implementation plan. Currently we are still strategizing on how to carry our systems to the apiary site without the potential to transmit or contract the risk of Covid-19. There are 2 NodeMCU systems and 8 RasPi systems waiting to be implemented.

By CVPI (+ Labtekindie)

Partnership Activities

SAMS PARTNERSHIP NEWS BY HOLETA

The SAMS consortium is developing International Partnership on business development, data management and utilization and technology and services for sustaining the results and ideas developed within the project. The major intent is to ensure that the developed technologies, knowledge and gained experience are changed into business and usable ideas that can help achieving sustainable economic development. Research institutes, universities, startups, scientists, private companies, public organizations and ministries already showed great interests to join at least one of the partnerships in support of creating an international platform for networking and foster dialogue on development of the beekeeping sector.

Among the consortium members, HOLETA, UNPAD and CVPI (+Labtekindie) already committed to join the international network of SAMS business development partnership to play a mentorship role, promoting the SAMS system, facilitating knowledge exchange between partners, support research and capacity building activities on bee-related issues and share research results with the community groups that are involved in the apiculture sector including beehive manufacturing.

UNILV and UNIGRAZ will be involved in the international partnership on data management and utilization. The focus of this partnership will include knowledge exchange and research on issues of data management and usability, refinement and promotion of the SAMS Data Warehouse and management of the SAMSwiki platform in collaboration with other bee-management system providers. This partnership also includes optimization/mainstreaming of the Decision Support System for bee-management and health issues. Apiculture and related sectors, scientists from various disciplines, economic communities, and policies are among the beneficiaries of this partnership.

UNIKAS and HOLETA discussed to engage the international partnership on technology and services by focusing on knowledge exchange and research on issues of bee-management and -health services, refinement of the SAMS technology for bee monitoring and optimization of the HIVE system and conduction of research to optimise honey bee selection to improve bee health and productivity.

By Holeta

SAMS Capacity Building Activities

06.2020 – CB ACTIVITIES IN ETHIOPIA

A capacity building (CB) training was conducted from 12-13 June 2020 by dividing the participants into two groups due to Corona. This CB training was planned to be conducted in April 2020 but due to the coronavirus pandemic, the training was postponed. However, through discussions with the district and zonal administrations, an agreement was reached to conduct the training open air with only limited numbers of participants.

The CB training was conducted to introduce participants to the SAMS monitoring system and to increase the knowledge of the participants on the ten bee management rules and bee health related issues. The feedback collected from both groups of participants indicated that the system fits perfectly their needs, if the price of the monitoring system fit their

economic status to afford the services. Besides, we focused on some beekeeping topics. For example, how to increase production and productivity, the use of the SAMS monitoring system in different disciplines of beekeeping (queen breading, honey yield improvement, pollination services) during the training. However, the trainees underlined the need for future capacity buildings to raise knowledge and awareness of beekeepers, extension agents and all groups were concerned on how to get more practical knowledge on the application of the beehive monitoring system and how to integrate the utilization in to different beekeeping systems.

Picture: Talk about bee health and management (left) and about the SAMS beehive monitoring system to the splitted groups of participants (right).

By Holeta

05.2020 - BUSINESS MODEL WORKSHOP

Saturday, May 13, 2020, the Webinar activity with the theme "Maintaining Momentum of Honey Bees Business and Beekeeping Products Post Covid-19 with an Innovative Business Model" was carried out by the UNPAD team. The activity of this webinar was attended by around 60 participants. Dr. Dwi Purnomo, STP., M.T., was the speaker in this webinar and explained the importance of maintaining the momentum of honey demand that increased during the Covid-19 period. One way is to understand the business model being run and the development that needs to be done. Innovation can be done on products offered, business models, or marketing.

In addition to providing knowledge on the importance of understanding BMC in business development, this webinar also aims to find and screen beekeeping business owners who are interested in becoming part of the 20 SAMS business plans from Indonesia. Later, interested participants will be selected and given mentoring regarding a deeper understanding of BMC as one form of the benefit provided.

Pictures: Webinar in Indonesia during the Covid-19 pandemic.

By UNPAD

05.2020 - Bee breeding and health in the light of SAMS

Brodschneider Robert from UNIGRA conducted a CB-activity with biology teachers in Vienna. Covered topics were bee breeding and health in the light of SAMS. A total of 16 participants learnt about practical tools used for beekeeping and bee breeding, bee health and bee breeding basics and possibilities of monitoring systems for queen breeding. Corona measurements were taken seriously by wearing masks throughout the whole event.

