



**Sustainable intensification of
food production** through
resilient farming systems in
West & North Africa

Deliverable D5.2

IP Frameworks- Report in IP Frameworks in each SustainAfrica Country available in the Dashboard

Due date of deliverable: M6
Actual submission date: 28th February 2021
Revision 1 submitted: 30th March 2023



GENERAL DATA

Grant Agreement: 861924

Project acronym: SustInAfrica

Project title: Sustainable intensification of food production through resilient farming systems in West & North Africa

Project website: www.sustinafrica.com

Start date of the project: September 1st, 2020

Project duration: 60 months

Organisation name of lead contractor: Luke

- Funding source: SFS-35-2019-2020 - Sustainable Intensification in Africa
Type of action: Research and Innovation Action

DELIVERABLE NUMBER:	D5.2
DELIVERABLE TITLE:	IP Frameworks- Report in IP Frameworks in each SustInAfrica Country available in the Dashboard
DELIVERABLE TYPE:	Report
WORK PACKAGE N:	WP5
WORK PACKAGE TITLE:	Sustainability, Replicability and Exploitation
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CONTRIBUTORS:	
DISSEMINATION LEVEL:	Public



ABSTRACT

Intellectual property (IP) is the property created by human minds or intellect. It is intangible in nature unlike other properties. The human mind creates many new innovative, original ideas in the form of literature, music, paintings, scientific and technological methods and products among others. IP laws protect the right of its creator for his creation or invention and confers exclusive rights for commercial exploitation. Intellectual Property (IP) management is therefore a key element in improving the competitiveness of any company. Unfortunately, small and medium-sized enterprises (SMEs) especially in Africa and some other least-developed countries often lack the time, resources or knowledge to address IP matters.

In this study, through desk research, followed by a round of validation from different SustInAfrica project resource people, we examined the IP landscape and frameworks for five countries in Africa named: Egypt, Tunisia, Ghana, Niger and Burkina Faso. In this report, we presented the types of IP in each country, the relevant laws, regulations, protocols and treaties applicable to IP protection as well as the agencies responsible for managing the IP in each of the countries.

The report also examined the IP laws relating to specific technologies developed by the SustInAfrica project including drones, remote sensing and smartphone applications with a keen lens to their potential adoption and applicability in Africa's agricultural development. E.g., SustInAfrica is developing and piloting modern technological inventions for advancing African agriculture into efficiency and competitiveness. Although there is great potential for efficiency improvement in agricultural operations, adoption and use of these technologies has heavily been hampered by restrictive national laws and regulations governing their importation, and usage.



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List of abbreviations and acronyms

List of abbreviations and acronyms:

AI – Artificial Intelligence
CCU - Commercial Crime Unit (Ghana)
CASC – Central Seed Testing and Certification Authority
EPO –European Patent Organization
EU – European Union
FDB – Food and Drug Board (Ghana)
GSA – Ghana Standards Authority
GUI – Graphical User Interface
INNORPI – National Institute for Standardization and Industrial Property
IP – Intellectual Property
IPR – Intellectual Property Rights
ITEDA – Information Technology Industry Development Agency
IUGRFA – International Undertaking for Plant Genetic Resources for Food and Agriculture
NCCA – National Civil Aviation Authority
NDVI – Normalized Difference Vegetation Index
NIPPS – National Intellectual Property Policy and Strategy
OAIP – African Intellectual Property Organization
PCT – Patent Cooperation Treaty
TRIPS – Trade- Related Aspects of Intellectual Property Rights
UPOV – International Union for the Protection of New Varieties of plants
UNCTAD – United Nations Conference on Trade and Development
WCT – WIPO Copyright Treaty
WIPO – World Intellectual Property Organization
WPPT - WIPO Performances and Phonograms Treaty
WTO – World Trade Organization



1.0. Introduction:

1.1. Objective:

The overall objective of WP5 is to ensure the lasting impact of African EU joint research at a local level by screening the methods, technologies, and solutions proposed and developed by SustInAfrica to increase climate resilience and positive impacts on gender, nutrition, and environment and explore their potential for replicability and scaling before developing exploitation strategies for public goods.

1.2. Specific Objectives:

The specific objectives include:

- OB5.1: Gain a deep understanding of the potential impacts of the technologies implemented under SustInAfrica: Assess the impact of methods, technologies, and solutions developed by SustInAfrica on the environment, social and economic systems.
- OB5.2: Ensure the replicability of SustInAfrica: Assess the replicability and readiness for scaling of the methods, technologies, and solutions developed by SustInAfrica.
- OB5.3: Ensure exploitation of SustInAfrica's outcome: Develop sustainable costed strategies, models, and business plans for scaling-up/scaling-out of SustInAfrica methods, technologies, and solutions through private and public investors.

To achieve this, WP5 will produce in collaboration with WP6 policy recommendations to overcome policy and IP barriers to adoption or commercialization. The level of IP protection in the project countries will be a key issue for developing appropriate exploitation strategies for any novel technologies developed by WPs 2 & 3.

Deliverable 5.3.c IP Frameworks (M12) reports in IP Frameworks will specifically review country-level intellectual property frameworks in each of SustInAfrica countries. The task will conduct a review of the IP frameworks relevant to the technologies being developed.

2.0. Intellectual Property and Intellectual Property Rights (IPR):

Intellectual property (IP) is a category of property that includes intangible creations of the human intellect. There are many types of intellectual property and some countries recognize more than others. The most well-known types of intellectual property are copyrights, patents, trademarks, and trade secrets.

Intellectual property rights (IPR) are the legal rights that provide the creator protection for original works, inventions, or the appearance of products, artistic works, literature, symbols, names, images, and scientific developments used in trade.

2.1. Rationale for the Protection of Intellectual Property Rights:

According to the World Intellectual Property Organization (WIPO), the underlying principle of IPR protection is to stimulate and promote creativity and innovations to spur socio-economic growth. The argument is that individuals and businesses invest in time, resources, material, training, technology acquisition among others for their inventions and creative work to be materialized, and as a result, effective IPR protection allows individuals and businesses to recoup their investments and encourage them to enhance their works. IPR protection also assures individuals and organizations that their



innovations will not be stolen by their competitors. Above all, individuals and enterprises, who are adequately rewarded for their inventions and creative work, tend to invest more in research and development.

Furthermore, IPR protection is beneficial to low, middle, and high-income countries. For low-income countries, IPR protection stimulates growth by attracting technology transfer into these countries. In high-income countries, IPR protection stimulates growth by providing incentives for more innovations. Likewise, in middle-income countries, IPR protection reduces the ability of countries to acquire technology by imitating but allows countries to attract technological inflows.

2.2. Types of Intellectual Property:

Intellectual Property broadly consists of two (2) main branches:

- i. Copyright
- ii. Industrial Property Rights.

The industrial property consists of patent, trademark, industrial design and geographical indications. In addition to the traditional branches, new variations of IPR such as Plant varieties, Layout Designs (topographies) of integrated circuits, trade secrets, Geographical Indications, undisclosed information, utility model, and folklore of traditional cultural expressions have also emerged.

1. Copyright:

A copyright is a form of IP protection given to authors of original works of authorship. Copyrights protect the writing, pictures, music, art, architectural drawings, or even software codes of intellectual works. The copyright owner has exclusive rights to sell, publish and/or reproduce any of his/her/its intellectual works and to derive financial reward from it. Copyright however does not protect the ideas but rather the tangible form of the creations of the original work. Many countries have a copyright voluntary registration system¹.

Requirements to obtain copyright protection:

In the EU, copyright protection is obtained automatically from the moment the work is created and no registration or other formality is required. However, some countries allow for the voluntary registration/deposit of works protected by copyright. Therefore, registration is not constitutive of the right but can be useful in some situations (e.g., to solve disputes over ownership or creation, to facilitate financial transactions).

