Ministry of Foreign Affairs

K2K Huambo Phase II :Strengthen the capacity of Labsidger to offer geodata based products

Commissioned by the Netherlands Enterprise Agency

>> *Sustainable. Agricultural. Innovative. International.*

K2K

Knowledge-to-Knowledge

K2K Huambo Phase II
Strengthen the capacity of Labsidger to offer geodata based products

Final Report

Period: 1st February 2020 – 31st March, 2021

Dr. A. de Miguel – angel.demiguelgarcia@wur.nl

June, 2021

Netherlands Enterprise Agency

WAGENINGEN
UNIVERSITY & RESEARCH

LABSIGDER
Laboratório de Sistema de Informação Geográfica e Detecção Remota

TABLE OF CONTENTS

1 INTRODUCTION

Background

The Government of Angola is developing a policy to diversify its economy. Agriculture is considered as one of the priority economic sectors to be developed. The main purpose of this initiative is to make Angola more self-sustaining by strengthening their capacity to use geodata based products for agriculture management.

To support the development of agriculture in Angola, a bilateral inter-university cooperation project "Building Capacity in Remote Sensing for Agricultural Development in Angola" also known as K2K, was carried out from 2017 to 2019 by the Faculty of Agricultural Sciences (FCA) of the José Eduardo dos Santos University (UJES) in Huambo together with Wageningen University & Research (WUR) in the Netherlands. The aim of the project was to fill knowledge gaps on geo-informatics and remote sensing (RS) to improve the productivity of Angola's agricultural sector.

As a result of K2K and thanks to the great interest showed by FCA-UJES in the topic, a laboratory in geo-data and remote sensing, called Labsidger, was developed. The unit was equipped with the software and hardware required, with internet connection to facilitate data accesibility and the staff was trained (http://www.labsigder.fcaujes.com/index.php). The creation of Labsidger was a clear indication of the institutional commitment of UJES with geo-informatics and RS. However, the long term sustainability of the unit will depend on the capacity of UJES to implement their business plan and acquire new assignments in order to gain some financially independence from the University. One of the main challenges identified with the managers of FCA-UJES was the lack of capacity of the current staff to manage the Lab and to change their mentality to a more business oriented approach. The creation of geodata and agricultural knowledge based products, including trainings and services will be key to strengthen their position. However, Labsidger does not yet have the maturity required to implement by themselves the business plan developed.

Among other collaborations, the cooperation with the ongoing Mavo Diami initiative would be a great opportunity for Labsidger to get enough workflow for the next years, but also to be in direct contact with international private institutions. It is also expected that during Mavo Diami, the market for geo-data and remote sensing tools will be further developed in Angola. It is therefore important that the FCA-UJES is well established to adjust to growing market.

Objectives

This project aims to strengthen Labsidger, the geo-services unit of FCA-UJES in Angola, with a more bussines oriented approach in order to provide the Angolan's agri-sector with relevant, specific and timely geo-data products to improve sustainable food production and/or improve efficiency in the use of inputs for food production.

2 Main results achieved during project

Note: The restrictions due to the current Covid-19 Outbreak *caused the modification of some of the activities planned in the project proposal. Those modification were previously agreed with RVO. Although Angola was not as severe affected as Europe, a lockdown was in place for almost all the spring 2020, with all the staff from UJES working at home. Restrictions to internal displacement was also in place, limiting travels to other regions within the country. This, together with the international travel bans made impossible the visit of the international staff to the project area.*

During the development of the project, the partners identified that Activity 1.2, "Co-creation of a portfolio of assignments for new products and services" should be the core of K2K. The identification and development of new market oriented products to be offered to potential clients will allow Labsidger to increase his visibility and its capacity to engage with potential clients.

2.1 Summary of results and performance achieved

A summary of the activities and results developed during the project (February 2020 to March 2021) could be found in Table 1.

Table 1. Summary of activities developed and the level of performance achieved

Activities	Perf.	Description
Result 1. New geodata based products delivered (to expand and strengthen their services)		
1.1 Facilitate the initiation of essential agriculture knowledge management process to develop and evolve open access "spatially explicit knowledge rules" required for development of Angolan agriculture geodata based services.		
• Engage, mobilize and involve experts in Angola (within and outside UJES) • Define scope of the process, and future vision on evolution of the process and knowledge domains (rules) • Rapid knowledge collection, reviewing, refinement and approval of a key set of priority rules for key crops • Identify the key geodata/spatial products to be developed and delivered by Labsigder as part of the knowledge management process (eg land suitability maps, soil map) • Agree on the geodata products to be developed, through a MoU between UJES and Mavo Diami.	100%	• A knowledge workshop, called "Obtaining local expert knowledge on soils, agriculture and water" was co-organized between K2K (UJES and WUR) and Mavo Diami consortium. It was developed in March 2020 (10th and 11th).
1.2 Co-creation of a portfolio of assignments for new products and services		• This activity was identified as a key component by the project partners.
• Identify some relevant products based on the requirement of key customers, such as Mavo Diami, the regional government of Huambo or other knowledge institutions. • Develop show cases pilot of those products in order to strengthen the commercial process, with support of a coach focusing on pragmatic	200%	• Two geo-data products were selected according to their potential suitability, business opportunities and potential links with other institutions. • Two pilots (one per geo-data product) were developed and the methodology and

practices relevant for Labsigder (training on the job and coaching sessions) • Validate the value proposition with the key customer (segments) and estimated real cost. • Deliver on identified and contracted customers.		results are available to be used as show cases by Labsidger.
Result 2. Strengthened Institution with a clear (refined) Business Model Plan and Financial Plan		
2.1 Refine the business model plan and financial plan with support of a coach • Value proposition (focus on what not to do, understanding the limitations and development path of Labsigder) • Customer segments and named customer leads (see result 1) • Core Capabilities / Activities, with focus on professionalisation of market based product development and delivery (business mindset) • Financial plan including income and cost projections for 1-3 years, including assessment of current costs and income (cost coverage)	*80%*	• Co-working process between WUR and Labsidger. • This activity was connected with the development of the pilots (Activity 1.2), making more explicit the business oriented approach of the geo-data products developed. • A business assessment was developed for the two geo-data products created. • UJES is in a process of internal reorganization (elections of a new Rector). A financial plan was developed but not agreed yet with the board of directors yet.
2.2 Obtain a certification from IGCA to provide geodata based products according with the preliminary conversations already developed between both institutions	*Not achieved*	• Several contacts were kept between both institutions. A face to face meeting in Luanda was planned, but not possible to make it due the Covid19 restrictions.
2.3 Strengthen and build partnerships required following the refined business model • A partnership with MavoDiami is developed with UJES • And/or a partnership with IGCA (Instituto Geográfico e Cadastral de Angola) is developed to involve Labsidger in national programs (such as Minha Terra). • And/or collaboration and partnership with other African Institutes developing and delivering geodata services	*100%*	• UJES signed a LoI with the Mavo Diami • Several partners from Mavo Diami and the KRES initiative was involved in one of the pilot selected in the Activity 1.2, contributing with knowledge and budget. The pilot will continue after the K2K lifespan, thanks to the cooperation between UJES and Mavo Diami partners. • Labsidger (UJES) is involved in a joint proposal led by WUR and partners from KRES initiative for the European call "DESIRA - RESEARCH AND INNOVATION APPLIED TO FAMILY FARMING FOR CLIMATE CHANGE ADAPTATION AND RESILIENCE IN ANGOLA". • Several contacts was kept with relevant institutions in Angola, such as AIPEX (Agency for Private Investment and Promotion of Exports of Angola) or the KRES initiative, or outside the country such as ISA (Instituto Superior de Agronomia do Lisboa) or FCT (Fundação para a Ciência e a Tecnologia).
2.4. Increase Labsigder awareness and visibility • Labsidger participate in at least three dissemination events (agri-food fairs, meetings	*80%*	• Due to the Covid19 situation, most of the events were cancelled in Angola.

and scientific workshops) organised by the other Angolan's or international entities.
- The website is updated and improved

- The website was improved and more material (geo-data and didactic material) is freely available.
- The results from Activity 1.2 are disseminated by two publications
- Two brochures were created with a business oriented approach and distributed between relevant stakeholders.
- Labsidger incremented his visibility by using social media channels, specially WhatsApp groups

A more detailed description of some of the activities developed and the results achieved can be found in section 3 (Result 1) and 4 (Result 2).

2.2 Oportunities

- Theere is a growing market in the provision of geo-data services for agriculture, such as the KRES initiative, where Labsider could be a suitable local subcontrator for field work (data collection and analysis) and data processing.
- There is a lack of digital information in the country, specially related with bio-geophisical variables, such as soil, water, land use or climate information. There is an urgent need of digitalisation of geo-data information.
- Colaboration among different department from FCA-UJES could be translated into more integral services from Labsidger to potential clients (i.e. soil related services) but also to support internal units from UJES to provide geo-data services.
- Labsidger stregths FCA-UJES in the capacity building of students by involving them in trainigns and projects.

2.3 Bottlenecks

- The bussines orientation of Labsidger is still very limited and the Unit still follows a traditonal project oriented approach based in grants. This barrier will be difficult to break since it is a cultural characteristic of the institution itself (UJES).
- The personal from Labsidger is not fully dedicated to the Unit and depends on the projects available. For the time being, the workload is not enough to ensure a minimum viable size.
- Most of the contacts from Labsidger relies on the public sector, who are not very willing to invest in geo-data products, because of a limited access to economical resources.
- The relation and contacts between Labsidger and private agribussines sector is limited, altough has improved thanks to the current project.

2.4 Other relevant outputs from the project

- Thanks to the colaboration between WUR and UJES, one staff from Labsidger (Josue Isau Quissindo) obtained an scholarship to develop a PhD on an international institution from the

Angolan government. Although the candidate is still developing a strong proposal, the intention is to devolp his study with WUR under the supervision of Prof. Jeste Stoorvorgel. The topic selected will be related with “Study soil degradation and forest and its impact on agriculture, water resources and climate change in Central Angolan Plateau”.

3 Result 1. New geodata based products delivered

Result 1.1 - Facilitate the initiation of essential agriculture knowledge management process to develop and evolve open access "spatially explicit knowledge rules" required for development of Angolan agriculture geodata based services.

Coordinated by UJES and in cooperation with Mavo Diami partners, a knowledge workshop entitled "Obtaining local expert knowledge on soils, agriculture and water" was developed the 10th and 11th of March 2020 in the Faculty of Agronomic Sciences (FCA-UJES) in Huambo (see program in Annex 1), with the aim to:

- Identify a group of experts able to provide agricultural knowledge to develop and validate future geo-data products.
- Create a network of experts to provide inputs and feedback on potential geo-data products.
- Collect relevant information on soil and water management in the Angolans' agricultural sector (and mainly for the provinces of Huambo, Bie and Cuanza Sul) to be used as an input for future geo-data products.