Pictures: Participants of the course learned about bee breeding and health in the light of SAMS. Corona measures demand mouth/nose protection.

By UNIGRA

Other Exciting News and Project Activities

FINAL SAMS CONFERENCE IS PLANNED FOR NOVEMBER 2020

Since SAMS is coming to its end we would like to announce our final conference planned for end of November. As you all know under current circumstances it's hard to say which format will be possible. Therefore, the project team plans currently to conduct the conference physically with an on-line stream to ensure access to the interested audience world-wide – especially in the project regions Indonesia and Ethiopia.

By GIZ

10 RULES OF HONEY BEE MANAGEMENT WERE ILLUSTRATED (DRAFT)

Iceaddis beautifully illustrated the 10 rules of honey bee management. The illustration can now be found on the SAMSwiki.

Picture: Illustration of 10 rules for honey bee management.

By iceaddis

NEW VIDEOS ON YOUTUBE - INDONESIA

The SAMS video, shot at the Bandung Bee Sanctuary (BBS) launch event is available on the SAMS-Indonesia YouTube channel. The launching of the Bandung Bee Sanctuary (BBS) was carried out by Universitas Padjadjaran in January 2020 in Bandung, Indonesia. This video can be found at URL: https://youtu.be/rKCooy1FVkw

By UNPAD

SAMSWIKI MAIN PAGE WAS RESTRUCTURED

In addition to the SAMS website, the SAMSwiki was restructured once again to improve usability. Visitors are able to click on the preferred language and they have quick access to important pages, for example "how to use the SAMSwiki?" and the "SAMSwiki" community.

By UNIGRA

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9. Newsletter Vol. 9

To access all hyperlinks in the newsletter, follow the link to the newsletter in the original version.

SAMS-NEWSLETTER

*This project has received funding from the European Union's Horizon 2020 research and innovation programme under **grant agreement N° 780755***

www.sams-project.eu

@SAMS_EU_H2020

Vol. 9, September 2020

PROJECT ACTIVITIES

FINAL PROJECT ACTIVITIES

DEAR SAMS COMMUNITY,

SAMS Smart Apiculture Management Services

We would like to inform you with this quarterly update about news and upcoming events on our project activities.

Project activities from July to September 2020

EVERY PROJECT MUST COME TO AN END

The SAMS project hit its last quarter and will officially end in **December 2020**. With this last project newsletter, we want to say thank you to all of our readers and supporters and we want to share some SAMS-project impressions with you:

We were able to develop our SAMS-system from scratch to a functioning and already implemented bee monitoring system. This took us some intermediate steps.

We conducted 28 capacity building events, which were attended by 613 people from Europe, Ethiopia and Indonesia.

Last but not least, during the past 2.5 years, the project partners grew into a community. We think that this team spirit made the SAMS project to something very special and facilitated the development and pursuing of new ideas.

We did a lot of UCD research and further developed 54 business models and evaluated the most promising 11.

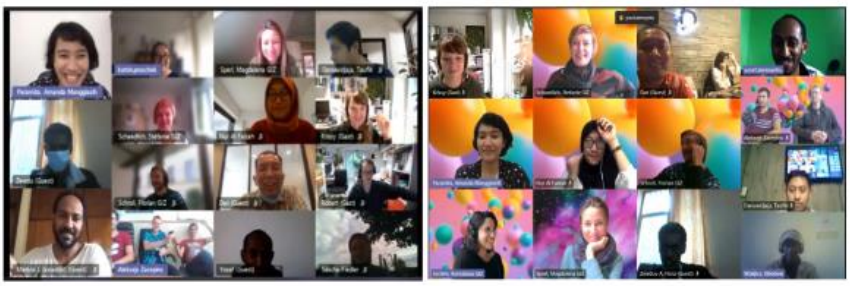
We visited 23 conferences and exhibitions. We published 8 articles in scientific as well as popular journals.