Although copyright is regulated at national level and, therefore, the requirements can vary from one country to another, to qualify for copyright protection a work must in generally:

- ✓ **Be original:** there is no total harmonization at international level on what is to be understood by « original ». However, based on EU law, it can be said that the originality requirement is satisfied when the author expresses his creativity by making free and creative choices, resulting in a work that reflects his personality.
- ✓ **Exist in some form:** There is no harmonization at EU level regarding whether the work must be fixed in material form to receive copyright protection. It is for member states to freely prescribe that works in general or any specific categories of works shall not be protected unless they have been fixed in some material form. Therefore, non-fixed works such as unrecorded speeches, may receive protection in some countries but not in others.

¹ https://www.wipo.int/export/sites/www/copyright/en/registration/pdf/a1_copyright_offices.pdf



Duration of Protection:

While moral rights have usually no time limit (they last forever, economic rights are limited in time. The Berne Convention establishes that economic rights must last at least during the author's lifetime plus 50 years from his death. However, national legislations can provide longer protection (e.g., in the EU, 70 years from the author's death).

2. Patent:

A patent is a form of right granted by a sovereign government to an inventor or their successor-in-title, giving the owner the right to exclude others from making, using, selling, offering to sell, and importing an invention for a limited period of time, in exchange for the public disclosure of the invention. An invention is a solution to a specific technological problem, which may be a product or a process, and generally has to fulfil three main requirements: it has to be new, not obvious and there needs to be an industrial applicability. A patent owner has every right to commercialise his/her/its patent including buying and selling the patent or granting a license to the invention to any third party under mutually agreed terms.

Requirements for patent registration:

1. **Novelty:** The invention must be new in comparison to existing knowledge in the relevant technical field. i.e., not being part of the state of art.
2. **Inventive step:** the invention must be non-obvious, i.e., it cannot be deduced easily by a person with average knowledge in the relevant technical field.
3. **Industrial application:** The invention must be capable of industrial application, i.e., it can be made or used in any kind of industry, including agriculture.

Duration of protection:

Patent protection is limited in time: 20 years from the date of filing of the patent application in most countries. The patent may lapse earlier if the annual fees are not paid. Once a patent expires, the protection ends and anyone can commercially exploit the invention without infringing the patent.

3. Utility Model:

A utility model is also referred to as a petty patent. A utility model is an exclusive right granted for an innovation which allows its owner to prevent others from commercially using the protected invention, without their authorisation for a limited period.

Requirement for Utility model registration:

The rules for utility model registration vary from country to country. Consequently, although novelty and inventive step are generally required, the conditions for utility models protection will vary depending on the applicable national legislation.

Duration of protection:

Utility model protection is limited in time. Its duration varies depending on the applicable national legislation. In Europe, it generally lasts from 7 to 10 years from the date of filing of the utility model application. Once a utility model expires, protection ends, and anyone has a right to commercially exploit the invention without infringing the utility model.

Differences between utility models and patents:

The main difference between utility models and patents are the following:



- The requirements for acquiring a utility model are less stringent than those of patents. While the requirement of novelty is always to be met, that of inventive step or non-obviousness is much lower. Therefore, protection for utility model is often sought for inventions with a limited inventive step, which may not meet the patentability criteria.
- The term of protection for utility model is shorter than patents and varies from country to country (usually between 7 to 10 years without the possibility of extension or renewal).
- The fees for obtaining and maintaining utility models are generally lower.

Many countries, however, allow conversion of a patent application into a utility model application (or vice versa) under specific conditions. This mechanism is often used when a patent application is refused by the relevant IP office for lack of compliance with the patentability requirements and the applicant decides to convert the patent application into a utility model application.

4. Trademark:

A trademark is a distinctive and recognizable sign, design, or expression which distinguishes products or services of a particular trader from similar products or services of other traders. A trademark allows consumers to easily identify the goods or services that a company or trader produces. A trademark can be in the form of a phrase, a symbol, or a colour scheme. Unlike a patent, a trademark can protect a set or a class of products or services instead of just one product or process.

Requirements for trademark registration:

1. **Clear and precise representation:** The sign whose registration as a trademark is sought must be capable of being represented in a manner that enables the subject matter of protection to be determined with clarity and precision. e.g., a word, a logo, a music sheet, etc.
2. **Distinctiveness:** The sign whose registration as a trademark is sought must be capable of distinguishing the goods or services bearing the trademark from those of other traders.
3. **Non-deceptiveness:** The sign whose registration is sought as a trademark must not deceive the public, for instance, as to the nature, quality, or geographical origin of the goods or services.
4. **Non-descriptiveness:** the sign whose registration as a trademark is sought must not serve to designate the characteristics of the goods or services bearing the mark, such as their kind, quality, intended purpose, value, geographical origin, etc.
5. **Non-customary in language:** The sign whose registration as a trademark is sought must not be a sign or indication which has become customary in the current language or in good faith and established practices of trade.
6. **Non-contrary to public order and morality:** The sign whose registration as a trademark is sought must not be contrary to public policy or morality.

Duration of protection:

Trademark protection is limited in time: in most countries, protection lasts for 10 years from the date of filing of the trademark application, and it can usually be renewed indefinitely for periods of 10 years. This protection may lapse if the renewal fees are not paid. Once a trademark expires, protection ends, and anyone can use it during trade in relation to the goods and services covered by the expired trademark without infringing it.

5. Trade secrets:



A trade secret is a confidential business information (formula, practice, process, design, instrument, pattern, or compilation of information) that is not generally known or reasonably ascertainable, by which a business can obtain an economic advantage over competitors and customers. There is no formal government protection granted; each business must take measures to guard its trade secrets. Examples of trade secrets include the formula of its soft drinks of the Coca-Cola company, recipes for certain food and beverages, new inventions, software, processes, and even some different marketing strategies. When a person or a business holds trade secret protection, others cannot copy or steal the idea.

Requirements for registration of trade secrets:

Trade secrets do not require administrative or procedural formalities in order to be protected. Trade secrets are protected without official registration. However, there are some conditions for the information to be considered and, hence, be protected as a trade secret.

The information must:

1. be secret, meaning that it is not generally known.
2. Have commercial value due to its secrecy and,
3. Have been subjected to reasonable measures, by the person in control of the information, to keep it secret.

These reasonable measures may include:

- Storing confidential information safely.
- Conducting non-disclosure agreements where trade secrets must be discussed with business partners.
- Including non-disclosure clauses with agreement such as licence agreements, employment agreements, consortium agreements or partnership agreements, where the exchange of confidential information is very likely and/or necessary.

The owner of a trade secret whose rights are breached may ask a court to ask against the individuals and prevent them from using the trade secret.

Duration of protection:

A trade secret can be protected for an unlimited period as far as the conditions for the information to be considered as trade secret are fulfilled.

6. Trade dress:

Trade dress is a legal term of art that generally refers to characteristics of the visual and aesthetic appearance of a product or its packaging (or even the design of a building) that signify the source of the product to consumers.

7. Plant varieties:

Plant breeders' rights or plant variety rights are the rights to commercially use a new variety of a plant. The variety must amongst others be novel and distinct and for registration², the evaluation of propagating material of the variety is considered³.

8. Geographical Indications:

² Patented varieties must respond to the criteria of Distinctness, Uniformity and Stability (DUS).

³ According the current regulatory framework to get the compulsory market approval, the varieties have to comply with two regulatory standards: 1) the DUS (Distinctness, Uniformity and Stability) registration is mandatory for all the listed species; 2) the VCU (Value for Cultivation and Use) for agricultural species.



A Geographical indication is a sign used on products having specific geographical origin and whose qualities and/or reputation are attributable to that origin. They are often place names. However, non-geographical names can be protected if they are linked to a particular place.

According to article 22 of the TRIPS Agreement, Geographical Indications are defined as Indications that identify a good as originating in the territory, or a region or locality in that territory, where a given quality, reputation, or other characteristics of the good is essentially attributed to its geographical origin. A registered Geographical Indication prohibits a third party to use such geographical Indication by any other means in the designations or presentations of goods that indicate that such good originates in a geographical area, e.g., Ghana cocoa.