The workshop was co-organized by several institutions both from K2K (UJES and WUR) and Mavo Diami (WorldVision, Future Water and Aequator) and moderated by UJES (Prof. Imaculada Henriques). The cost associated to the workshop was fully covered by Mavo Diami (travel cost of participants, DSA, lunch, etc.).

An initial identification of experts was developed, trying to cover the most relevant aspects for agriculture development: soil, fertility, irrigation, crop, climate, pests and geo-data. To reduce the logistic challenge, those experts belong to institutions of the regions of Humabo, Bie and Cuanza Sul, although most of them had previous experience in other regions of the country.

A total of 33 participants from several Angolan and Dutch institutions were identified and engaged in the workshop (see a full list of participants in Annex II). The institutions involved were: Universidad Jose Eduardo dos Santos (UJES), Instituto Superior Politecnico do Kwanza Sul (ISPKS), Instituto de Investigação Agronómica (IIA), Ministério da Agricultura e Florestas, Centro de Ecologia Tropical e Alterações Climáticas (CETAC), Instituto de Tecnología Agro-Alimentar de Malanje (ISTAM), Universidade Mandume ya Ndemufayo, Instituto do Desarrollo Agrario, FAO, Market-oriented Smallholder Agriculture Project (MOSAP), ADRA Angola, GrupoLider, World Vision, FutureWater, Aequator and Kres.

WUR staff finally couldn't attend personally the workshop due to the Covid-19 Outbreak, although it was actively involved in the coordination process.

The participants were divided in several working groups according to their background and previous expertise. As a result, three knowledge matrix were created:

1) Relevant factors affecting agriculture in Angola (table 2).
2) Overall description of agricultural practices in Angola (table 3).
3) Specific agricultural practices for some crops in Angola: sweet potato, maize, rice, cassava, beans and tomato (table 4).

These matrixes gather the most relevant agricultural practices in Angola according to the timing (before, during and after cropping season). Among other potential usages, the matrixes will be used as an input by Mavo Diami consortium to create a set of "management rules", in order to develop a tool for farmer advice (under development).

Other objective of the workshop was the creation of a "network of experts". Thanks to the active interaction between the Angolans' expert during the workshop, the knowledge network was consolidated, with most of the participants willing to engage. However, the main challenge identified was how to keep the network alive after the workshop, if no resources are allocated to organise regular meetings. The best way identified by the participants to keep the network active was through the creation of a Whatsapp group, where relevant knowledge and information could be shared between the experts. Today, the group counts with more than 30 people and is already in use to test and validate a meteo advice service created by Mavo Diami for the province of Huambo.

Other relevant outcome from the workshop were:

- Soil information is a valuable asset not usually available in Angola, and even less in a spatial-explicit way. The need of proper and digital soil information was highlighted by most of the experts.
- Field data collection from farmers is usually done by several Angolan's institutions. However, this information is usually not available with an spatial distribution, limiting the impact for further analysis.

Table 2. Relevant factors affecting agricultural practises in Angola

	Land use	Soil	Crop	Field practices	Agro-Meteorology	Agro-Hydrologist
Before cropping season	Forest protected areas	Terrain slope	Type of crop	Soil tillage	Rainfall for next cropping season	Water availability for the next cropping season
	Urban areas	Nutrients	Variety	Quality seeds		
	Existing crop areas	Soil water storage capacity	Growth period	Distance between plants	Air temperature for next cropping season	Crop water requirements for the next cropping season
	Plans for new crop areas		Root depth	Plant density		
		Effective soil depth	Quality of seed		Wind speed for next cropping season	
	Change to crop area	Soil texture		Erosion control techniques		
	Crop types	Stoniness		Plagues planning	Relative humidity for next cropping season	Irrigation schedule (irrigation volume, irrigation interval)
		Soil Classification		Fertilizers planning		
		Soil structure			Measurements	Irrigation type (e.g. drip)
During cropping season	New crop areas	Root depth	Planting dates	Mulching	Rainfall forecasts	Changing irrigation schedule (irrigation volume and/or irrigation interval)
		Soil structure	Germination phase	Erosion control techniques	Air temperature forecasts	
			Vegetation phase		Wind forecasts	
			Flowering phase			Measurements

			Ripening phase Monitore plagues Apply fertilizers	Fertilizer application/interval Plague monitoring Disease monitoring	Relative humidity forecasts Measurements	
After cropping season	Change to another crop type Change to another land use	Erosion control	Markets Store the crop in… Sell the crop in…	Prepare the field for next season Bare soil Erosion control techniques	Evaluate the accuracy of forecasts Measurements	Storing water for next cropping season Measurements

Table 3. Overall description of agriculture in Angola a

	Soil	Land use	Agro-Meteorology	Agro-Hydrologist
Before cropping season	Selection of the planting area Soil colour Soil preparation (manually, tractor oxen) Fertilization of basal dressing with a compound fertilizer NPK) Crop rotation	Property: owned by the state and divided in Rural and urban Use: Can be used by any citizen as this land are called the reserve for the state Land acquisition: require land from the state, heritance and buy from the state. Legalization: from the local or traditional authorities, land administration at commune or municipality levels. Land exploitation land should be used within three-five year after acquisition, otherwise the government can receive away the land	Germination success in the fields depends on the rains. Regular rains in the previous months should not be more or less to maintain the good growth of the crops. Certain insects like crickets to help the farmers to know that the rains are established and they plant their crops. The germination of the world grass or bushes help to tell the farmers that there is good rains to now plant their crops. High temperatures also show that the rains are about to come.	Cultivation is based usually on the rains on the uplands and small plots in low lands where they depend on rivers and lakes in the habitation land. Usually irrigation is recommended to be done in morning and afternoon depending on the soil condition and climatic condition. The types of irrigation are manual irrigation using buckets, furrow irrigation and flood irrigation.
During cropping season	Top dressing Weeding Application of pesticides and fungicides			
After cropping season	Leave the crop residues Dry soil preparation Application of compost manure or animal			

Table 4. Overall description of agriculture in Angola

	Sweet Potato	Rice	Maize	Tomato	Cassava	Beans
Before cropping season	Variety selection looking at income, pest and disease and the production cycle. Land selection	**Land selection** Low lands (along the river, Lakers) or upper lands **Varieties** Certaneja, Cailaila, Limpompo, Neriacal 19, Nerica4 and Cilewa	**Land selection** Seasons for planting maize July to August and October to November **Varieties** local or hybrid in the first season they use local varieties and in the second season they use hybrid	**Land selection** The seed bed should be located near the source of water in a place where its rarely cultivated on flat area Best season to make the nursery should be between February to June	**Varieties** Sweet and bitter varieties	**Varieties** Selection of seeds and variety selection per the farmer depending on the market requirements of the varieties of the beans. Quality of the seeds
During cropping season	**Planting Dates**: Two seasons (Feb-mar, Jul-set) **Land preparation & cultivation** Planting spacing of the crop depends on the objective of the farmer: for seeds the spacing should be 75cm x20cm for consumption the spacing should be 75cm x40cm **Growth Period** 90-120 days, but it can go up one (1) year with local varieties. Sprouting takes 8-15 days Vegetative growth takes 30-40days / initial from flowering of the crop	**Planting Dates**: October to December **Land preparation & cultivation** August and September Ploughing and harrowing Arrangement of the of the field by making beds, division main beds in the main field, making furrows for drainage, construction protection ridges and compacting of the soils. Planting of the seeds can be in lines,	**Planting Dates**: January-February in low land June -July in the upper land August-September upper land **Land preparation & cultivation** Organization of the equipment (oxen, manually using hoes or tractor) Uprooting in the new or virgin lands in September to October First ploughing in the virgin land should be done in October. Seedling and fertilization in beds manually all the season 5kg can be planted in a day and depending on the size of the seeds 25-30kg per hectare.	**Land preparation & cultivation** Should be in simultaneous with the seed bed. Between30-45 days but it will also depend of the growth rate of the plants in the seed beds Spacing of 1mx50cm,70cmx40cm,50cm x50cm, Water in days intervals or 7days interval depending of the soil moisture holding capacity or season of the planation. Prevention treatment of the crop should be done	**Planting Dates:** October to December and January to March **Land preparation & cultivation** Land preparation in August and September length of stacks 20cm-30cm Ridges 50cm-60cm high Spacing 1mx1m between ridges Spacing 1mx30cm **Growth Period**	**Planting Dates**: First season October/November Second season January/February Third season July /August (Wet lands) **Land preparation & cultivation** Manually or by oxenIn virgin land it should be done before three (3) months at a depth of 20-25cm deep. Spacing can be at 80x40cm with 4-5 seeds per station

	Continuous monitoring from germination to vegetative growth **Fertilization** Basal dressing with a compound fertilizer Top Fertilization Urea Sulfate of Ammonia after 35 days Mulching is not used due to the fact that the farmers no know this method.	broadcasted or in the nurseries **Growth Period** Germination takes about 7 days Maturing and harvesting is in Abril to June **Fertilization** Basal dressing should be done 15 days after germination **Harvesting** Should be let to dry very much in the field otherwise the ALL the seeds will fall off in the field. Pest are rats and birds	Fertilization is done manually as basal dressing in all seasons with NKP 150-200kg of Animal manure should be applied in a hectare. Spacing should be 75cm x50cm 3-5 seeds per station **Fertilization** Top dressing should be done after 35 days with NPK, Urea and sulfate of Ammonia. Control of pests and diseases. Irrigation and drainage.	Weeding should be done frequently to prevent the infection of the pests in the crop. **Fertilization** Top dressing should be done with Compound D12,24,12. Or urea Disease and pest control should be a continuous process during the growing of the crop.	Spouting 8-15days Plant duration period 6-24 month Weeding is done depending on the weeds growing in the field.	In mixed culture maize and beans 60cm between plants 10to 10 cm. **Growth Period** Germination 5-8days after sowing Vegetation growth period is between 25-35days Maturing 65 to 120 days Weeding when required They don't monitor of pest and diseases in beans production. **Fertilization** No top-dressing fertilization in beans In mixed culture with maize you can apply 80kg in a hectare.
After cropping season	**Harvesting** Manually it's a continuous process up to two or three year before the whole plan can be uprooted **Post harvesting** Storage the tubers are left in the ground to save seeds for the coming season and family consumption. Sometime warehousing (with temperature control) Transporting of the farm products to the markets (personal transport, Hiring, agents) **Commercialization** Information of prices (which is defined by the buyers)		Warehousing Treatment Marketing	**Harvesting** Harvesting depending on the color of the fruits **Commercialization** Informal market	**Harvesting** Manually **Commercialization** Informal market Eaten as cooked and transformed in meal meal (flour)	**Harvesting** Manually **Post harvesting** Drying of the beans is done naturally and no special condition are required. Threshing of the beans is done naturally depending the exposure to the natural temperatures. Storage is done in bags, drums, calabashes. The stored beans is monitored to avoid weevils **Commercialization** Informal market The prices is determined by the demand according the availability of the product.