By UNIGRA

09.2020 - 7TH STEERING COMMITTEE MEETING – unfortunately this time as virtual meeting

The 7th SAMS Steering Committee Meeting took place as virtual meeting from September 23 – 25, 2020. As some of our readers may know, the SAMS team had to face some barriers in the previous month, not only due to COVID-19, but also due to unrest and internet shutdowns in Ethiopia. Therefore, it was even more a wonderful surprise that the meeting worked out very well without any bigger technical issues. As SAMS reaches now its last quarter of the project the consortium intensively discussed the progress of the last 6 month which were in all countries hardly influenced by COVID-19, such as the SAMS system implementations. Nevertheless, the consortium were able to define approaches to overcome barriers and further implement SAMS systems, ensure support for generated SAMS Business Models, develop more processing models as use of generated SAMS data, continuously update and integrate important content to the SAMSwiki, discuss the signing procedure of SAMS Partnership agreements and the SAMS Final Conference, to which all of our readers are invited. Please register on our SAMS website for the Final Conference, which will take place Nov 25-26,2020 as online event.

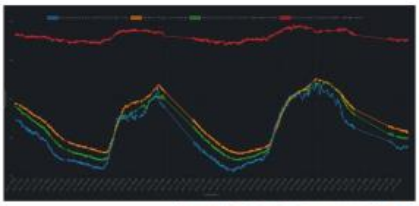
Finally, let´s all cross fingers that Covid 19 does not hits us all hardly again and that drawn plans are possible.



By GIZ

SAMS Hardware, Software and Data Warehouse Updates ...

NodeMCU AND SOFTWARE IMPROVED




Pictures: Top: data from a monitored Apis cerana hive (left), monitoring system based on NodeMCU (right); Bottom: Monitoring system in a A. cerana hive. Pictures by CV.PI.

Partners from CV.PI continued to locally assemble two monitoring systems based on the NodeMCU platform. Together with the UNILV partner the systems were constantly improved and tested. All the necessary parts for such systems are affordable and available at the local Indonesian market. The power-saving architecture of the NodeMCU platform allows it to enter a deep sleep mode to conserve power, therefore it is energy efficient and perfect to be used for battery powered applications. Two NodeMCU based monitoring systems equipped with multiple temperature sensors, a humidity sensor and a load cell for weight measurements were implemented in Maribaya, Indonesia for two *Apis cerana* colony monitoring. Three sensors in total were placed inside the hive to monitor temperature in different places of the hive in order to determine the optimal sensor location. As tests proved, the sensor placed in the middle provided the most reliable temperature measurements. Such tests also proved the flexibility of the SAMS data warehouse - connections from different monitoring systems.

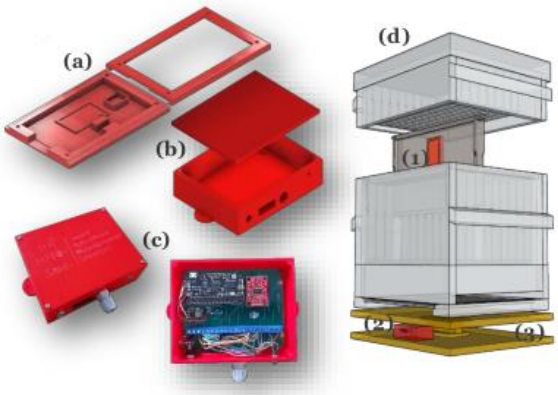
By LLU

MANUAL ON HIVE CONSTRUCTION AND OPERATION

The official instructions for the construction and operation of the SAMS HIVE system and the alternative based on NodeMCU have been published for download and can be found on our website in the Reports section. Additionally, the latest software image version 2.47 for the SAMS HIVE system based on Raspberry Pi as well as a Quick Start manual are also available on the SAMS Github page.

By UNIKAS

CASE MODELS



Pictures: SAMS HIVE system sensor case (a) and computer case (b), computer case with PCB (c) and SAMS HIVE system installation positions (d): sensor frame (1), Computer (2), Scale (3; right)

The latest versions of the CAD 3D models for the sensor case (Figure 1) and the case for PCB and computer (Figure 2) have been completed. Figure 3 and Figure 4 show a sketch of the respective installation positions of the SAMS HIVE main components as well as the computer case in the original, equipped with a SAMS PCB. The 3D models can be downloaded as STL files from the Github page of the SAMS project.