9. Industrial Designs:

According to WIPO, an Industrial design constitutes the ornamental aspects of an article. An industrial design may consist of three-dimensional features, such as the shape of an article, or two-dimensional features such as patterns, lines, or colours. It is the outward appearance of the whole of a product resulting from the features of, in the lines, contours, colours, shape, texture and/or materials of the product itself and/or its ornamentation. In principle, the owner of a registered industrial design or a design patent has the right to prevent third parties from making, selling, or importing articles bearing or embodying a design which is a copy, or substantially a copy, of a protected design, when such acts are undertaken for commercial purposes.

Requirements for industrial design registration:

1. **Novelty:** A design is considered to be new if it has not been disclosed to the public previously.
2. **Individual character:** Assessing individual character consists of verifying whether the overall impression produced by the design differs from the overall impression produced by the designs made available earlier.
3. **Non-functionality:** Those features of the design that are dictated solely by a technical function do not receive protection.

Duration of protection:

Design protection is limited in time: 5 years from the date of filing of a design application in most countries, which can be renewed for periods of five years, up to a total term of 25 years. The design may lapse earlier if renewal fees are not paid.

2.3. Purpose and Benefits of IPR Protection:

The main purpose of intellectual property protection is to encourage the creation of a wide variety of intellectual goods and services. To achieve this, the law gives people and businesses property rights to the information intellectual goods and services they create, usually for a limited period. This gives an economic incentive for their creation because it allows people to profit from the information and intellectual goods and services they create. These economic incentives are expected to stimulate innovation and contribute to the technological progress of countries, which depends on the extent of protection granted to innovators. IP protection also stimulates innovations, design, and the creation of new technology thus giving an incentive and the means to finance research and development activities.



3.0. IP Contextualization in North and West Africa:

Intellectual Property Rights ('IPR') are, without a doubt, one of the most important assets of major companies and corporations. Not only are they important for the protection of a brand, but they are also important for the protection of the rights derived from the products developed and services promoted by corporations. Whilst trademark rights represent a substantial focus for IP owners, many other aspects of IP rights also exist, such as copyright, patents, industrial designs, trade secrets, and plant varieties.

Indicator	Egypt	Tunisia	Ghana	Burkina Faso	Niger
New Business Density (New Registrations Per 1,000 People Ages 15-64)	-	1.68	-	0.33	0.09
No. days to start a business	6.5	11	14	-	-
No. procedures to start a business	18	104	91	-	-
Effectiveness of law-making bodies (1-7 best)	2.37	3.73	4.1	-	-
Intellectual Property Protection index (1-7 best)	3.24	3.54	3.87	-	-
Laws relating to ICTs (1-7 best)	3.16	3.37	3.35	-	-
Software piracy rate, % software installed (0-100)	62	75	-	-	-
Ease Of Doing Business (0-100)	60.1	68.7	60	51.40	56.8
Patent applications, total	2.27K	555	26	-	-
Trademark applications, total	21.95K	6.05K	3.35K		
Efficiency of the legal system in settling disputes (1-7 best)	3.41	3.61	4.16	3.3	3.6
Efficiency of legal system in challenging regulations (1-7 best)	3.43	3.55	3.85	3.02	3.17
Active mobile-broadband subscriptions per 100 inhabitants	50.7	62.6	66.8	15	1.8
The intensity of competition in the local markets	4.24	4.75	4.79	4.57	-

Data from <https://tcdata360.worldbank.org/topics>

3.1. Intellectual Property Rights in Egypt:

Egypt has acknowledged the importance of the protection of IPR and its direct correlation to securing a healthy environment for investments. In addition to being one of the pioneers in the promulgation of legislation that protects IPR, the Egyptian Constitution guarantees the protection of Intellectual and Industrial Rights. Egyptian Laws and Regulations also seek to protect IPR. However, Egypt is considered one of the top countries in copyrights infringement. According to the International Intellectual Property Alliance report, the rate of software piracy in Egypt was 61% in 2011 which significantly impacted the software and IT sectors. The country has experienced a year-on-year average growth rate of 0.83% for the period 2012 to 2016 (World Bank⁴). The intellectual property protection index (to what extent is intellectual property protected on a 1-to-7 (best) scale) for Egypt is 3.24 while the global average is 4.1⁵.

⁴ <https://tcdata360.worldbank.org/indicators/entrp.piracy>

⁵ <https://tcdata360.worldbank.org/indicators/entrp.ip>



3.1.0. Source and scope of IPR Protection:

3.1.1. The Egyptian Intellectual Property Legal Framework:

The first trademark law passed in Egypt was Law 57/1939. With the development of IPR and Egypt's Accession to many international IP treaties, a new law was Issued – the IP Law 82 for the year 2002 (82/2002) which replaced a collection of laws dating back to 1939. Law 82/2002 reflects the provisions stipulated in the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPs) which covers all IP rights. The four Books of the new code in Law 82/2002 addresses patents, copyrights, trademarks, trade statements, industrial designs, integrated circuits, undisclosed information, geographical indications, and plant variety protection.

In addition to the IP Law, several other laws, regulations, and a series of decrees further clarify procedures and, in some instances modify the application and enforcement of the regulations to improve implementation. The adoption of the decrees to clarify the application of the intellectual property law remains an ongoing process.

- i. The Constitution of 2014 provides for the establishment of a special body to ensure the protection of intellectual property.
- ii. The Consumer Protection law (67/2006).
- iii. The Protection of Competition and Prohibition of Monopolistic Practices Law (3/2005).
- iv. The Trade Law (17/1999).
- v. Decree 770/2005 of the Minister of Foreign Trade and Industry regulating the implementation of the law on import and export and the inspection and control procedures of imported and exported Goods (118/1975).
- vi. The Customs Law (66/1963) as amended by Law 95/2005.
- vii. The Executive Regulations for Law 82/2002 issued in Cabinet Decree No. (1366) of 2003 for Books 1, 2, and 4.
- viii. The Prime Ministerial Decree No. (497) of 2005 for Book 3 of the law. The regulations have been amended twice, once by Prime Ministerial Decree No. 1241/2006 deleting some articles in the regulations to Book 4, and a second time by Prime Ministerial Decree No. 2202/2006 amending the Book 3 regulations. The Executive Regulations primarily address procedural issues not specified in the law itself.
- ix. In addition to Law 82/2002, international agreements governing IP protection to which Egypt is a member (e.g. World Intellectual Property Organization-WIPO, World Trade Organization – WTO, the Berner Convention (1977), The Agreement on Trade-Related Aspect of Intellectual Property Rights (TRIPs); the Paris Convention for the Protection of Industry Property and the Madrid Protocol concerning International Registration of Marks are considered to be part of the Egyptian IP Law.

3.1.2. Types of IPR Protection in Egypt:

1. Copyrights:

Egypt protects the creative works of authors under copyright and protects performers, producers of phonograms, and broadcasting organizations under related rights. Copyright protects all creative productions whatever their type or mode of expression e.g. books, music, movies, computer software, architecture, and photographs. The author, or his successor in interest, has the exclusive right to authorise or prevent any exploitation of his/her work. Copyrights in Egypt are governed by Law 82/2002. This is provided in Articles 138-188 of Law 82/2002, Prime Ministerial Decree no. 487 of 2005, and Prime Ministerial Decree No. 2202 of 2006.



Ownership of copyrighted content is proven either by first publication or prior submission. Copyright in Egypt is divided into three sections: a) **Drawings**, b) **Books**, and c) **Software Codes**.

a). Drawings: This includes cartoon characters, creative shapes, and artistic drawings. Such content is registered at the Fine Arts Sector at the Supreme Council of Culture.

b). Books: This includes books and scripts. The books are registered at the National Library.

c). Software Codes: This is mainly the software code and language of the applications and/or software. Software codes are registered at the Information Technology Industry Development Agency ('ITIDA').

In Egypt,

- a) Penalties for copyright infringement are low as the minimum sentence is one month and the fine is from LE 5,000 to LE 10,000
- b) The Economic Court was established in 2008 under Law No. 120. The establishment of the Court in which copyrights cases are handled by trained judges has significantly affected the development in the area of intellectual property. The Court accepts the electronic evidence such as email address, IP address, and website IP address.
- c) Owners of copyrighted materials and trademarks should register their products in Egypt. Through registration, the rights are obtained for the product and allow the legitimate owner to take appropriate action in case of violation. This in itself will not only protect the owners but also contribute to efforts aimed at reducing the tremendous number of illegal users of trademarks and copyrights' infringers.