Result 1.2 - Co-creation of a portfolio of assignments for new products and services

During the development of the project, the partners identified that Activity 1.2, “Co-creation of a portfolio of assignments for new products and services” should be the core of K2K. The identification and development of new market oriented products to be offered to potential clients will allow Labsidger to increase his visibility and its capacity to engage with potential clients.

A co-creation process was follow in order to develop this activity, involving strategic partners outside the project.

A list of potential products that could be offered by Labsidger according to the necessities of its potential clients was developed. Based on this assessment, the output from the workshop and according to the requirement of some of the key customers, such as Mavo Diami partners and the regional government of Huambo, two products were selected as candidates to become a pilot project (show case). Those pilots will be developed under the umbrella of the K2K project.

- Pilot 1: develop an approach for the digitalization of soil maps in Angola: pilot project in the province of Huambo.
- Pilot 2: develop a methodology for field data collection to evaluate the agrarian sector: pilot project in the in municipality of Ecunha (Huambo).

Pilot 1: develop an approach for the digitalization of soil maps in Angola: pilot project in the province of Huambo.

Context

The use of soil maps is a key tool for agriculture development, since it allows planners and farmers to take informed decisions on agricultural management based on soil properties. Soil maps in Angola are scarce, outdated and usually only available in analogic versions (paper). Usually those maps, created in the 60s, are not easily accessible for the agricultural sector in Angola and in many cases they are scattered in some Universities of Europe (Portugal, The Netherlands, etc). The scale of the maps is usually too large (from 1:500.000 to 1:1.000.000) to be used for regional or local assessment and they are focused in soil classification, that can be hardly used for agricultural development.

K2K partners, together with partners from Mavo Diami project (Aequator and WorldVision) and in cooperation with the KRES initiative, implemented a pilot project to test the suitability of the application of the S-world methodology (Stoorvogel et al., 2017)[1] to the region of Huambo. The S-world methodology would allow to produce a set of soil properties maps on a scale of around 1:100.000-50.000 (suitable for regional/local management), by combining the "old" soil map information available at large scale with other soil other information sources (such as the soil profile databases) and auxiliary information for various landscape properties (temperature and precipitation, topography, elevation, land use, and land cover).

Aim

Asses if the S-world is a suitable methodology to develop a set of soil property maps in the context of Angola, in order to create soil-based products for agricultural services.

Description of the activity

The S-world methodology was successfully applied to the region of Huambo, in order to produce a map of Soil Organic Content, with a scale suitable for regional and local assessment (below 1:100.000). To achieve this result, several steps were followed:

1. Identify and asses potential methodologies to update the current soil information of Angola. From this assessment, the S-world methodology was identify as the one with more potential.
2. Make an inventory of suitable geo-data information available for Huambo:
    i. Analogue map "Carta Generalizada dos Solos de Angola II, Distrito do Huambo", scale 1:500.000, 1961.
    ii. Analogue database of soil profiles from "Carta Generalizada dos Solos de Angola II, Distrito do Huambo", 1961. A total of 91 soil profiles are available in the region, with information at different depths for several soil properties: Texture, Organic Matter, pH, Cations (Ca, Mg, K and Na), Cation Exchange Capacity, P, N and Organic Carbon.

[1] Stoorvogel, J. J., Bakkenes, M., Temme, A. J., Batjes, N. H., & ten Brink, B. J. (2017). S-world: A global soil map for environmental modelling. Land Degradation & Development, 28(1), 22-33. https://www.wur.nl/en/Publication-details.htm?publicationId=publication-way-353131373234

iii. Digital soil map of Angola developed by the School of Agriculture University of Lisbon (ISA), scale 1:1.000.000.
iv. Harmonized World Soil Database at 1 km resolution – worldwide
v. Digital Soil Elevation Map (30m resolution - worldwide)
vi. Land Use Map (1 km resolution - worldwide)

3. Digitise the analogue soil profile database, including its georeferentiation.
4. Correct the georeferencing map by comparing with the digital elevation model (DEM).
5. Disaggregate soil associations/units by the combination of the two soil maps available (in digital format) and applying environmental properties (DEM).
6. Assigning soil properties to soil types, by combining the local soil profile database with the Harmonized World Soil Database (worldwide) and other environmental properties (land use map). This step was only applied to Organic Matter Content.
7. Validation process. A preliminary validation process was developed with the judgement from the soil experts from FCA-UJES.

Main Results

- The "old" soil map from the region of Huambo (Carta General dos Solos de Angola II – Distrito do Huambo, scale 1:500.000) was digitised by Labsidger and it is available for all the project partners. This map has been used as background information for the implementation of the S-world methodology.
- A set of "soil profiles" for the region of Huambo has been georeferenced and digitise, including the elaboration of a look-up table with the soil properties.
- A digital soil map for all Angola (scale 1:1.000.000) developed by the School of Agriculture University of Lisbon (ISA) was located and the permission for its use as background information has been obtained from ISA.
- A map with the Soil Organic Content was created and it is available for the project partners. The product is still a beta-version that should be developed in more detail.
- A market oriented brochure was developed to be distributed between potential clients (see Annex VI).
- A international scientific publication with the description of the S-world methodology and its application to Angola is under development and will be submitted for evaluation in the coming months.
- A project proposal was developed by UJES to extend the soil mapping activity to a large area. This proposal includes a cost estimation (Annex VIII).

Next steps

Although this pilot is mainly developed under the K2K project, it is also in the interest of MavoDiami project (Aequator and WorldVision). Thanks to this, a more detailed validation of the current beta version will be developed in the coming months. For doing this, the following steps are planned:

1. Validate the Soil Organic Map (beta version) in certain areas by comparing with soil maps with a lower scale (1:10.000 to 1:5.000) (support from WorldVision).
2. Validate the Soil Organic Map (beta version) in the field, by using the Visual Soil Assessment approach (support from Aequator).

3. Adjust the soil map units and include information for agricultural management

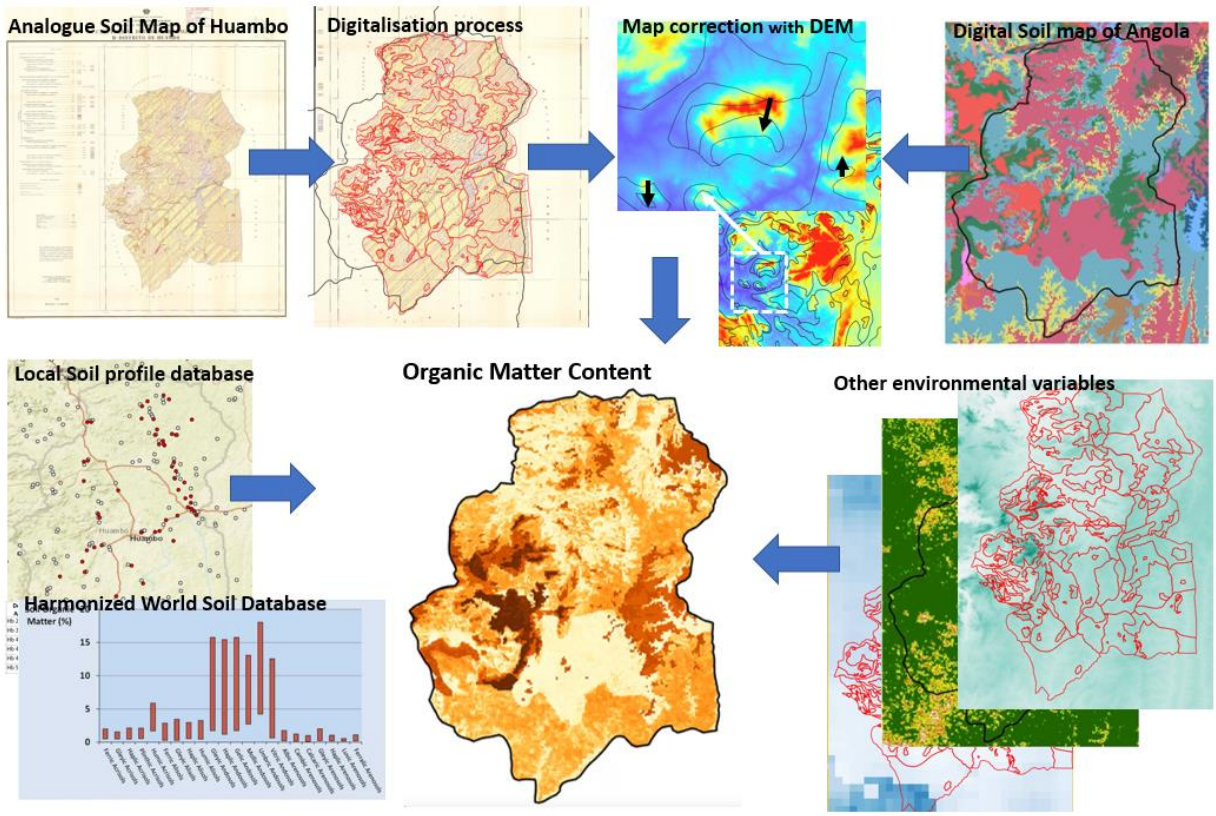
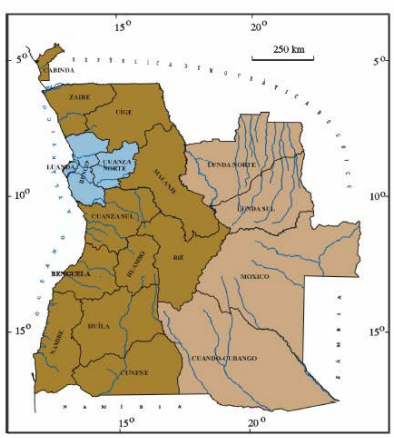


Figure 1. Steps followed with the S-world methodology to create a soil organic matter content map (beta version) of the region of Huambo

Limitation of the methodology

The map of Soil Organic Content created by the application of the S-world methodology presents some limitations in accuracy and scale, mainly because of the lack of suitable background information. The most relevant bottlenecks identified are:

- Land Use Map – a more detailed/updated land use map is required, with a resolution lower than 1 km (1:50.000). This map can be created on purpose from satellite images for the areas with a higher interest.
- Soil profile database – the number of soil profiles is limited, especially for a certain type of soils. The compilation of more soil profiles from other sources (other projects and/or institutions) as well as the development of field campaigns to fill soil data gaps in certain areas could improve substantially the accuracy of the soil property maps.
- The methodology was applied to the region of



Províncias	Área km² (10³)	%	Escala	Ano
Cunene	77,3			1959
Huíla	79,3			
Namibe	58,0		1:1 000 000	1963
Uige	62,8			1972
Zaire	37,8			
Huambo	33,3			1961
Cabinda	6,9		1:500 000	1968
Benguela	39,1			1981
Cuanza Sul	55,7			1985
Malanje	83,9		1:750 000	1995
Bié	71,0	48		2002
Cuando-Cubango	199,2		1:500 000	
Lunda Norte	106,7			
Lunda Sul	77,6		1:1 000 000	
Moxico	200,8	47		
Bengo	33,5			
Cuanza Norte	24,0		1:500 000	
Luanda	2,3	5		
	1249,2			

Publicadas | Em publicação | Em elaboração

Figure 2. Current situation of the Carta Geral dos Solos de Angola (Raposo y Madeira., 2006)

Business model

S-world methodology has been probe to be an appropriate methodology to update the current soil information available in Angola, providing a set of soil property maps suitable for regional and local assessment (below 1:100.000). The current pilot was focused in the development of a map of Soil Organic Content for the region of Huambo. Therefore, a large initiative is required to extend the current activity to other soil properties and regions from Angola and specially to create soil-based products suitable for the interest of the different stakeholders. This initiative should:

- Engage both the public and private stakeholders
- Improve and update the current Land Use Map of Angola (or the region of interest)
- Improve and update the soil background information by compiling data available from different institutions and by developing a field data campaign to fill gaps in specific areas.
- Develop a set of specific soil-based products according to the interest of the potential clients:

Type of product	Description	Adressed to
Soil property maps at national/regional scale	A set of maps with general soil properties to be used as background information for the elaboration of suitability maps for agriculture	Ministry of Agriculture Regional Governments Large investors
Soil property maps at regional/local scale	A set of maps with properties to be used for farming planning and advice	Regional Goverments Large and medium farmers Farmer Cooperatives NGOs and field schools (“scolas do campo”) Agricultural inputs companies
Nutrient content at local/farm scale	Downscalled maps with detailed information of soil properties and nutrient content. What and where to plant? how to manage (fertilisation/irrigation)?	Large and medium farmers Farmer Cooperatives Small farmers

[2] Ricardo, R. P., Raposo, J. A., & Madeira, M. (2006). Estudos dos solos de Angola pelo ISA e pelo IICT. Contribuição para a Ciencia do Solo Tropical. Angola: agricultura, recursos e desenvolvimento. Lisboa, ISAPress, 97-120.

Pilot 2: develop a methodology for field data collection to evaluate the agrarian sector: pilot project in the in municipality of Ecunha (Huambo).

Context

Field data collection of agriculture in Angola is usually done by traditional methods (on-paper surveys), with no geospatial attributes (at most disaggregated at the municipality level). The use of open source mobile apps, such as ODK (open data kit), allows institutions/companies to collect and manage geo-data in resource-constrained environments. This geodata information could be later processed into more valuable geo-products, such as land use maps or suitability maps.

Aim

Develop an approach for field data collection though mobile devices in order to improve the agriculture base information at different levels.

Description of the activity

A methodology to collect agricultural field data was developed and tested by a pilot project in the municipality of Ecunha, province of Huambo.

1. Design a questioner for agricultural information and implement it in ODK (Open Data Kit), by using the ONA tool.
2. Train Labsidger staff and students in the use of ODK in mobile devices (smartphones and tables)
3. Develop a field campaign in the municipality of Ecunha to collect agricultural information from farmers and detect potential improvements in the methodology
4. Analyse the information and compare with other geodata relevant sources.

Main Results

- A total of 7 technicians and students from FCA were trained in field data collection, including elaboration of questionnaire using the ONA platform and in the use of data collecting tools with mobile devices, through ODK (Open Data Kit).
- A methodology for field data collection was created and tested in the municipality of Ecunha (Huambo). A field trip was organised from 23rd to 26th June, 2020, collecting data from a total of 108 families belonging to 6 “Escola de Campo Agrícola (ECA)” from the Município da Ecunha (Huambo).
- A manual for collecting and analysing agricultural data “METODOLOGIA DE COLECTA DE DADOS EM CAMPO E SUA ANÁLISE PARA AVALIAR O SECTOR AGRÁRIO NO MUNICÍPIO DE ECUNHA (HUAMBO)” was developed and available through the website. The manual includes the most relevant results from the pilot developed in the Município da Ecunha (Huambo).
- A market oriented brochure was developed to be distributed between potential clients (see Annex VII).

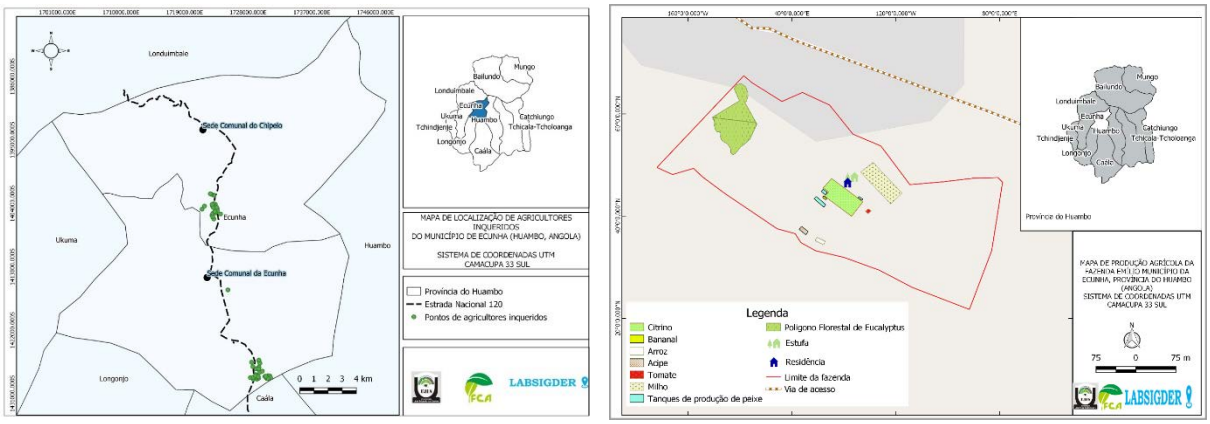


Figure 3. Two examples of the maps developed from the data collected in the field during the field test. Left: Mapa de produção agrícola da Quinta Emílio. Rigth: Mapa de localização dos campos de cultivo visitados no município da Ecunha

Figure 4. Left pictures: Typical smallholder farm and. Right pictures: process of field data collection by technicians and socialisation with the population.

Business model

Labsidger can offer the product to its clients in two models:

- Tailor made surveys, where Labsidger can offer a comprehensive service according to the customer needs, including the elaboration of the survey, design and implementation of the field data campaigns, data analysis, reporting and elaboration of maps. The cost will be estimated according to the specific requirement of each client.
- Assistance model, where Labsider offer to its client a capacity building program to implement a field data collection approach within the institution, together with a follow-up and support process, with an estimated cost of 450 000 to 600 000 AOZ, depending on the staff to be trained.

Identification of Potential clients (applied both to pilot 1 and 2)

- Ministério da Agricultura e Florestas;
- Instituto de Desenvolvimento Agrário;
- Instituto de Desenvolvimento Florestal;
- Gabinetes Provincias da Agricultura;
- Repartições Municipais da Agricultura e Floresta;
- Instituto de Investigação Agronómica;
- Associações e Cooperativas Agrícolas;
- Organizações Sem Fins Lucartivos;
- Instituições e Empresas Internacionais que actuam no sector agrário angolano, como a FAO (Organização das Nações Unidas para a Alimentação e a Agricultura) e o PNUD (Programa das Nações Unidas para o Desenvolvimento em Angola).
- AIPEX - Agency for Private Investment and Promotion of Exports of Angola
- Grandes investidores internacionais interessados no desenvolvimento agrícola

4 Result 2. Strengthened Institution with a clear (refined) Business Model Plan and Financial Plan

Refine the business model plan and financial plan with support of a coach•

The development of an integral business plan was not specifically achieved during this project, although some improvements in the Business Plan already developed in the previous phase were done. Among other factors, UJES is in a process of internal reorganization (elections of a new Rector). A financial is available but not agreed yet with the board of directors.

However, this activity was mainly connected with the development of the pilots (Activity 1.2), making more explicit the business oriented approach of the geo-data products developed. In this regard, a co-working process between WUR and Labsidger was developed, in order to:

- Identify the potential clients and how the products developed will align with their necessities.
- Analysis of internal capacities to further develop the geo-data products selected (two pilots), and engage, if needed, with other partners who could support the Unit in offering those products (i.e. partners from the KRES initiative).
- Identification of other potential limitations when offering those products (human capital, capacity of processing, hardware, etc)
- Financial analysis, with an estimation of the potential cost of the geo-data products selected.

Obtain a certification from IGCA to provide geodata based products

Several contacts was kept between FCA-UJES and IGCA in order to obtain a certification to provide geodata based products. However, due to the Covid19 restrictions, people from FCA-UJEs was not allow to travel to Luanda at the agreed period and this agreement has been posponed till further notice.

Strengthen and build partnerships required following the refined business model •

- UJES signed a LoI with the Mavo Diami
- Several partners from Mavo Diami and the KRES initiative was involved in one of the pilot selected in the Activity 1.2, contributing with knowledge and budget. The pilot will continue after the K2K lifespan, thanks to the cooperation between UJES and Mavo Diami partners.
- Labsidger (UJES) is involved in a joint proposal led by WUR and partners from KRES initiative for the European call “DESIRA - RESEARCH AND INNOVATION APPLIED TO FAMILY FARMING FOR CLIMATE CHANGE ADAPTATION AND RESILIENCE IN ANGOLA”.
- Several contacts was kept with relevant institutions in Angola, such as AIPEX (Agency for Private Investment and Promotion of Exports of Angola) or the KRES initiative, or outside the country such as ISA (Instituto Superior de Agronomia do Lisboa) or FCT (Fundação para a Ciência e a Tecnologia).
- One staff from UJES will probably develop a PhD in WUR, under the supervision of Prof. Jestse Stoorvogel.