By UNIKAS

DATA COMMUNICATION (D6.3)

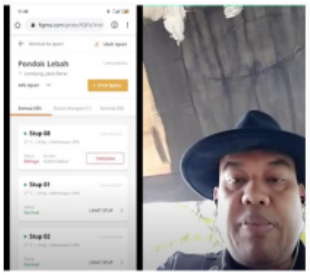
In August 2020, the report on Data Communication was submitted. This report covers information on the data communication process within the implementation phase of the SAMS HIVE monitoring system. Several options regarding network and coverage to maintain the data communication process are also identified, including options for data package types despite regulations and conditions applied in each country (prepaid, postpaid, Machine to Human data package, or Machine to Machine data package). Challenges that are encountered regarding the data communication process in Ethiopia and Indonesia are:

- Network stability in Ethiopia (router with 2G capabilities)
- Lack of IT expertise for the application of a quick solution/fixing of problems at the installation sites of Holeta and Gedo, causing that the systems in Ethiopia are not operating
- Availability of healthy bee colonies during the dry season
- Instability of the firmware, which will be approved

By CVPI (+ Labtekindie)

USABILITY TESTING DSS INTERFACE (INDONESIA)

The DSS interface usability testing was conducted in June 2020. Due to the pandemic, we initiated the usability testing remotely. Our researchers interacted with the respondents, mediated by a usability testing app, namely Lookback. In total, 5 beekeepers participated. We selected the respondents carefully from various beekeeper spectrums; young beekeepers who practice certain beekeeping activities as part of the beekeepers' community, experienced beekeepers, and grassroot beekeepers. Usability testing was conducted to investigate how beekeepers from different backgrounds use and understand the DSS interface's design as well as solutions provided by SAMS technology. Some of the major findings were:



Picture: Beekeepers test the DSS interface.

- Beekeepers are unfamiliar with certain terms in the copywriting
- Beekeepers were unable to see the difference between the in-app guidance page and the real page
- Beekeepers are doubting the advice feature of the DSS interface, many of them see that the advice provided is unfit with the beekeeping method they used to do

Recently, it was decided to iterate the DSS interface design once again.

By CVPI (+ Labtekindie)

SAMS DSS implementation tests in Ethiopia and Indonesia

IMPACTS OF CURRENT UNRESTS IN ETHIOPIA ON SAMS PROJECT IMPLEMENTATION

Ethiopia is dealing with unrests since October 2019. Especially, the unrest happened after the killing of the famous singer Hacalu Hundessa at the end of June 2020 have led to shock waves of anger, resentment, and frustration throughout Ethiopia. This unrest caused a serious challenge to the SAMS project implementation due to internet shutdowns to disrupt online communications by the government to prevent the circulation of unwanted news. This condition has lasted for about a month causing break-offs in communication between our international and national partners. On top of this, the unrest preceded by many small-scale conflicts in various areas and made movements very difficult, which impacts project implementation. Coupled with the unrests, the surging state of the COVID-19 pandemic, caused the stacking of outdoor project works and resulted in delayed field implementation of beehive monitoring systems, preventing conduction of capacity building trainings planned in the last four months and activities like honey market value chain analysis surveys and advisory board meeting activities in Ethiopia.

By Holeta

SAMS BEEHIVE MONITORING IMPLEMENTATION ACTIVITIES - ETHIOPIA

Even though new SAMS beehive monitoring systems couldn't be implemented, 13 SAMS monitoring systems that stopped the data upload due to an old image failure were re-implemented by replacing the old image with the new one (version2.47). The systems are located at three places, namely Holeta, Menagesha and Bako. The new beehive monitoring system implementation is planned to be conducted in Addis in the month of **September** in collaboration with the team from iceaddis. A total of six monitoring systems in Addis Ababa is planned. As Internet coverage and security issues in Addis is better than in the other areas, we decided to start field implementation first in the capital to get more data uploaded to the SAMS data warehouse for the prototype validation works. If the situation allows it, Holeta together with iceaddis intend to extend the implementation locations further to areas like Bonga, Horo, Wolmera and Ginchi. We already selected beekeepers and prepared to implement 37 beehive monitoring systems. So far, lots of beekeepers showed interest to use the monitoring systems and collaborate in future partnership in providing data to develop SAMS in Ethiopia.

By Holeta

IMPLEMENTATION AND MODERN BEEHIVE WORKSHOP - INDONESIA

Picture: Implementation workshop.

During the past months, we implemented 2 NodeMCU systems at Mr. Koswara's apiary in Maribaya, Bandung. Despite the COVID-19 pandemic, we decided to keep going as long as we are able to follow the health protocols. We see that the implementation itself was rather safe since it was conducted in an outdoor location and only three persons were involved. In terms of implementation, CV.PI intended to go forward. We are planning to scout more participating beekeepers and apiaries for the next implementation of 35 systems. So far, we have encountered Mr. Wanto as a prospective beekeeper who shows interest in modern and innovative ways of beekeeping. Mr. Wanto is an experienced beekeeper, who owns hundreds of *Apis cerana* in his apiary in Ciamis, West Java (more or less 116 km from Bandung). Currently, he has cooperated with the Provincial Forestry Agency to develop a *Trigona* Breeding Centre. We have established communication with Mr. Wanto and planned to organize a modern beehive workshop in his apiary in Ciamis, along with Mr. Koswara in Lembang, and Mr. Aep in Dago. We hope that this workshop could provide a mutual way of implementation, as well as a session to co-create a modern beehive that fits the needs of local beekeepers.