Protection Period of the Copyrights:

The Author and his successor literary property are perpetual imprescriptible and inalienable.

Books and computer programs are guaranteed protection for the author's lifetime plus 50-70 years from the date of their death. Sound recordings are guaranteed 50 years protection from the recording date.

The economic rights relating to a work published anonymously or under a nickname is protected for a period of 50 years from the date on which the Work was published or made available to the public for the first time, whichever occurs later.

2. Trademarks:

The trademark practice in Egypt generally focuses on protection i.e. filing, registration, and enforcement of brands against infringement and counterfeits. One of the common misperceptions is the assumption that registration of a trademark grants the applicant ownership of that trademark. However, registration is only considered as proof of ownership, which can be disproven. According to Egyptian law, and as established and confirmed by precedent, ownership of the trademark is established by 'first use of the mark' in the market.

Trademark registration is valid for ten years from the date of filing the trademark application. Thereafter, trademark registration is renewed for periods of ten years upon application and payment of renewal fees. Registration of a trademark is necessary for the enforcement of IPR in Egypt. If the trademark is owned by Egyptians, it must be written in Arabic and English provided that the Arabic language must be larger and more protruding than the English language as per Law no. 115/1958 on the Necessity of using the Arabic language in Letters and Signs in the Arabic Republic of Egypt. The well-known trademark is protected in Egypt even if it is not registered in Egypt. The owner of



trademark registration is entitled to prohibit others from registering and/or using identical and/or similar trademarks through the following:

- i. Opposing the registration of a similar trademark. Even though any interested party is entitled to oppose the registration of a trademark, the chances of success in case of the presence of trademark registration are much higher;
- ii. Initiate a raid against traders of counterfeit products (i.e. products that bear similar or identical trademark);
- iii. Initiate direct trademark imitation misdemeanour against traders of counterfeit products.
- iv. File for compensation action sustained and profit lost as a consequence of trademark infringement.

It is worth mentioning that well-known trademarks enjoy special and wider protection under Egyptian Laws. Even though there are no criteria to prove 'well known' status, it is at the Court's sole discretion to assess the trademarks and fulfilment of the so-called 'well known' criteria.

3. Patents:

Law 82/2002 guides the compliance of a patent. In Egypt, a patent term is twenty years. A patent is granted once all compliance measures are satisfied. The patent application must be filed before the invention has become known through disclosure or use worldwide. According to the IP Law, an invention is eligible to be patented when certain conditions are fulfilled:

- i. Novelty: described as the quality of being new, or following from that, of being striking, original, or unusual.

- ii. Inventive step:

An invention should be sufficiently inventive and non-obvious to be patented to avoid granting patents for inventions that only follow from "normal product design and development", to achieve a proper balance between the incentive provided by the patent system, namely encouraging innovation, and its social cost, namely conferring temporary monopolies. The non-obviousness bar is a measure of what society accepts as a valuable discovery and therefore provides incentives for fundamental research rather than for "incremental improvements" and minimizing the "proliferation of economically insignificant patents that are expensive to search and to license.

- iii. Capability of economic exploitation.

Once the patent has been registered, the owner of the patented invention is entitled to prohibit others from the commercial use of such patent.

Enforcement of rights related to a patent is achieved through filing patent infringement actions and in urgent cases court injunctions. Moreover, due to the nature and complexity of patents, the Egyptian courts usually assign a technical expert to review and adjudicate on the technical aspects of such disputes (i.e. an expert in the field of the patent which is the subject of the dispute is assigned with the task of reviewing and researching whether an infringement of a claimed right has occurred).

4. Plant Varieties:

This refers to a form of intellectual property right granted to the breeder of a new plant variety in relation to certain acts concerning the exploitation of the protected variety which require the prior authorization of the breeder.



Plant varieties are protected under Article 189 through 206 and Article 185 of the Executive Regulations of August 2003 (Cabinet Decree No. 1366) of the IP Law 82/2002. Article 195 of the 82/2002 Law however gives non-exclusive rights of exploitation to the inventor under the following:

- i. None-commercial activities and use of the product of harvest by farmers on their holdings for private propagating purposes
- ii. Experiments and scientific research
- iii. Breeding, cross-breeding, and selection to breed new varieties
- iv. Education and training
- v. Use, commercial exploitation, and consumption of crop materials.

For Rights to be granted, the plant variety must fulfil the following:

- i. The variety must be new, which means it must not have been previously marketed in Egypt for longer than one year before the application date, or more than six years for tree crops or four years for other crops.
- ii. The new plant must be distinct from other available crops.
- iii. The plant must be uniform
- iv. The trait or traits unique to the new variety must be stable so that the plant remains true to type and repeated cycles of propagation.

A breeder's Rights Certificate is valid for 25 years for tree crops & vines and 20 years for other crops from the date of filing.

3.1.3. Agencies Governing IP Rights and Enforcement in Egypt:

- i. Property Office - The Information Technology Industry Development Agency ('ITEDA') - It is mainly responsible for issuing licenses for software, software business development, receiving complaints and training. The establishment of ITEDA helped to legitimize the software products in Egypt.
- ii. The Academy of Scientific Research and Technology is the entity in charge of issuing patents in Egypt.
- iii. The Central Department of Audio-Visual Censorship – Ministry of Culture - for music, films, possible software, and performances.
- iv. The Ministry of Information- for broadcasting rights.
- v. The Ministry of Communication and Information technology; Information Technology and Industry Development- for software and database.
- vi. Trademark Office; Ministry of Trade/Supply; – Counterfeits.
- vii. Cyber Investigation Unit; Ministry of Interior Affairs;– for internet copyright.
- viii. Anti-Piracy Unit; Ministry of Interior Affairs;– for artistic works.
- ix. Central Seed Testing and Certification Authority (CASC) and Plant Variety Protection Office; Ministry of Agriculture; – for plant variety registration.
- x. Customs Authority – Infringement of trademarks.
- xi. Economic Court – IP and trademark disputes.

3.1.4. International Conventions in Egypt:

Egypt is a signatory of the Paris Convention, which states that if a patent application is made in a member country of the Paris Convention or any other country offering reciprocal treatment, the applicant may apply for a patent in Egypt within one year of the relevant application abroad.

Egypt is also a signatory to the Madrid Convention of 1954 and the Berne Convention of 1886.



3.2. International Property Rights in Tunisia:

Tunisia enjoys the second-highest human development score in Africa. Intellectual property plays an important role in technical progress by protecting industrial inventions through patents and trademarks and in the development of human creativity by safeguarding literary and artistic works through copyright. A strong IP regime is an instrument for the promotion of international trade and indicates economic and social progress. In 2016, the software piracy rate was estimated at 75%, compared to a global average of 60%. Keen to attract foreign investment and following a rise in counterfeiting and piracy in recent years, Tunisia is trying to build a robust framework of IP legislation by acceding in international treaties and passing domestic laws. The intellectual property protection index (to what extent is intellectual property protected on a 1-to-7 (best) scale) for Tunisia is 3.54 while the global average is 4.1.

3.2.1. Source and Scope of IP Protection:

Tunisia is a signatory of the Paris Convention for the Protection of Industrial Property and the Paris Convention regarding Trademarks as revised in The Hague, London, and Stockholm. It is also a member of the World Intellectual Property Organization (WIPO) and is a signatory of the UNCTAD Agreement on the protection of patents and trademarks. Tunisia’s IPR protection is provided in its constitution guaranteeing IP protection in Article 41 of the constitution. Tunisia’s various intellectual property laws enshrine the equal treatment of foreign registrants and Tunisian nationals. Registration and maintenance requirements for Tunisian patents, trademarks, and copyrights are straightforward and relatively inexpensive. The creation of a specialized IP Court in 2014 employing judges and court clerks with specific training and expertise in handling IP cases has also significantly increased the speed and quality of legal enforcement decisions for clients with numerous high profile wins for companies claiming trademark infringement in connection with counterfeits.