Increase Labsigder awareness and visibility

A large number of activities were developed in order to disseminate the results from the project and increase the visibility of Labsidgert. Among others, the most relevant are:

- The contents of the Website have been updated, including information of the pilot projects developed. The website was improved and more material (geo-data and didactic material) is freely available.
- One scientific publication is under progress with the results of pilot 1 (soil mapping methodology)
- One publication addressed to a general audience was developed from pilot 2 (METODOLOGIA DE COLECTA DE DADOS EM CAMPO E SUA ANÁLISE PARA AVALIAR O SECTOR AGRÁRIO NO MUNICÍPIO DE ECUNHA (HUAMBO))
- Two business oriented brouchers were developed and distributed among relevant stakeholders
- Labsidger incremented his visibility by using social media channels, such as WhatsApp and Telegram groups.

ANNEX I. PROGRAM OF THE KNOWLEDGE WORKSHOP

Knowledge Workshop in Huambo, Angola - Obtaining local expert knowledge on soils, agriculture and water.

Workshop location: University José Eduardo dos Santos (FCA-UJES) Campus Chianga, Huambo, Angola

Dates: March 10th - March 11th, 2020

Knowledge Workshop **Tuesday, March 10th, 2020**		
08H30-09H00	Introduction: ● *Virginia Lacerda (Vice Reitora Área Científica e Pós-Graduação of FCA-UJES)* ● *Imaculada Henriques (Head of FCA-UJES)* *Purpose and objectives of the workshop (Alexander)* *Goals of this workshop day, explain the method (local experts need to talk)* *Sustainable knowledge network*	FCA-UJES/ Mavo Diami
09H00-09H30	*Presentation about Dialog Design (Chiteta Capalo)* *Crop timeline (decisions before, during, after the planting period). Example crops (e.g. potato)* *Knowledge crop roadmap (e.g. potato)*	Mavo Diami
09H30-10H30	*Self-presentation of local experts, including expertise (topic and areas)*	UJES and other local experts universities/institutions
10H30-11H00	*Coffee and snacks*	All
11H00-14H00	*Potato knowledge rules (example crop) - Knowledge matrix* *Moderator: Imaculada* *Identify subgroups of local experts or work all together (depends on expertise and number of participants)* *Subgroups working together to fill in the Knowledge matrix.* *Knowledge matrix: Decisions before, during and after the planting period considering different information about soils, plagues, crops, field practices, climate, etc.* *Discussion about information/data requirements (e.g. based on policy, regulations), information/data used, information/data needed to support decisions making to answer the following questions: where to plant, what to plant, when to irrigate and how much to irrigate.*	Mavo Diami UJES and other local experts universities/institutions

14H00-15H00	*Lunch*	All
15H00	*End of the session*	

Knowledge Workshop Wednesday, March 11th, 2020		
08H30-09H00	*Summary of the previous sessions. Goals of this day*	Mavo Diami
09H00-11H00	*Subgroups working together to fill in the Knowledge matrix.* *Choose two or three relevant crops and work with the same methodology as for potato to fill the knowledge matrix* *Knowledge matrix: Decisions before, during and after the planting period considering different information about soils, plagues, crops, field practices, climate, etc.*	Mavo Diami UJES and other local experts universities/institutions
11H00-11H30	*Coffee and snacks*	All
11H30 - 13H00	Presentation of results of each team *Discussion about information/data requirements (e.g. based on policy, regulations), information/data used, information/data needed to support decisions making to answer the following questions: where to plant, what to plant, when to irrigate and how much to irrigate.*	Mavo Diami UJES and other local experts universities/institutions
13H00 - 14H00	*Creation of the "Sustainable knowledge network"* *Discussion in how to keep the "knowledge rules network" alive (coordination, management, feedback, etc)*	Mavo Diami UJES and other local experts universities/institutions
14H30 - 15H00	*Closing remarks*	Mavo Diami
15H00-16H00	*Lunch*	All

ANNEX II. LIST OF ATTENDANT TO THE KNOWLEDGE WORKSHOP

MAVO DIAMI

World Vision ANGOLA

10/03/2020

Workshop de Conhecimento no Huambo, Angola - Obtenção de conhecimentos especializados locais em solos, agricultura e água.

Lista de Presenças

Nº	Nome	Instituição	Telefone	Email	10/3/2020	11/3/2020	
1	Israel J. N. Domingos	ISPKS	933029717	[illegible]@gmail.com	✓	2	
2	Lourindo C. Ladeira	ISPKS	921905366	GIAMBULALADEIRA@GMAIL	✓	4	
3	Peltier Rossi Loino de Aguiar	ISPKS	925368845	peltieraguiar@gmail.com	✓	4/3	
4	[illegible]	ITA-HBO	923459727	[illegible]	✓	4/3	
5	[illegible]	ITA-HBO	923530119	[illegible]	✓	4	
6	Ornelas Vavaumba	ISTAM-Malanje	923238[illegible]	Ornelarodrigues2011@hotmail.com			3
7	José Amândio Paulino	WVI	923531292	JOSE_AMANDIO@WVI.ORG	✓	4	
8	Chitata Capalo	WVI MAVO DIAMI	934603410	ChitataCapalo@WVI.ORG	✓	6	Aavo
9	Herida Gonçalves A. Lopes	ISPKS	924820000	[illegible]@gmail.com	✓	2	
10	Santos Quizembe	IIA	934784336	SANTOSQUIZEMBE@YAHOO.COM.BR	✓	4/2	
11	Isaú Quissindo	FCA-LABSIGDER	927627744	[illegible]2011@hotmail.com	✓	1	
12	Ngoma M. Fortuna	FCA-LABSIGDER	926043142	ngomafortuna@gmail.	✓	5	
13	António Manuel Teixeira	FCA-DER	923489622	antmanuelteixeira@gmail.com	✓	5/2	
14	Helena da C. Maliti	IIA-HBO	923459515	helenamaliti@gmail.com		3	
15	JOAQUIM LAURIANO	CETAC	927684258	JOAQLAU2000@HOTMAIL.COM	✓	6	

MAVO DIAMI

World Vision ANGOLA

10/03/2020

Workshop de Conhecimento no Huambo, Angola - Obtenção de conhecimentos especializados locais em solos, agricultura e água.

Lista de Presenças

Nº	Nome	Instituição	Telefone	Email	10/3/2020	11/3/2020
1	Amilcar Salumbo	FCA/IIA	926071048	asalumbo@hotmail.com	X	1
2	Luzia G. Baptista	IIA/ HBO	924398237	baptistaluzia13@hotmail	X	4/3
3	Alister Pinto	HCTA	924361255	chitatap@gmail.com		6/4
4	Joaquim Pinto Afonso	IDA-HUAMBO	923465398	pintoafonso@hotmail.com	X	4
5	Celestino N. J. Essuvo	FAO-ECA'S MOSAP	921554311	celestinovonjila2010@hotmail.com	X	4
6	Hélder Marcelino	Fac. Economia	934508777	helderecco@yahoo.com.br	X	3
7	Armando Chc. Pintar	ADRA	924023986	achitiB@hotmail.com	X	4
8	Antonio A. Chc. Kamutali	FCA	924348455	ninoKamutli@gmail.com	X	3
9	Segenet					4/2
10	HANS					2
11	Alex					6
12	Inacuba					3
13	Mango					3
14	Everlard					2
15	Adriano Braga Bingo Bingo	FCA	948620944	adrianobingobingo@gmail.com		1/2

MAVO DIAMI

World Vision ANGOLA

10/03/2020

Workshop de Conhecimento no Huambo, Angola - Obtenção de conhecimentos especializados locais em solos, agricultura e água.

Lista de Presenças

Nº	Nome	Instituição	Telefone	Email	10/3/2020	11/3/2020	
1	José Domingos	FCA	929138[illegible]	Zedma4@gmail.com	X	4	pesticida
2	Carlos Conceição	FCA	923061582	Conceicaocarlos6@hotmail.com	X	4	pesticidas
3	Imaculada Matias	FCA	925780778	cessaeyahoo.com.br			
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

MAVO DIAMI

World Vision ANGOLA

Workshop de Conhecimento no Huambo, Angola - Obtenção de conhecimentos especializados locais em solos, agricultura e água.

11/03/2020

Lista de Presenças

Nº	Nome	Instituição	Telefone	Email	10/3/2020	11/3/2020
1	Israel Freitas Mongando Domingos	ISPKS	933021717	nongando@gmail	✓	✓
2	Peltier Rossi Vinho de Figueiras	ISPKS	925368845	peltieraguier@gmail	✓	✓
3	António Manuel Teixeira	ECA	923489622	antmanuelteixeira@gmail.com	✓	✓
4	Vilda F. Ch. S. Pedro	I.I.A-Hbo	923530119	vildaformacaodm@gmail		X
5	Hélio Md. Vicente Tiago	I.I.A-Hbo	923362189	heliotiago22@gmail.com		✓
6	SANTOS QUIZEMBE	IIA	934784336	SANTOSQUIZEMBE@yahoo.com.BR	✓	✓
7	Luzia J. Baptista	I.I.A	924398237	baptistaluzia13@hotmail	✓	✓
8	Alister Piate	HCTA	924361255	Chitetelp@gmail.com		
9	Antonio Kamutali	FCA	924348453	ninokamutali@gmail.com		
10	Joaquim Pinto Afonso	IDA	923465398	pintoafonso760@hotmail.com		X
11	Hans VAN CEERSWIJK	KEESCIDER	+31622393844	hans@kees.io		✓
12	Alexander Kaune	Future Water	+31685434291	a.kaune@futurewater.nl	✓	✓
13	Everhard van Essen	Aequator	+31626518630	evanessen@aequator.nl	✓	✓
14	Segenet Tessema	WV	930306731	Segenet_tessema@wvi.org	✓	✓
15						