By CVPI (+ Labtekindie)

Transfer Studies

CROSS REGIONAL TRANSFER STUDY

HOLETA Team is currently working on a Cross Regional transfer study, which deals with the transferability of SAMS related technologies and businesses into 10 other regional settings within Sub-Saharan Africa, 10 within ASEAN regions as well as 1 for the EU. In this study, the process in which technologies and innovation obtained from research studies, experiences, knowledge sharing and information about specific settings and established partnerships, developed business ideas and scenarios communicated to the potential stakeholders, settings and target groups will be assessed. SAMS as a whole, as well as all SAMS modules are separately under investigation regarding their effects, need for potential adaptability in different regions and the possible impacts due to use within different user groups in these regions. Analysis on how SAMS benefits different stakeholder groups such as beekeepers, political conditions, environmental preconditions, future potential, user community etc. are the major focus of this study. Moreover, the study examines potential of the transfer countries and regions for the use of the SAMS system.

By Holeta

Partnership Activities

ESTABLISHMENT OF SAMS PARTNERSHIPS

To ensure long-term impact of the project achievements, SAMS is establishing three international partnership networks between stakeholders from the EU, Asia and Africa. The partnerships are developed in the spirit of promoting international collaboration and knowledge exchange within the apiculture sector and scientific society. The partnerships aim to foster modern and precision beekeeping and to sustain, refine and disseminate SAMS products and ideas with the objective is to support small-hold beekeepers in managing bee health and bee productivity. Several stakeholders from the international and national apiculture and scientific society have already expressed interest in collaboration within the partnerships. In order to formalize the partnerships, a Declaration of Intent (DoI) has been developed by the SAMS consortium and will be signed by members of each partnerships´ steering boards during a signature ceremony at the SAMS Final Conference in November 2020. The steering boards include stakeholders from Europe, Asia and Africa and will represent the management structure of each partnership.

By GIZ

CALL FOR PARTNERS

The International Partnership on Bee Colony and Knowledge Exchange is currently looking for partners. The partnership aims to foster research on bee -colony data and international knowledge exchange on bee- colonies, the SAMS system and beekeeping. Activities will focus on (1) data research and mainstreaming of the SAMS Data Warehouse (DW), and on (2) development of the SAMSwiki platform:

- SAMS DW: knowledge exchange and research on data management and utilization issues and mainstreaming of the SAMS Decision Support System (DSS) and DW, as well as support in accessing and using the SAMS Data Warehouse with your monitoring device
- SAMSwiki: knowledge exchange on issues of bees, bee health and bee productivity through SAMSwiki content creation and management as well as development of the platform. To foster international knowledge exchange on beekeeping, the partnership is developing a SAMSwiki Community.

For more information on the partnership and to contact the consortium for cooperation on bee data research, connecting your bee monitoring device to the SAMS DW or to collaborate within the SAMSwiki community, please contact us via the SAMS partnership application form SAMS partnership application form. Partnership applications for the International Partnership on SAMS Business Development (PS1) and the International Partnership on Technology and Services (PS2) are closed.

By GIZ

INTERNATIONAL PARTNERSHIP ON SAMS BUSINESS DEVELOPMENT

The SAMS consortium establishes an International Partnership on Business Development to ensure the sustainability of the SAMS project ideas. The partnership aims to foster business development in the apiculture sector and to promote the SAMS technology. Activities will focus on supporting apiculture business development through mutual learning and knowledge exchange on issues of modern and precision beekeeping as well as on trade and marketing of SAMS products. The major intent is to provide accessibility to the technologies, knowledge and experience gained during SAMS project time to foster smart apiculture business development, hence promoting sustainable economic development. Research institutes, universities, start-ups, scientists, private companies, public organizations and any stakeholders of the apiculture society are invited to join the partnership to join forces for the development of an international network of professionals in this field and to foster the dialogue on development of the beekeeping sector. Until August 2020, about 50 stakeholders showed interest in cooperation and applied to join the program. Main partners are: Agricultural Research Institute Holeta Bee Research Centre ("HOLETA"), University of Padjadjaran ("UNPAD") and Sacita Muda Indonesia Elaborasi ("Local Enablers"). They will soon sign the Declaration of Intend to formalize their role as steering board members of the partnership. They express intent to act as mentors for apiculture businesses, promoting the SAMS system, facilitating knowledge exchange between partners, support research and capacity building activities on bee-related issues and share research results with the community groups involved in the apiculture sector.