In 2016, Tunisia signed an agreement with the EU that allows automatic patent protection in Tunisia for European patent applications through the European Patent Organization (EPO). The agreement went into effect in December 2017.

3.2.2. Intellectual Property Treaties – Tunisia:

Berne Convention	Beijing Treaty on audio-visual Performance	Paris Convention
Budapest Treaty	Madrid Protocol	Nice Agreement
Hague Agreement	Marrakesh VIP Treaty	UPOV Convention
Lisbon Agreement	Nairobi Treaty	Vienna Agreement
	Patent Cooperation Treaty	WIPO Agreement

3.2.3. Types of IPR Protection in Tunisia:

1. Trademarks

Tunisia is a member of the Paris Convention, the Nice Agreement, the Vienna Agreement and the WTO/TRIPS. It adopted the international classification of goods and services for registration marks under the Nice Agreement. Tunisia joined the World International Property Organization. Withdrawing from the Madrid Agreement with regards to trademarks in 1988, Tunisia then joined the Madrid Protocol for International Registration of Trademarks in 2013. As a result, trademark applications thereafter should be filed by anyone interested to protect a trademark right to secure his interest and



be availed protection under the Laws of Tunisia. Registration is a necessary element to gain protection and is ordinarily issued directly upon applying for registration. Replacing the Tunisia Trademarks and Trade names Law of 1889 and its amendment of 1936, Tunisia was issued Trademark Law No. 136 in 2001. Trademark registration is valid for fifteen years from the date on which the application was filed. It may be renewed indefinitely for similar periods of time. Tunisia does not need a condition for maintaining registration. Provision is made for the registration of trademarks and goods and services for collective marks and well-known marks. Applications may be filed as a national application in appropriate circumstances claiming priority in terms of the Paris Convention. Infringement measures include prevention of importation goods by customs, Raid, Injunction, Damages, Fine and/or imprisonment.

2. Patents:

Tunisia is a member of the Paris Convention, the Budapest Treaty, the PCT, and the WTO/TRIPS. Patent protection is available via a national filing or by a way of a national phase application based on an international PCT application in which Tunisia is designated.

Patent applications are examined by the Patent Office only about form and while the novelty of an invention is examined, merit is not. A patent application together with the grant of a patent is published in the Office Gazette. The opposition of a patent application must be filed within two months of the date when the application was filed. Applications for the issue of letters, the patent should be made before the invention has been published, used, or otherwise received sufficient publicity to allow it to be put into practice.

The protection period of a patent invention is twenty years from the date on which the patent was filed. Working on a patent is an official requirement and must be done for two consecutive years starting within three years of the date on which the patent application was filed or two years from the date on which the patent was granted. Nominal working of a patent, by way of direct offer or solicitation, is sufficient to meet the standards.

The validity of a patent is 20 years from the international filing date. Annuities are paid annually on the anniversary of the international filing date with six months surcharge grace period. Infringement measures include prevention of importation of goods by customs, Raid, Injunction, Damages, Fine and Imprisonment.

Rights in a patent may be transferred or assigned to third parties, including, by the laws of succession to heirs.

In Tunisia, patents cannot be granted for;

- i. plant varieties and animal breeds or essentially biological processes to produce plants or animals except medical-biological processes and products obtained by these processes,
- ii. inventions the publication or implementation of which would be contrary to good morals, public order, public health, and protection of the environment.

3. Copyrights:

Tunisia is a member of the Berne Convention and the WTO/TRIPS. The Tunisian Copyright Law of 1994 determines the copyright as the right of the owner of the work to have the exclusive right to copy the work in a material form, whatever its type is, and to present his work to the public. The protected work may be literary works, scientific or artistic work, computer software, architectural works, technical drawings, engineering plans and layouts, whatever its value or the purpose for which it is prepared.



According to Article 18 of the Law, the copyright shall be valid during the author's lifetime and shall continue for fifty calendar years after the author's death. The copyright concerning photographic works is valid, according to Article 19, for twenty-five calendar years from the date of work completion. The Law establishes the **Tunisian Institution for the Protection of Copyright**. The Institution has several functions, including the protection of copyright. Any third party which does not respect copyright as defined by the law shall be obligated to pay damages to the owner of this right. The law also establishes monetary sanctions for violations or infringements. Infringement measures include warning, monetary compensation, and confiscation of all copies.

4. Designs and Industrial Models:

Tunisia is a member of the Paris Convention, The Hague Agreement, and the WTO/TRIPS. Design protection is available by a national filing or by an international filing via The Hague Agreement on the International Registration of Industrial designs designating Tunisia. Designs and industrial models' protection may be granted through registration. There is no novelty examination conducted regarding the application for registration of a design or industrial model. Any interested party who has applied for the same or similar design or model may file a request for cancellation of the infringing design or model before a competent tribunal.

A design or industrial model registration is granted for five, ten, or fifteen years beginning on the date the application for registration was filed. The registration of a design or industrial model, as well as its cancellation or assignment is published in the Official Gazette and entered in the design register. There are no provisions regarding compulsory working or licensing of a design or industrial model. Infringement measures include prevention of importation goods by customs, Raid, Injunction, Damages, Fine and Imprisonment.

5. Plant Breeders Rights:

Tunisia is a member of the UPOV Convention. Plant breeders' rights can be obtained in Tunisia in terms of legislation of the Tunisia Ministry of Agriculture.

3.2.4. Agencies Governing IP Rights and Enforcement:

- i. Tunisian Institution for the Protection of Copyright for the protection of copyrights
- ii. The National Institute for Standardization and Industrial Property (INNORPI) for the registration and protection of patents and trademarks
- iii. The Tunisia Internet Authority is responsible for administering the TN Country-specific top-level domain name.

3.3. Intellectual Property Rights in Ghana:

Lack of awareness of the legal rights and protections afforded registered intellectual property, particularly the exclusive exploitation rights over product and process inventions have contributed to minimal patronage of intellectual property registration by small and medium enterprises, as well as individuals. Considering this, the Government of Ghana developed the National Intellectual Property Policy and Strategy (NIPPS) on 26th January 2016, to effectively harness and manage the intellectual property system in Ghana. NIPPS's long-term goal is to exploit intellectual property rights for accelerated growth in technology and industrial development. The IP policy was launched jointly by



Ghana and the Swiss Federation. It was the first step aimed at ensuring that innovators, creators, users, and consumers benefit from an improved intellectual property environment that will create favourable conditions for entrepreneurship, innovation, technology transfer, and product modernization. In Ghana, IP is primarily a private right. It is therefore the responsibility of the rights holder to register, protect and enforce their rights where relevant, retaining their counsel or advisors. The intellectual property protection index (to what extent is intellectual property protected on a 1-to-7 (best) scale) for Ghana is 3.9 while the global average is 4.1.

3.3.1. Source and Scope of IPR Protection:

Ghana is a signatory of and complied with most of the international IP Agreements, Treaties, and Protocols related to IP rights. Intellectual property laws of Ghana encompass laws governing IP rights such as copyrights, patents, trademarks, industrial design rights, unfair completion among others. These are supplemented by regulations passed by the Legislature to augment the rate of development under the intellectual property laws. Among the international agreements, treaties, and protocols that Ghana is a member and a signatory to include:

- i. The Paris Convention for the protection of industrial property
- ii. The Berne Convention for the protection of literary and artistic work
- iii. The Patent Cooperation Treaty (PCT)
- iv. The World Intellectual Property Organization (WIPO)
- v. The WIPO Copyright Treaty (WCT)
- vi. The Hague Agreement on International Deposit for Industrial Designs
- vii. The Madrid System on International Registration of Marks
- viii. The Lusaka Agreement
- ix. The Beijing Treaty on Audio-visual Performance
- x. The Nairobi Treaty
- xi. The Madrid Protocol
- xii. The Singapore Treaty
- xiii. The Marrakesh Treaty

3.3.2. Existing national laws on IPR in Ghana:

- i. Protection against Unfair Competition Act, 2000 (Act 589)
- ii. Industrial Designs Act, 2003 (Act 660)
- iii. Geographical Indications Act, 2003 (Act 659)
- iv. Patents Act, 2003, (Act 657)
- v. Trademarks Act, 2004 (Act 664)
- vi. Layout Designs (Topographies) of Integrated Circuits Act, 2004 (Act 667)
- vii. Copyrights Act, 2005 (Act 690).