MAVO DIAMI

World Vision
ANGOLA

11/03/2020

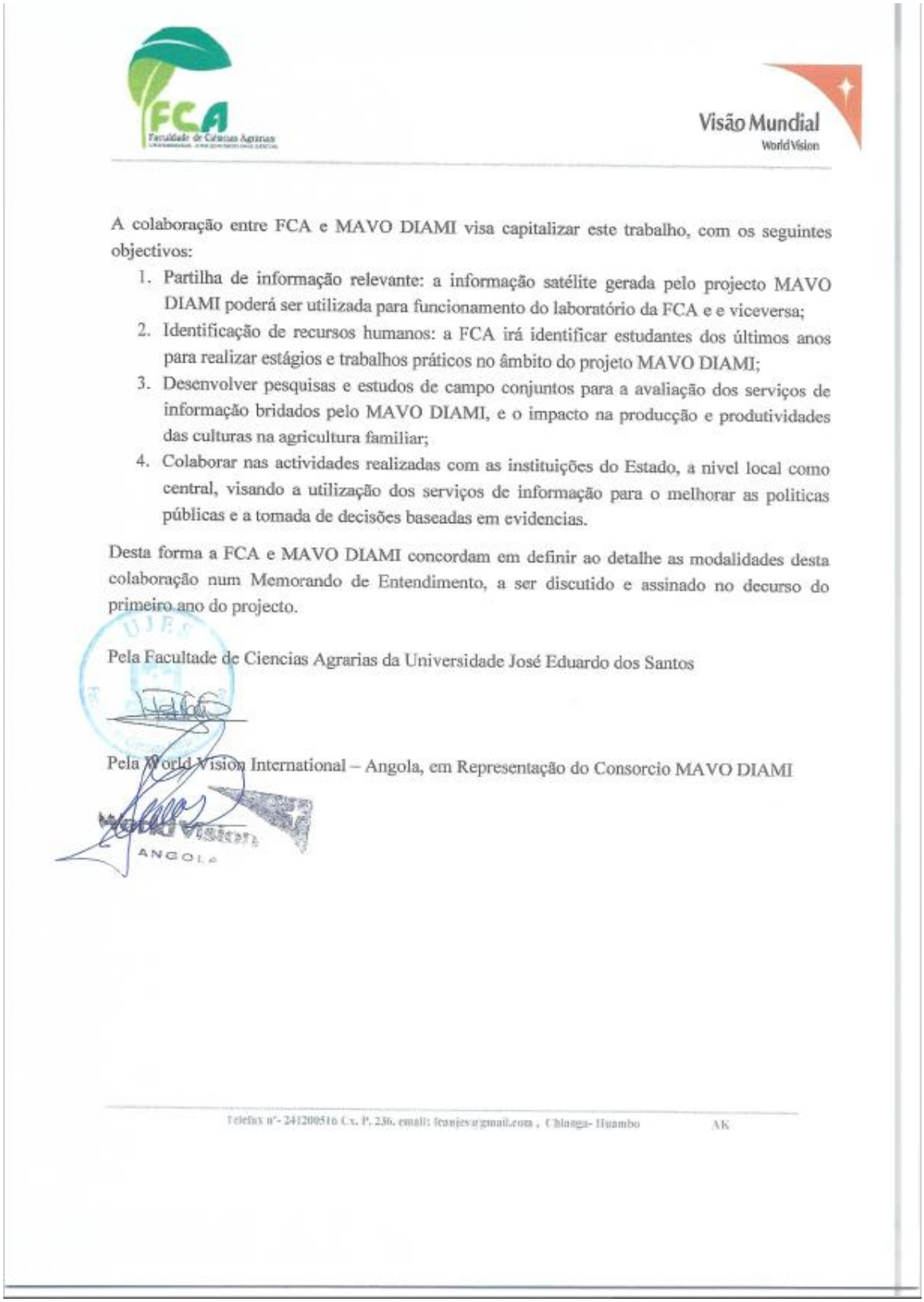
Workshop de Conhecimento no Huambo, Angola - Obtenção de conhecimentos especializados locais em solos, agricultura e água.

Lista de Presenças

Nº	Nome	Instituição	Telefone	Email	10/3/2020	11/3/2020
1	Estevão Mango Mbambi	World Vision	924691365	mango_mbambi@wvi.org	✓	✓
2	Segenet Tessema	" "	930306731	segenet_tessema@wvi.org	✓	✓
3	JOSÉ AMÂNDIO PAULINO	" "	923531292	JOSE_AMANDIO@WVI.ORG	✓	✓
4	Chilefe Capato	" "	934640340	Chilefe_Capato@wvi.org	✓	✓
5	Hunda Lopes	ISP-KS	924821000	hundalopes@gmail.com	✓	✓
6	Isaias Caidongo Alfredo	IIA-Hbo	923459727	[illegible]	✓	✓
7	LAURINDO CH. LADEIRA	ISPKS	990387376	CHAMBULALADEIRA@GMAIL	✓	✓
8	Ngoma M. Fortuna	FCA/LABSIGDGR	926043182	ngomafortuna@gmail	✓	✓
9	Isaú Quissindo	FCA/LABSIGDER	927627774	[illegible]@hotmail.com	✓	✓
10	[illegible] F. Hentifua	[illegible]	923214927	[illegible]@gmail.com		✓
11	Armando Ch. Pintor	ADRA	924023986	ochite05@hotmail.com	✓	✓
12	[illegible]	ISTAM	923238577	[illegible]rodrigues2011@hotmail.com		
13	Holanda da B. Toliti	IIA-Hbo	923459515	holandatoliti@gmail.com	✓	✓
14	Celestino V. J. Essuvo	FAO - MOSAP II	921554311	celestinovanjila2010@hotmail.com		✓
15	Adriano Braga Bingobingo	FCA	948620944	adrianobingobingo@gmail.com	✓	✓

[redacted]

ANNEX III. Letter of Interest between World Vision and FCA-UJES



A colaboração entre FCA e MAVO DIAMI visa capitalizar este trabalho, com os seguintes objectivos:

1. Partilha de informação relevante: a informação satélite gerada pelo projecto MAVO DIAMI poderá ser utilizada para funcionamento do laboratório da FCA e e viceversa;
2. Identificação de recursos humanos: a FCA irá identificar estudantes dos últimos anos para realizar estágios e trabalhos práticos no âmbito do projeto MAVO DIAMI;
3. Desenvolver pesquisas e estudos de campo conjuntos para a avaliação dos serviços de informação bridados pelo MAVO DIAMI, e o impacto na producção e produtividades das culturas na agricultura familiar;
4. Colaborar nas actividades realizadas com as instituições do Estado, a nivel local como central, visando a utilização dos serviços de informação para o melhorar as politicas públicas e a tomada de decisões baseadas em evidencias.

Desta forma a FCA e MAVO DIAMI concordam em definir ao detalhe as modalidades desta colaboração num Memorando de Entendimento, a ser discutido e assinado no decurso do primeiro ano do projecto.

Pela Facultade de Ciencias Agrarias da Universidade José Eduardo dos Santos

Pela World Vision International – Angola, em Representação do Consorcio MAVO DIAMI

ANGOLA

Telefax nº- 241200516 Cx. P. 236, email: feanjes@gmail.com , Chianga- Huambo AK

CARTA DE INTENÇÃO

A Faculdade de Ciências Agrárias (FCA) da Universidade José Eduardo dos Santos (UJES) e a organização não governamental World Vision pretendem estabelecer uma colaboração no âmbito do projecto **MAVO DIAMI**, actualmente em fase final de formulação, a ser financiado pelo Netherland Space Office (NSO) através do fundo Geodata for Agriculture and Water (G4AW). O projeto Mavo Diami visa diminuir a vulnerabilidade e aumentar a produtividade dos agricultores, melhorando a informação disponivel para a tomada de decisões. Esta informação será brindada por um consorcio de empresas holandesas (GaiaVision, Aequator Groen & Ruimte, eLEAF, Weather Impact e FutureWater), que utilizam dados obtidos a partir de satélite, em combinação com observações terrestres, dados meteorológicos e produção de modelos climáticos de última geração. Esta tecnologia irá permitir aos pequenos produtores diminuir a vulnerabilidade frente á variabilidade metereologica, escolher melhor as datas de preparação das actividades produtivas, utilizar melhor os insumos agrícolas (sementes, agua, adubos, etc) de forma a tirar melhor proveito dos recursos e consequentemente aumentar o rendimento das culturas.

A FCA tem mantido uma proficua colaboração com a Universidade de Wageningen na implementação do projecto K2K – Knowledge to Knowledge, financiado pelo Governo de Holanda e focado em reforçar as competências em Tecnologias de Informação Geográfica da FCA. Entre outras actividades, foi estabelecido um programa com uma abordagem baseada em "Formação de formadores - TtT" , no qual a empresa holandesa Future Water colaborou, com o objetivo de desenvolver o conhecimento e as habilidades do pessoal da FCA em Geoinformática e Sensoriamento Remoto. Foi ainda criado um laboratório em sig e teledetecção. Como fruto deste apoio, o pessoal da Universidade adquiriu o conhecimento necessario para, entre outras coisas:

- Estabelecer um programa universitário de treinamento em sensoriamento remoto;
- Desenvolver e manter o material didático necessário;
- Iniciar e realizar seu próprio programa de pesquisa;
- Desenvolver pequenos cursos destinados ao setor agrícola.

Telefax nº- 241200516 Cx. P. 236, email: fraujes@gmail.com . Chianga- Huambo AK

ANNEX IV. Develop a methodology for the digitalization of soil maps in Angola: pilot project in the province of Huambo

PROJECTO PILOTO NO ÂMBITO DA EXTESSÃO DO K2K:

Develop a methodology for the digitalization of soil maps in Angola: pilot project in the province of Huambo

Context

The use of soil maps is a key tool for agriculture development, since it allows planners and farmers to take informed decisions on agricultural management based on soil properties. Soil maps in Angola are scarce, outdated and usually only available in analogic versions (paper). Usually those maps, created in the 60s, are not easily accessible for the agricultural sector in Angola and in many cases they are scattered in some Universities of Europe (Portugal, The Netherlands, etc).

With the aim to create a series of management rules for agricultural development in Angola, UJES (University of Jose Eduardo dos Santos in Huambo), the MavoDiami consortium and WUR developed in February 2020 a Knowledge Workshop "Obtaining local expert knowledge on soils, agriculture and water" in Huambo, with the participation of several experts from the province of Huambo, Cuanza Sul and Bie. Among other results, the need of a proper soil information was highlighted by most of the experts. This project plan aims to start with an improvement of Angolian soil maps and digitalization of it. Experts of UJES en Labsiger asked the Mavo Diami consortium and WUR to cooperate in this issue and already wrote an extensive proposal.

Description

Several discussion between UJES soil and GIS experts (Labsidger), Aequator (MavoDiami consortium) and WUR were developed in order to explore the possibility to collect the soil maps available in analog format for Angola and digitalize them. During this process, an update, validation and adjustment to the current requirement is also needed. The final aim is to create an updated digital soil map of Angola, including the most reliable physical and chemical soil properties. This activity is completely linked with the objectives of the two running projects MavoDiami and K2K. However, all the parties agreed that this should be a long term project which would need the collaboration of

other institutions and an extra financial support. There is already a draft proposal developed by UJES to scale up the use of the current approach.