By Holeta

SAMS Business Development

BUSINESS DEVELOPMENT

54 SAMS Business Models have been developed by start-ups, SMEs and students in different business development activities supported by UNPAD and ICEADDIS as well as UNILV, UNIKAS and UNIGRA. The SAMS Business Models range from honey reselling, digital market places, beekeeping supply, beekeeping products for health and beauty to tourism, education and technology incl. remote monitoring beehives, DSS, PCB, data warehouse etc.

In order to identify the five most promising SAMS Business Models per country and one for EU, the UCD group set-up an evaluation and rating process in three steps: Step 1 cross-country evaluation, Step 2 virtual discussion within the UCD team, Step 3 evaluation and rating by experts. The most promising SAMS Business Models are:

Ethiopia:

- Anabi by Anabi - Smart beehives with monitoring system and DSS
- Daemat by Daemat - Digital Market Platform for agricultural products
- Birzz by Yiblu - Honey healthy energy product
- MbeeHive by MbeeHive - Modern beehives
- Kekros by Kekros Ethiopia - Beehives with monitoring systems

Indonesia:

- Masagi by Masagi - Production and sale of honey derivative products
- Madu Cantik (MaCan) by Herbal Khansa - Production and sale of honey beauty/cosmetic products
- Laduni Mutiara by Apiary Laduni Mutiara - Developing of *Apis mellifera* apiaries and selling genuine honey
- Madu Hanjuang by Madu Hanjuang - Reselling pure, good-quality honey
- Bandung Bee Sanctuary by Bandung Bee Sanctuary - Beekeeping educational center and beekeeping research and community empowerment in Bandung/Indonesia

Europe:

- Remote Monitoring System (for beehive observation, for monitoring of bee colonies for queen breeding, for selling and renting)

The most promising ones will be supported in funding, licencing and certification in association with the business partnership network. All SAMS Business Models will be available soon on the website and on SAMSwiki.

By GIZ

SAMS BUSINESS MODELS – ETHIOPIA

Between Jun/2020 - Aug/2020, iceaddis contacted SME's and startups to involve their business concepts in the SAMS business development process. Afterwards, 10 business concepts were developed through one on one follow ups with the business teams. In total, 21 individuals were directly involved in the process. Among those, 7 of them were female and 19 belong to youth. The 10 developed business concepts were rated by the SAMS partners and the most promising 5 were selected for further follow-up with the startups.

By iceaddis

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By iceaddis

SAMS BUSINESS MODELS – INDONESIA

Picture: Zoom meeting participants.

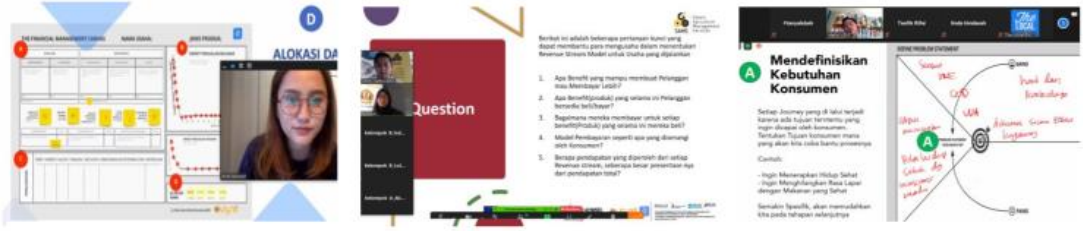
In July 2020, the UNPAD team carried out the final drafting and reporting activities on 24 SAMS Business Models from Indonesia. These 24 business models were produced by the UNPAD team and interested SME partners. The activities have been carried out to obtain 24 business models started from developing honey derivative products in 2018, developing a local beekeeping IoT system, developing beekeeping tourism, Ideathlon in 2019, and conducting a webinar in 2020 to find SMEs who are willing to join this activity. The activity was hampered due to the Covid-19 pandemic that entered Indonesia, which limited the movement of the UNPAD team to carry out business model creation activities. The team counteracted by conducting several virtual Zoom-meetings.