Ghana has no law on genetic resources and traditional knowledge. There is currently a draft bill on plant breeders' rights (Plant Varieties Protection), which is not yet passed by parliament).

3.3.3. Types of IPR Protection in Ghana:

1. Copyrights:



In Ghana, the creator or author of a work is entitled to the copyright and protection afforded to that work under the Copyright Act. The Copyright Act provides for the registration of a copyrighted work and section 39 (3) is to effect that a publisher of work may submit the work for registration by the copyright administrator after it has been published and two copies of the best edition are deposited at the copyright office. The protection extends only to the original expression but not the ideas, procedures, methods, styles, and techniques that constitute the subject matter of the work. It may be granted for the entire life of the author plus 50 years for individual works. Copyright owners also enjoy economic and moral rights. The economic rights allow the owners to receive financial rewards for the use of their works by others. On the other hand, moral rights allow them to claim authorship or oppose changes in their work that can harm their reputation.

However, it is prominent to note that copyright protection is not dependent on the registration of the work. Copyright arises automatically and one need not register his work for protection as long as it is original. Registration of copyright provides prima facie evidence of ownership and to facilitates their enforcement.

Related rights are akin to copyrights and may be enjoyed by the category of individuals or legal entities including performers, producers of phonograms, and broadcasters.

Copyright holders in Ghana enjoy the following rights:

- i. The right to reproduce the work in any form; to translate, adapt, arrange or transform the work to any other form
- ii. The right to perform the work publicly, communicate it or broadcast it
- iii. The right to distribute to the public either originals or copies of the work through first sales or other distribution methods,
- iv. The right to rent to the public the originals or copies of the work for commercial gain.

International treaties governing copyright in Ghana include the Berne Convention, WIPO Copyright Treaty (WCT), and Agreement on Trade-Related Aspects of Intellectual Property (TRIPS).

Copyright infringement or piracy means using the original piece of creative work without the permission of the right holder. Copyright infringement suits can be filed by any copyright owner of a work. Copyright is primarily covered as a civil law rather than a criminal law and as such the right holder can decide the extent to enforce his or her right.

2. Patents:

A patent according to section 1 of the Patent Act, is the right to protect an invention. It is an exclusive right a Sovereign State grants to an inventor to monopolize an invention for a limited in exchange for a detailed disclosure of an invention or a discovery of a new process of doing things to the public. An invention is deemed patentable if it is useful, new, and non-obvious.

An application for registration of a patent is required to be filed with the Registrar and should contain a request for the patent, a description of the invention seeking patent protection, and where required drawings of it. Owners of a patented invention can provide access to third parties, either by requiring payment of a license fee or royalties or other forms of payments dependent on the agreement reached. The right prohibits others from buying, selling, or importing the patented invention for a term of the patent which is 20 years.

A patent that has been granted or yet to be granted may be challenged, and as a result, countries stipulate a limited period for third parties to challenge the grant of patents. Even though patents are generally for 20 years, countries may extend the term of a patent under certain circumstances.



The main treaties governing patents in Ghana include:

- i. Patent Cooperation Treaty (PCT)
- ii. Paris Convention for protection of Industrial Property
- iii. TRIPS Agreement under the World Trade Organization
- iv. Budapest Treaty

3. Industrial Designs:

An Industrial design consists of the creation of a shape, configuration, or composition of a pattern or colour or a combination of a pattern and colour in two or three-dimensional form containing aesthetic value used to produce a product, industrial commodity, or handicraft. The Industrial Designs Act, 2003 (Act 660) passed on 31st December 2003 protects industrial designs.

An application may be made to the Registrar by an applicant for the registration of an industrial design. The application is subject to some payment fees as prescribed and it shall contain a request, drawings, photographs, or any other adequate practice representation of the industrial design, as well as an indication of which design is to be used. To protect the creator or the legitimate person entitled to the registration, the application shall contain a justification of the applicants' right in applying, where he is not the creator. Registration of the industrial design grants the person with the registered right, exclusive rights over the design. He has the sole right of granting consent to any entity or person who wants to exploit the registered design. He also has the right to institute court proceedings in addition to other rights and remedies, against anyone who infringes the industrial design or who is likely to make an infringement occur.

The duration of the registration is for five years starting from the filing date of the application for registration. The registration may be renewed for two further consecutive periods subject to payment of a prescribed fee. A registered owner may surrender the registration through a notification to the Registrar and this comes into effect from the date of record of the surrender.

An infringement party is liable for civil and criminal penalties.

4. Trademarks:

The Trademark Act, 2004 (Act 664) is an Act for the protection of trademarks and matters related. Trademark protection is available for products or services. Unlike patents and copyrights, trademarks do not expire after a set term of years.

A trademark is subject to registration under section 4 of Trademark Act 664. Such registration confers an exclusive right of use of the trademark on that person. Under section 4 of Act 664, the application for registration of a trademark must be filed with the Registrar and is contingent on the payment of a prescribed fee and further must contain a reproduction of the trademark and a list of goods and services for which registration of the trademark is made. Registration of a trademark by a person confers an exclusive right to use the trademark on that person. A person other than the registered owner of the trademark must not knowingly infringe the rights of the owner of a registered trademark by exploiting the trademark without the consent of the owner. If the registered owner can prove exploitation of a trademark by other persons without his consent, he/she may wish to institute court action against the offender and such a person may be held to have committed an offense and would be liable on a summary conviction to a fine or a term of imprisonment or both. The duration of the registration of a trademark and collective marks is for ten years and may be renewed for a further



period of ten years subject to renewal fees to be paid. Collective marks also enjoy all the rights as conferred on trademarks per section 8(2) of Act 664.

5. Geographical Indications:

Geographical Indications in Ghana are protected by the Geographical Indications Act, 2003 (Act 689) which was adopted on 31st December 2003. Act 689 protects for good such as Ghanaian cocoa beans originating from a defined area with certain characteristics linked to their geographical origin. Under the Act, the usage of a certain designation is likely to mislead the public of the actual origin of the product constitutes an offense. In this regard, the High Court of Ghana may place an injunction or award damages of such goods. Geographical Indications registration is not required for protection but indicates that a Geographical Indication has been registered under the Act.

6. Layout Designs (Topographies) of Integrated Circuits:

The Parliament of Ghana on 25th March 2004 enacted the Layout Designs (Topographies) of Integrated Circuits Act 2004, (Act 667) to protect layout designs (Topographies) of Integrated Circuits and related matters. The protection for any layout designs is valid for ten years after the date of commencement. The layout design must be original and must not have been commercially exploited for more than two years anywhere in the world.

3.3.5. Administration and Management Structures of Ghana's Intellectual Property System:

In Ghana, the Registrar-Generals' Department and the Copyright Office administer intellectual property matters. The Registrar General's Department of the Ministry of justice deals with trademarks, patents, industrial designs, layout designs, and geographical indications before entering the Ghanaian market. The intellectual property outfit within the Registrar General's Department currently does not have any enforcement powers. It is however instrumental in the initial stages of protection. The Copyright Office operating within the Ministry of Justice and under the Attorney General is responsible for registering copyrights. Unlike the Registrar General's Department, the Copyright Office is charged with the implementation of relevant laws and regulations, investigating and redressing cases of violations. The Copyright regulations adopted in 2020 established the fees, jurisdiction, and powers of the Copyright Tribunal. The Copyright Tribunal once constituted will have the power to hear disputes concerning licensing schemes and bodies.