This is why a pilot to digitalize/update the soil map in the province of Huambo, including the training of the local counterpart and the development of a joint methodology is proposed.

Activities

In order to cope with the current Corona situation, the involvement of the international institutions will be mainly remotely (WUR Aequator), although it will depend on the travel restrictions. Local support from GaiaVision is also envisioned). The following activities are proposed.

1. Develop a joint methodology for the digitalization/update of soil maps in Angola (UJES, Aequator and WUR, GaiaVision)
2. Train UJES (Labsidger) in the digitalization process (Aequator and WUR to UJES)
3. Pilot improvement quality of the soil map of the province of Huambo (UJES, with the support of Aequator and WUR, GaiaVision)
    a. Use digital open SoilGrid map (250m grid) as a start (available for Angola) (see annex 1) for development of smart digitization process and validation (field) plan
    b. Update the SoilGrid by using relevant (define the right soil suitability factors) information of the current analogue (1960s) soil map of Huambo (scale 1:500.000) like soil thematic (legend based on weathering) and geometric (polygons/lines)
    c. Digitalize soil information available at UJES from older projects (including geo-localization)
    d. Validate with smart planned field visits (sampling geostatistically based) and with the soil information already digitalized
    e. Update the current map with available soil information (using geostatistics, digital elevation model, existing big scale Isric soil maps)
    f. Adjust the soil map units and include information for agricultural management

Alignment with K2K

The current proposal is fully aligned with the project plan of K2K, since it will allow Labsidger (UJES) to develop a new product/methodology that could be offered to future clients . The accompaniment of other international institutions will also provide a “learn by doing” process to strength the business plan of Labsidger. The pilot proposal is mainly linked with the following K2K activities:

Activity 1.2 Co-creation of a portfolio of assignments for new products and services

Activity 2.3 Strengthen and build partnerships required following the refined business model

Activity 2.4 Increase Labsigder awareness and visibility

Budget

To cover the cost of the activities proposed, the budget will be a joint effort between the 2 running projects involved, including budget to cover the personal and travel cost of Labsidger (UJES) as well as personal cost of the supporting institutions (WUR and Aequator, GaiaVision).

	Labsidger (UJES)	WUR	Aequator	GaiaVision	Total
From K2K	4000 (cash)	8720 (10 Days)			12,720
From MavoDiami	4000 (cash)		4000 (??)*	8800 (10 days)	16,800
Total	8000 (cash)	8720	4000	8800	

Separation of task and responsibilities

The current proposal is a joint effort between two on going initiatives, K2K and Mavo Diami, each of them with different objectives and budget sources.

- WUR, together with UJES, will coordinate the pilot and specially all the activities related with the digitalization of maps and data.
- UJES will be in charge of the daily activities and data collection and validation (including soil expertise)
- Aequator will provide their soil knowledge and previous experience in soil map validation
- GaiaVision will cooperate with geostatistical knowledge.

ANNEX V. Develop a methodology for field data collection to evaluate the agrarian sector: pilot project in the in municipality of Ecunha (Huambo).

LABSIGDER

Laboratório de Sistemas de Informação Geográfica e Detecção Remota

PROJECTO PILOTO NO ÂMBITO DA EXTESSÃO DO K2K:

Metodologia de colecta de dados em campo e sua análise para avaliar o sector agrário no município de ecunha (huambo)

OBJECTIVOS

A colecta de dados de campo do sector agrário em Angola é feita, geralmente, por métodos tradicionais (pesquisas em papel), sem atributos geoespaciais (localização no máximo segmentados ao nível do município ou comuna). Por isso, o uso de aplicativos móveis de código aberto, como ODK (Open Data Kit ou Kit de Dados Abertos), permite que instituições e empresas colectem e gerenciem dados geográficos em ambientes com recursos limitados. Essas informações de geodados podem ser posteriormente processadas ou convertidas em produtos geográficos mais valiosos, como mapas de localização das parcelas agrícolas, mapas de uso do solo ou ainda mapas de aptidão agrícola.

Assim, visando desenvolver uma abordagem para a coleta de dados de campo através de dispositivos móveis, a fim de melhorar as informações da base agrícola em diferentes níveis no país e no âmbito da extensão do "Projecto de reforço de capacidades em detecção remota para o desenvolvimento agrícola de Angola", o vulgo K2K (Knowledge to Knowledge), o LABSIGDER em colaboração com a Universidade de Wageningen (WUR) da Holanda e financiamento da Agência de Cooperação Holandesa (Netherlands Enterprise Agency - RVO), executará um pequeno projecto piloto no Município de Ecunha, província do Huambo.

O projecto tem por objectivos:

- Criar uma metodologia de colecta de dados em campo e sua análise para avaliar o sector agrário no município, visando o apoio ao programa de combate contra a fome e a pobreza;

- Conhecer com base na informação prestada pelos agricultores e camponeses a produtividade real dos principais produtos agrícolas da zona alvo;
- Obter dados de campo que, futuramente, podem ser relacionados com índices de vegetação (NDVI, EVI) para monitorização de cultivos agrícolas e estimação da produtividade na zona alvo.

Esta metodologia estará disponível para uso posterior por parte de autores do sector agrário (Instituto de Desenvolvimento Agrário, Técnicos do Gabinete Provincial e Secção Municipal da Agricultura, entre outros) na província do Huambo ou mesmo no país.

Assim, o presente documento apresenta de forma sucinta o plano de actividades a serem desenvolvidas neste piloto, entre Junho e Outubro de 2020.

METODOLOGIA, ACTIVIDADES E CRONOGRAMA

A metodologia de trabalho para este piloto passará pelas seguintes etapas descritas em ordem de realização no quadro 1.

Quadro 1. Plano de Actividades

MÊS	DIA/SEMAMA	ACTIVIDADE
Junho	01 a 12	1. **Submissão da proposta** * 2. Feedback e a**provação** por parte do **financiador** *
	08 a 12	Preparação do **formulário de colecta de dados *ODK Collect*** em ONA
	12 a 15	Selecção e **capacitação de estudantes** finalistas da FCA-UJES *
	16 a 30	**Visita de campo** (preenchimento do formulário de colecta de dados ODK): 1. Auscultação aos agricultores: principais problemas enfrentados no cultivo e produção 2. Cadastramento de agricultores por parcela e produtos cultivados 3. Extracção de coordenadas geográficas extremas das parcelas agrícolas 4. Colecta de dados para estimação da produtividade da última época agrícola em cada parcela ou por área (ha) 5. Aquisição de dados sobre pecuária, silvicultura, piscicultura e apicultura 6. Interação com técnicos do IDA e Secção Municipal da Agricultura
Julho	01 a 17	**Organização dos dados colectados**
	20 a 31	**Criação** de um conjunto de **mapas de cariz agrícola**: 1. Mapas de localização das parcelas agrícolas georreferenciadas previamente na zona de estudo 2. Mapa de uso do solo com base nas classes de uso de solo encontradas nas visitas de campo
Agosto	03 a 07	
	07 a 31	**Redação** da **metodologia de colecta de dados em campo e sua análise** para

Setembro	01 a 11	avaliar o sector agrário em escala municipal, visando o apoio ao programa de combate contra a fome e a pobreza
	14 a 18	Apresentação da intenção de **partilha** da presente **metodologia** ao **IDA** e **técnicos do agrários** da província *
	21 a 30	**Capacitação dos técnicos do IDA e técnicos do agrários** da província no uso da metodologia em outros municípios
Outubro	01 a 31	1. **Avaliação**: pela WUR e RVO * 2. Aspectos **administrativos** sobre o **término** do projecto: Decanato e WUR * 3. **Término do projecto piloto**: Decanato e WUR *

* Estas actividades não constam do quadro de previsão do orçamento por serem consideradas isentas de custos.

ORÇAMENTO

A previsão do orçamento para a execução das actividades e o alcance dos resultados são as constantes nos quadros abaixo.

Quadro 2. Previsão do Orçamento

ACTIVIDADE	RUBRICA OU PESSOAL	CUSTO UNITÁRI O (Akz)	SUBTOTAL (Akz)
Preparação do formulário de colecta de dados ODK Collect em ONA	Mão-de-obra (5.000,00 / dia): 1. Angel Garcia * 2. Isaú Quissindo (5 dias)	25.000,00	25.000,00
Visita de campo (preenchimento do formulário de colecta de dados ODK)	Combustível / transporte	100.000,00	575.000,00
	Ajuda de custo para docentes (25.000,00 / dia): Isaú Quissindo (5 dias) Ngoma Fortuna (5 dias)	250.000,00	
	Ajuda de custo para técnicos e estudantes (15.000,00 / dia): Sérgio Fernando (5 dias) Ambrósio Dala (5 dias) Augusto Futi (5 dias)	225.000,00	
Organização dos dados colectados	Mão-de-obra (5.000,00 / dia): 1. Ngoma Fortuna (5 dias) 2. Sérgio Fernando (5 dias)	50.000,00	50.000,00

Criação de um conjunto de mapas de cariz agrícola	Mão-de-obra (5.000,00 / dia): 1. Angel Garcia * 2. Isaú Quissindo (5 dias)	25.000,00	25.000,00
Redação da metodologia de colecta de dados em campo e sua análise	Mão-de-obra (5.000,00 / dia): 2. Isaú Quissindo (10 dias) 1. Ngoma Fortuna (5 dias) 2. Sérgio Fernando (5 dias)	100.000,00	125.000,00
	Revisão (5.000,00 / dia): 1. Imaculada Matias (5 dias) 2. Angel Garcia *	25.000,00	
Capacitação dos técnicos do IDA e técnicos do agrários da província no uso da metodologia em outros municípios	Mão-de-obra (12.500,00 / dia): 1. Imaculada Matias (2 dias) 2. Isaú Quissindo (2 dias)	50.000,00	50.000,00
TOTAL GERAL		**850.000,00**	

* O envolvimento deste pessoal não requer custo.

RESULTADOS ESPERADOS E POTENCIAIS CLIENTES

Os resultados esperados, neste piloto são os seguintes:

- Layer ou camadas shapefiles criadas e com informação do produtor e dos produtos cultivados, ou seja, parcelas agrícolas georreferenciadas e estas com informação da área, do produtor e dos produtos cultivados;
- Conhecimento da produtividade média dos principais produtos agrícolas do município. Estimativa da produtividade média por área: estimativa real da última época agrícola, o que poderá permitir futuramente relacionar com dados de índices de vegetação para estimar o mesmo parâmetro na zona;
- Criada uma metodologia de colecta e análise de dados agrário a nível municipal;
- Cadastro das famílias e associações de camponeses ou agricultores partculares.