1) INNOVATIVE BUSINESS MODEL INCUBATION - KICK-OFF (JULY 3, 2020)

The UNPAD team launched an Innovative Business Model incubation program for beekeeping businesses. A total of 180 participants registered, around 80 participants were accepted to take part in the incubation program batch 1. This incubation program is expected to have an effect on strengthening the MSME business model in the beekeeping business, changing mindsets and increasing the capacity of business actors, strengthening the business ecosystem, and strengthening the community's economy. This incubation program will focus on introducing the Business Model Canvas and a deeper understanding of the blocks contained in BMC so that participants are expected to be able to create and describe the business model they are running.

Picture: Business model incubation kick-off event.

2) INNOVATIVE BUSINESS MODEL INCUBATION (JULY – AUGUST, 2020)



Pictures: impressions of the online meeting.

This event was for business actors in the beekeeping sector, aiming to increase the capacity of participants in understanding their business model by using the business model canvas as a tool. The event was carried out in six meetings with the following topics:

- July 10, 2020 - Improving the Quality of Customer Relationships
- July 17, 2020 - Designing Product Excellence based on Customer Needs
- July 24, 2020 - Work Management with Impact
- August 7, 2020 - Mapping Key Partners
- August 14, 2020 - Financial Management
- August 28, 2020 - Diversification of Revenue Streams

The speakers for this incubation activity were members of The Local Enablers team and the UNPAD SAMS team. In addition to the main session, the participants were also given a special discussion time in small teams to provide opportunities for everyone to understand and master the learning material more deeply, assisted by facilitators from The Local Enablers.

3) INNOVATIVE BUSINESS MODEL INCUBATION – INAUGURATION (SEPTEMBER 4th, 2020)

The Inauguration of Innovative Business Models Incubation for beekeeping and bee derivative product actors has been carried out with a keynote speaker from Lingkar Temu Kabupaten Lestari (LTKL). This inauguration activity is the closing of a series of workshops offered by the SAMS UNPAD to business people in the beekeeping sector.

In this last session, the incubation participants were given an increased understanding of their role as ecological actors. Business activities in the beekeeping sector play an important role in maintaining the sustainability of various types of flora, especially those that become sources of human food, in addition to other types of flora that can maintain the balance of nature. The speaker, who was presented from LTKL, was Adinda Aksari, Deputy Director at LTKL.

Picture: Key note speaker at the innovative business model incubation event.

By UNPAD

SAMS Capacity Building and Dissemination Activities

NEW SCIENTIFIC ARTICLES SUBMITTED

- SAMS project, its objectives and already achieved results was submitted to the International Journal of Agricultural Sustainability. Decision from the journal editor is still in progress.

- "When it pays to catch a swarm - evaluation of the economic importance of remote honey bee (*Apis mellifera*) colony swarming detection" submitted to the journal of Environmental and Resource Economics is still in a review phase.

By LLU

- An article on experimental setup of the SAMS HIVE systems at the University's apiary was published in the Project and Research Guide of the Experimental Plant for Irrigation and Solar Technology within the Department of Biosystems and Engineering at the University of Kassel. It can be downloaded here.

By UNIKAS

INDONESIAN MONTHLY TEAM MEETING – SEPTEMBER 4, 2020

Within the virtual meeting, the preparation for the SAMS Final Conference in November was discussed. The discussion focused on the concept of the SAMS Final Conference to be implemented, the video content that needed to be created, and the target participants. In addition, there is a factor that is of particular concern to the Indonesian team, it's the condition of Covid-19 in Indonesia, which the case is still significant increase every day. This makes the concept of a local public viewing obsolete.

By UNPAD

MUC CONFERENCE (HUMAN COMPUTER CONFERENCE) – SEPTEMBER 7, 2020

Picture: SAMS at the Mensch und Computer conference on September 7th.

The Mensch und Computer (MuC) conference is an annual conference organized by the German Informatics Society (Gesellschaft für Informatik e.V.) and the German Usability Professionals Association (German UPA). With more than 800 participants in the past, the Mensch und Computer (MuC) is one of the largest German-speaking IT conferences and the largest Human Computer Interaction conference in Europe. This year, SAMS joined the MuC conference to share the experience of international collaborative works within the SAMS project for the past 2.5

years. It was concluded in the talks, that in order to succeed a collaborative UCD teamwork with multi-discipline and various background team members, sensing journey or site visit plays an important role. The empathizing phase could help each team member with their respective background to understand the problem or challenge's context.