3.3.6. Institutional Structures and Enforcement of Intellectual Property Rights in Ghana:

Apart from the Copyright Office, the following agencies and offices are also charged with the responsibility of enforcing IPR:

1. The Customs Division of the Ghana Revenue Authority:

The Customs Division of the Ghana Revenue Authority operates within the Ministry of Finance. As part of its mandate, the officials of the Customs Department operate at the country's entry port and are charged with the responsibility of policing Ghana's imports to prevent infringement and illicit products from entering.



2. The Ghana Police Service:

The Commercial Crime Unit (CCU) of the Criminal Investigation Department (CID) of the Ghana Police Service is designated to investigate commercial crimes, including intellectual property rights infringements. Thus, the commercial crime unit after ascertaining those certain goods have been infringed, in collaboration with other relevant government agencies conducts raids. It also has powers of arrest and detains charged offenders.

3. The Ghana Standards Authority:

The Ghana Standards Authority (GSA) operates within the Ministry of Trade and Industry under the Standards Authority Act, 1973 and the Labelling Rules Amendment of 1992. The Ghana Standards Authority sets and promotes standards that apply to all manufactured and imported products. It also collaborates with other regulatory bodies to inspect, test, and monitor activities. The Ghana Standards Authority's Destination Inspection Department together with the Ghana Standards Authority's Market Surveillance Group monitors and enforces the institution's mandate of protecting the Ghanaian population.

4. The Food and Drugs Board:

The Food and Drugs Board (FDB) operates within the Ministry of Health under the Food and Drugs Act 1992. It is responsible for ensuring the safety of food and drugs sold on the Ghanaian market. Hence all foods and drugs manufactured locally or imported into Ghana must register with the Food and Drugs Board. It also has a Post-market Surveillance Unit that acts as the enforcement and investigative component of the Food and Drugs Board. Together with the Pharmacy Council, the Food and drugs Board investigates claims of counterfeit and expired health-related goods being sold on the market.

5. The Commercial Court:

The Commercial Court in Ghana was inaugurated on 4th March 2005 to deliver efficient, expeditious, and effective resolutions of commercial disputes which are defined in Order 58. Order 58 introduces a new and unique process of Civil Procedure Rules C. 147 which allows for pre-trial settlement conference for expeditious resolution of disputes. As a result, the court thus plays a key role in the protection of intellectual property rights such as placing injunctions, seizure orders, and the awarding of damages. It also plays a role in administrative procedures and measures such as fast-tracking and case management which impinges on the efficient adjudication and enforcement of intellectual property rights.

6. National Intellectual Property Policy and Strategy (NIPPS):

On 21st January 2016, the Government of Ghana launched a regulatory framework document termed the National Intellectual Property Policy and Strategy (NIPPS) which aims at strengthening the management of the intellectual property system. The new policy also aims at ensuring that the country's intellectual property system is in full compliance with the Trade-Related Aspects of Intellectual Property Rights (TRIPS) and serves as a tool of adding the value of peoples creative and innovative potentials.



3.4. Intellectual Property Rights in Niger and Burkina Faso:

Niger and Burkina Faso are some of the French-speaking states in West Africa. Regarding intellectual property rights protection in their respective countries, Niger and Burkina Faso do not have national laws governing the protection of IPR. This is due to their membership to the African Intellectual Property Rights Organization whose principles govern the application of IPR in their respective member states. The OAIP being a regional IPR protection body is also a member of some international intellectual property rights treaties and organizations in the world. As a result, all principles and protocols governing IPR protection in those international treaties and organizations are binding to OAIP and its member states. OAIP registrations automatically extend to all member states. It is thus neither necessary nor possible to designate member states. However, the enforcement of IPR protection and infringements, though guided by the principles of OAIP, is a preserve of the member countries to protect and enforce.

3.4.1. The African Intellectual Property Rights Organization (OAIP):

Intellectual Property Rights in Niger and Burkina Faso are guided by the principles of their membership to the African Intellectual Property Organisation (OAPI) of which they are signatories. OAIP encompasses most of African French-speaking countries with a current membership of 17 States. The OAIP was created by the Bangui Agreement on March 2, 1977 and came into force on February 8, 1982. A revised Bangui Agreement came into force on February 28, 2002. The Bangui Agreement works as a common Intellectual Property Act: its provisions have the effect of national law in each of the member states and no validation or extension is required. An OAIP registration automatically extends to all member states; it's neither necessary nor possible to designate individual member states. The decisions by a national court of any member state on the provisions of the OAIP Law are binding to all other member states.

The goal of OAIP is to foster cooperation between member states and share common objectives in Intellectual Property matters. Member states do not have National Intellectual Property Laws.

3.4.2. OAIP Member Countries:

Benin	Comoros	Guinea Bissau	Guinea
Burkina Faso	Congo Republic	Mali	Togo
Cameroon	Cote d'Ivoire	Mauritania	
Central African Republic	Equatorial Guinea	Niger	
Chad	Gabon	Senegal	

3.4.3. Historical Development of OAIP:

On September 13, 1963, between twelve Heads of State and government, the Agreement establishing the African and Malagasy Office of Industrial Property (OAMPI) was signed in Libreville, Gabon. This Agreement was revised in Bangui, the Central African Republic on March 2, 1977, to give birth to the African Intellectual Property Organization (OAIP). On February 24, 1999, the Bangui Accord was revised to:

- i. Make its provisions compatible with the requirements of international intellectual property treaties to which member states are parties, in particular the Agreement on Trade-Related Aspect of Intellectual Property Rights (TRIPs) Agreement.



- ii. Simplify the procedure of issuing titles
- iii. Extend the mission of OAPI which, beyond its traditional mission, must promote the development of Member States by means of effective protection of intellectual property and related rights and provide training in intellectual property.
- iv. Extend protection to new subjects (new plant varieties, layout designs of integrated circuits).

The new agreement entered into force on February 28, 2002. It strengthens creativity and the protection of intellectual property rights to secure investments, facilitate technology transfer and thus contribute to the economic growth of member states.

3.4.4. OAIP Systems:

- i. OAIP is headquartered in Yaoundé, Cameroon. It is also the Industrial Property Office common to all member states. To this end, in the space of its seventeen member states, a uniform law is implemented and applied namely the Bangui Agreement and its Annexes.
- ii. The organization centralizes all the procedures for issuing industrial property titles such as patents, certificates of registration of trademarks, titles that are valid in all member countries.
- iii. There are no national protection systems that co-exist with the regional system.
- iv. Sanctions for infringements of intellectual property rights are the responsibility of courts of each member state
- v. Final judicial decisions, rendered on the validity of titles in one member state are authoritative in all other member states, except those based on public order and good morals.

3.4.5. OAIP Administration:

The OAIP administration is governed by three bodies:

1. **The Board of Directors:** The Board of directors is endowed with all regulatory and control powers. It is made up of the Ministers responsible for Industry from the seventeen member states.
2. **The Superior Appeals Commission:** This is the competent body that hears appeals against decisions to reject industrial property title applications taken by the Director-General. It also hears appeals against decisions on oppositions, requests for restoration, and registration in the special register. Finally, it hears against decisions to strike-off agents. It is made up of six magistrates, three of whom are titular and three substitutes, all nationals of OAIP member states.
3. **The General Management:** This is placed under the authority of a Director-General, who is the Executive Officer of the organization. It ensures the management and continuity of the organization daily. The Director-General is appointed for a term of five years renewable once.

3.4.6. The OAIP Legal Framework:

3.4.6.1 Bangui Agreement:

Adopted on March 2, 1977, the Bangui Agreement governs intellectual property rights within the seventeen member states of OAIP. This agreement serves as national law for each of the member states. It was revised on February 24, 1999, and December 14, 2005. The purpose of this latest revision was to bring it into line with the new global legal environment and enable it to better respond to the concerns of economic and social development.



It should be noted that since the signing of the Bangui Agreement, many international property treaties have been adopted or revised, in particular: the Doha Declaration on Intellectual Property and Public Health, the Decision of the General Council of the WTO of August 30, 2003, the Protocol amending Article 30 of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPs), the Treaty on Patent Law, the Singapore Treaty on Law of Trademark, the Beijing Treaty on Audio-visual Performance, the Marrakesh Treaty on Facilitating Access to Blind, visually impaired people, and people with reading difficulties from printed texts to published works.