Entre os potenciais clientes estão:

- Instituto de Desenvolvimento Agrário - IDA;
- Gabinetes Provinciais e Secções Municipais da Agricultura ou Governos Provinciais e Administrações Municiapais;
- Programas da FAO;
- Empresas do sector agrário;
- ONGs envolvidas em projetos de combate a fome e a pobreza (com foco na agricultura);
- Instituições de Ensino e Investigação do Sector Agrário Angolano: Instituto de Investigação Agronómica, Instituto de Investigação Veterinária, Universidades, etc.

ANNEX VI. Brochure pilot 1.

Projecto K2K – Extensão: Projecto piloto de metodologia de colecta de dados em campo e sua análise para avaliar o sector agrário no município de Ecunha (Huambo)

Serviços de criação de ferramenta de colecta de dados agrários em campo

Tendo em conta que a colecta de dados de campo do sector agrário em Angola ainda é feita, por métodos tradicionais (pesquisas em papel), sem atributos geoespaciais (localização no máximo segmentados ao nível do município ou comuna), o Laboratório de Sistemas de Informação Geográfica e Detecção Remota da Faculdade de Ciências Agrárias da Universidade José Eduardo dos Santos (Huambo, Angola) em parceria com a Universidade de Wageningen (Holanda), desenvolveu uma metodologia de colecta de dados agrários com base nas geotecnologias.

Este projecto piloto contou com o financiamento da Agência de Cooperação Holandesa (*Netherlands Enterprise Agency* - RVO) foi parte da extensão do "Projecto de Reforço de Capacidades em Detecção Remota para o Desenvolvimento Agrícola de Angola", vulgo K2K (*Knowledge to Knowledge*).

Na sua execução contou com a participação da Administração do Município da Ecunha e da Estação de Desenvolvimento Agrário deste município.

O projecto visou desenvolver uma abordagem para a coleta de dados de campo através de dispositivos móveis, a fim de melhorar as informações da base agrícola em diferentes níveis no país.

De forma mais particular, o projecto teve por objectivos:

1

- Criar uma metodologia de colecta de dados em campo e sua análise para avaliar o sector agrário no município, visando o apoio ao programa de combate contra a fome e a pobreza;
- Ter informação de base para futuramente conhecer com base na informação prestada pelos agricultores e camponeses a produtividade real dos principais produtos agrícolas da zona alvo;
- Obter dados de campo que, futuramente, podem ser relacionados com índices de vegetação (NDVI, EVI) para monitorização de cultivos agrícolas e estimação da produtividade na zona alvo.

Esta metodologia está disponível para uso posterior por parte de autores do sector agrário (Instituto de Desenvolvimento Agrário, Técnicos do Gabinete Provincial e Secção Municipal da Agricultura, entre outros) na província do Huambo ou mesmo no país.

Entre os resultados já alcançados destacam-se:

- A capacitação de 7 técnicos, entre estudantes e Engenheiros formados pela própria Faculdade no uso de ferramentas como ODK Collect e plataforma ONA na colecta de dados agrário em campo;
- Redacção de um pequeno manual a ser publicado em parceria com a Universidade de Wageningen (Holanda), intitulado "Metodologia de colecta de dados em campo e sua análise para avaliar o sector agrário no Município de Ecunha (Huambo)".

ANNEX VII. Brochure pilot 2: Tecnologia de mapeamento de solo para impulsionar o desenvolvimento agrícola em Angola

Tecnologia de mapeamento de solo para impulsionar o desenvolvimento agrícola em Angola

Por que uma boa informação digital do solo é a chave para impulsionar o desenvolvimento agrícola?

O solo garante e serve de suporte estrutural para as plantas na actividade agrícola, além disso é a fonte de água e nutrientes de qualquer cultura ou plantação. Os solos variam muito em suas propriedades químicas e físicas, tendo pontos fortes e fracos quanto a especificidades na produção agrícola. Embora alguns solos sejam naturalmente mais bem estruturados do que outros, algumas características físicas e químicas dos solos podem ser alteradas por boas práticas agrícolas.

A informação espacial sobre as propriedades do solo é útil para os agricultores durante a fase de planificação de preparação do solo e das operações ou maneio agrícola, aplicações de fertilizantes, práticas e tratamentos, de modo a melhor conservar o solo e potencializar o desempenho da cultura. Mas também os mapas de solo auxiliam gestores agrários, agricultores ou investidores deste ramo para avaliar melhor a aptidão de determinadas áreas para a prática agrícola.

Informação do solo em Angola

Os mapas de solos em Angola são escassos, desatualizados e normalmente apenas disponíveis nas versões analógicas (formato físico ou papel). Esses mapas, elaborados nos anos 1960, não são facilmente acessíveis para o sector agrário angolano e, em muitos casos, encontram-se dispersos. A escala é geralmente muito grande para avaliação regional ou local, variando entre 1: 1.000.000 e 1: 500.000, e os mesmos estão focados na classificação geral dos tipos de solos, que dificilmente podem ser úteis para o desenvolvimento agrícola.

Melhorar as tecnologias de mapeamento do solo em Angola: piloto no Huambo

Pelas razões acima expostas, no âmbito do Projecto K2K, o Laboratório de Sistema de Informação Geográfica e Detecção Remota (LABSIGDER) da Faculdade de Ciências Agrárias (FCA) da Universidade José Eduardo dos Santos (UJES), Huambo-Angola, e a Universidade Holandesa de Wageningen (Wageningen University & Research - WUR), em cooperação com parceiros do Projecto MavoDiami (Aequator e WorldVision) e a iniciativa KRES, testou uma metodologia para produzir um conjunto de mapas de propriedades do solo na Província do Huambo.

Para tal, foi utilizada a metodologia *S-world*, que permitiu produzir um conjunto de mapas com informação de conteúdo de matéria orgânica da Província do Huambo, a uma escala de 1: 50.000, adequado para avaliação provincial, municipal, comunal ou local. A metodologia combina os mapas de solo actuais disponíveis em grande escala (geralmente em formato físico) com outras fontes de informação do solo (como bancos de dados mundiais de perfis de solo) e informações auxiliares para várias propriedades da paisagem (temperatura e precipitação média mensal/anual, topografia, elevação, uso e cobertura do solo).

Desenvolvimento de uma estratégia nacional de mapeamento de solos para Angola

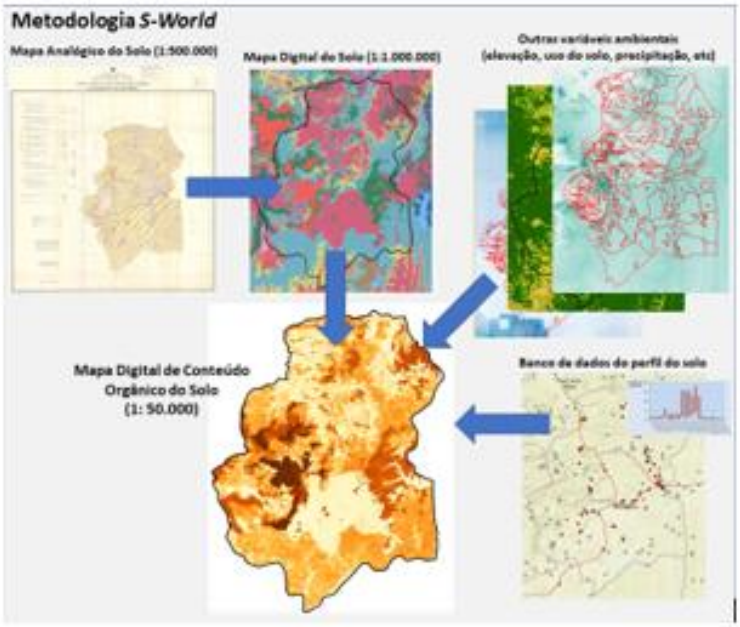
Actualmente, espera-se uma grande iniciativa para a aplicação da metodologia em escala nacional e contemplar outras propriedades dos solos, de modo a criar produtos de base de solo adequados ao interesse dos diferentes interessados, desde o agrícola aos demais sectores económicos.

Instituições públicas, desde governos nacionais a locais, investidores, grandes e médios agricultores, mas também pequenos proprietários (camponeses), podem ser beneficiários desta informação de solo espacial e mais detalhada. Por esse motivo, espera-se e convida-se parceiros estratégicos quer do sector público como privado.

Potenciais produtos

O objectivo final é obter um conjunto de produtos de solo específicos de acordo com o interesse dos diversos parceiros ou clientes; onde se destaca:

- Mapas precisos de propriedades do solo (conteúdo de nutrientes, textura, capacidade de retenção de água, etc.) em escala provincial ou municipal, adequados para o planeamento do uso da terra (mapas de aptidão agrícola para determinadas culturas).
- Mapas de conteúdo de nutrientes em escala local, adequados para estratégias de cultivo e fertilizantes.



A sua instituição tem interesse em fazer parte desta iniciativa?

Se estiver interessado em financiar esta iniciativa, ou considera oportuno para dar informações úteis para o aprimoramento das tecnologias de mapeamento de solos em Angola, por favor entre em contacto connosco.

Imaculada Henriques, Decana da Faculdade de Ciências Agrárias da Universidade José Eduardo dos Santos, Huambo-Angola.

Isaú Quissindo, Coordenador do Laboratório de Sistemas de Informação Geográfica e Detecção Remota da FCA-UJES.

Telefax: +244 241 200 516

Caixa Postal: 236

Chianga-Huambo, Angola

E-mail: labsigdrfca@gmail.com ou fcaujes@gmail.com

Para mais informação, por favor, visite o nosso site:

www.labsigder.fcaujes.com.

LABSIGDER

WAGENINGEN UNIVERSITY & RESEARCH

AEQUATOR groen & ruimte

World Vision

This is a publication of
Netherlands Enterprise Agency
Prinses Beatrixlaan 2
PO Box 93144 | 2509 AC The Hague
T +31 (0) 88 042 42 42
Contact us
www.rvo.nl

This publication was commissioned by the ministry of Foreign Affairs.

Publication number: RVO-121-2022/RP-INT

NL Enterprise Agency is a department of the Dutch ministry of Economic Affairs and Climate Policy that implements government policy for Agricultural, sustainability, innovation, and international business and cooperation. NL Enterprise Agency is the contact point for businesses, educational institutions and government bodies for information and advice, financing, networking and regulatory matters.

Netherlands Enterprise Agency is part of the ministry of Economic Affairs and Climate Policy.