By CVPI (+ Labtekindie)

Citizen Science Conference – SEPTEMBER 7, 2020

Due to Covid-19, the 5th Citizen Science Conference was held online but still was attended by more than 200 people from different science disciplines. Gratzer Kristina from UNIGRA presented the SAMS poster to the audience.

Picture: SAMS poster was presented at the CCC 2020.

By UNIGRA

Other Exciting News and Project Activities

SAVE THE DATE: SAMS FINAL CONFERENCE AT 25TH AND 26TH OF NOVEMBER

Since SAMS is coming to its end we would like to announce our final conference planned for end of November. Due to the global COVID 19 Crisis, the event will be held 100% virtual. However, there will be "public viewing events" conducted by the different project partners in the various regions of the SAMS project.

The topics of the conference comprise precision apiculture, policies in apiculture, bee health, apiculture in the development context, data monitoring in apiculture and data management.

The planned talks of the conference will be published soon on the SAMS project website.

Please, register for the SAMS Final Conference via the registration form on our homepage.

By GIZ

SAMSWiki Updates

Picture: SAMSwiki-Status quo (09/2020)

NEW CONTENT AND GOOD DEVELOPMENT

The SAMSwiki is an important and valuable outcome of the SAMS project. During the past years, we were able to constantly improve the availability of the content and the knowledge database itself. We already translated some of the content into BAHASA (Indonesia) and AMHARIC (Ethiopia), and we included some of the many SAMS project findings (SAMS-system based recommendations/management options, or SAMS - Labels and certifications for bee products). With new content creators, languages, literature sources and expert knowledge, the content will further be increased. By the way: have you already thought of supporting the SAMSwiki project? Please visit the SAMSwiki, create a new account and be part of our publicly available knowledge database.

By UNIGRA

Final project activities

UCD GLOSSARY – IN PROGRESS

UCD (User Centered Design) Glossary was initiated at the beginning of the project to help the UCD teamwork with the same definition of the terms. This was initiated by Katrin as SAMS advisory board member and grew along with the UCD team process in Indonesia and Ethiopia. After UCD research processes are pretty much done, it is decided to publish the glossary in the hope of providing information and hints for the public who attempt to do UCD research themselves. Instead of publishing only the terms and its definition, the UCD team decided to add the context of use on several terms in the form of stories on how the UCD team in respective countries encounter the terms. The development of the stories is still progressing right now. These stories will also serve as material for reports, the script of the final conference presentation, etc.

By GIZ

USER CENTRED DESIGN & BUSINESS DEVELOPMENT – COMING UP

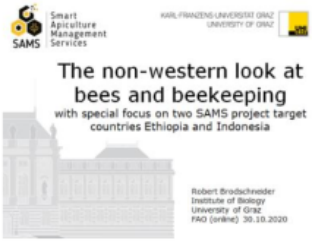
In the last three project months, the User Centred Design & Business Development tasks will be finalized:

- The UCD Glossary will be made available for public on the website and on SAMSwiki
- The DSS interface will be adapted
- The 54 developed SAMS Business Models will be made available for public on the website and on SAMSwiki
- The 11 most promising SAMS Business Models will be supported in funding, licencing and certification in association with the business partnership network
- UCD lessons learnt and results will be highlighted in Deliverable D2.2, the evaluation of the business models will be pointed out in Deliverable D2.4 and the evaluation of the business models in terms of licences will be in Deliverable D2.5

By GIZ

TALKS – COMING UP

- Robert Brodschneider (UNIGRA) was invited to speak in front of the Food and Agriculture Organization of the United Nations (**FAO**) in an online event on October 30th. The talk deals with the non-western look at bees and beekeeping with a special focus on two SAMS project target countries Ethiopia and Indonesia.



By UNIGRA

PLANNED SCIENTIFIC PUBLICATIONS – COMING UP

- "Transition of *Apis mellifera* beekeeping in Ethiopia - from traditionalism to modern" (review article) in "Journal of rural studies"
- Working title "SAMS - decentralized bee colony monitoring in Ethiopia and Indonesia" in "Proceedings of Science"

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PLANNED CONFERENCES – COMING UP

- Partner from Latvia will participate in **XI International Agriculture Symposium "Agrosym 2020",** which will be held online in October, 2020. SAMS monitoring system based on ESP will be presented there, as well as economic aspects of precision beekeeping will be presented and discussed

By LLU

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Smart Apiculture Management Services

Thank you

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