The Bangui Agreement includes ten annexes setting out provisions applicable in each member state about:

- i. Patent for invention (Annex I)
- ii. Utility Models (Annex II)
- iii. Trademarks of products and services (Annex III)
- iv. Industrial Designs (Annex IV)
- v. Trade names (Annex V)
- vi. Geographical Indications (Annex VI)
- vii. Literary and Artistic Property (Annex VII)
- viii. Protection against unfair competition (Annex VIII)
- ix. Layout designs (topographies) of integrated circuits (Annex IX)
- x. Plant Variety Protection (Annex X)

International Treaties:

1. The Paris Convention
2. The Berne Convention
3. TRIPS Agreement
4. Hague Agreement
5. Patent Cooperation Treaty (PCT)
6. Rome Convention
7. WIPO Convention

3.4.7. Types of IPR Protected by the Bangui Agreement:

The Bangui Agreement covers IPR protection guidelines for Patents, Utility Models, Trademarks, Industrial designs, trade names, Geographical Indication, Copyrights, Unfair Competition, Integrated Circuit layout, and Plant Variety Rights.

i. Patents (Annex I):

Patents applications must be filed at the OAIP Office. Alternatively, member states may require that applications domiciled in the territory of a member state must first apply with national administration (OAIP Liaison Office) on the member state. In that case, the application must be transmitted to OAIP by the national administration office within five days.

OAIP member countries are also members of the Paris Convention, the Budapest Treaty, the Patent Cooperation Treaty (PCT), and the TRIPs Agreement. Since OAIP is a member of the PCT, patent protection may also be obtained by way of PCT application.

ii. Trademarks (Annex III):



The Bangui Agreement in Annex III provides for the protection of trademarks including service marks and well-known marks. Specific provisions are made for the registration of collective marks. OAIP is a member of the Madrid Protocol. With this accession by OAIP, the Madrid system now provides brand owners the potential to protect their products through one international application.

iii. Industrial Designs (Annex IV):

Design applications must be filed at the OAIP office or with the Ministry in a member state responsible for industrial property. In the latter case, the Ministry must transmit the application to the OAIP office within five days.

OAIP is a member of the Hague Agreement concerning the Industrial Deposit of Industrial Designs. As such, the design protection in the OAIP can be obtained either via an OAIP application or via an international application under The Hague designating OAIP.

iv. Trade Names (Annex V):

The Bangui Agreement provides for the protection of trade names or commercial names in Annex V. Within the meaning of this Annex, a trading name shall be the name under which a trade, industrial, craft, or agricultural establishment is known and exploited. A name or designation shall not be admissible as a trading name if, because of its nature or the use to which it may be put, it is contrary to morality or public policy and if it is liable to mislead trade circles or the public as to the nature of the trade, industrial, craft or agricultural establishment of that name. Subject to the provisions hereafter, a trading name shall belong to the person having first made use of it or having first registered it. The use of a trading name may only be proved by written or printed matter or documents contemporaneous with the facts they seek to establish. Where a registered trade name has been publicly used continuously on the national territory for at least five years without having given rise to a legal action recognized as being well-founded, ownership of the trade name may not be challenged on the ground of priority of use, unless it can be proved that, at the time of the filing of the application for registration, the applicant could not have been unaware of the existence of the trade name of the initial user.

v. Geographical Indications (Annex VI):

The Bangui Agreement provides for the protection of Geographical Indications in Annex VI. For this Annex, “geographical indication” means an indication that serves to identify a product as originating from a territory, a region, or a locality within that territory, in those cases where the quality, reputation, or another specific characteristic of the product may be essentially attributed to such geographical origin. Geographical indications shall be protected as such if they have been registered by the OAIP or are to be treated as having been registered by an international convention to which the Member States are a party. Geographical indications foreign to the territories of the member States of the OAIP may be registered by the OAIP only where provided for in an international convention to which the member states are a party or in the enforcing legislation.

4.0. Major World IPR Treaties and Organizations:

Many countries of the world including Ghana, Egypt, Tunisia, Burkina Faso, and Niger are members of some major world IPR treaties. As such if a country is a member state of an IPR treaty it is bound and governed for IPR protection by the principles of that treaty.



4.1. World Intellectual Property Organization (WIPO):

WIPO is a specialized agency of the United Nations with 193 member states. The mission of WIPO is to develop a balanced and accessible international IP system that rewards creativity, stimulates innovations, and contributes to economic development while safeguarding the public interest.

WIPO was established by the WIPO Convention in 1967 with a mandate from its member states to promote the protection of IP throughout the world through cooperation among member states and in collaboration with other international organizations.

WIPO cooperates with IP offices, users, and other stakeholders to develop shared IP tools, services, standards, databases, and platforms. This technical infrastructure is designed to help IP institutions collaborate more effectively and deliver more efficient services to their users as well as enable innovators and information seekers worldwide to freely access knowledge contained in the IP system. WIPO provides human capacity building across the full spectrum of intellectual property rights i.e. patents, trademarks, industrial designs, geographical indications, and copyright. Training takes place through in-depth programs offered by the WIPO Academy or tailor-made technical workshops.

4.1.1. Legal Framework under WIPO:

- a. Patent Cooperation Treaty (PCT) under the Paris Convention assists applicants in seeking patent protection internationally for their inventions, helps patent Offices with their patent granting decisions, and facilitates public access to a wealth of technical information relating to those inventions. By filing one international patent application under the PCT, applicants can simultaneously seek protection for an invention in many countries.
- b. Madrid Protocol: The Madrid System for the International Registration of Marks is governed by the Madrid Agreement, concluded in 1891, and the Protocol Relating to that Agreement, concluded in 1989. The system makes it possible to protect a mark in many countries by obtaining an international registration that has effect in each of the designated Contracting Parties
- c. Vienna Agreement establishes an International Classification of the Figurative Elements of Marks called the Vienna Classification for marks that consist of, or contain figurative elements.
- d. Nice Agreement concerns the International Classification of Goods and Services for the Registration of Marks.
- e. Locarno Agreement establishes an International Classification for Industrial Designs called the Locarno Classification.
- f. WIPO Copyright Treaty (WCT) is a special agreement under the Berne Convention which deals with the protection of works and the rights of their authors in the digital environment. The Treaty also deals with two subject matters to be protected by copyright: (i) computer programs, whatever the mode or form of their expression; and (ii) compilations of data or other material ("databases").
- g. WIPO Performances and Phonograms Treaty (WPPT) deals with the rights of two kinds of beneficiaries, particularly in the digital environment: (i) performers (actors, singers, musicians, etc.); and (ii) producers of phonograms (persons or legal entities that take the initiative and have the responsibility for the fixation of sounds).
- h. WIPO Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore is, following its mandate, undertaking text-based negotiations to reach an agreement on a text(s) of an international legal instrument(s), which will ensure the effective protection of traditional knowledge (TK), traditional cultural expressions (TCEs) and genetic resources (GRs).



- i. The Standing Committee on Copyright and Related Rights (SCCR) was set up in the 1998-1999 biennium to examine matters of substantive law or harmonization in the field of copyright and related rights.
- j. Hague System for the International Registration of Industrial Designs provides a practical business solution for registering up to 100 designs in 74 contracting parties covering 91 countries, through the filing of one single international application
- k. Lisbon System for the International Registration of Appellations of Origin and Geographical indications offers a means of obtaining protection for an appellation of origin or a geographical indication in the contracting parties through a single registration procedure and one set of fees.

4.2. Paris Convention for the Protection of Industrial Property:

The Paris Convention for the protection of Industrial Property, signed in Paris, France on March 20, 1883, was the first global IP treaty and it established a Union for the protection of industrial property. One of the most important rules in the Paris Convention concerns the Conventions Priority Right also called Union Priority Rights. It was established by Article 4 of this treaty and provides that an applicant from one contracting state shall be able to use its first filing date (in one of the contracting states) as the effective filing date in another contracting state, provided that the applicant files a subsequent application within a certain time. Regarding patents, an applicant who has applied for the same patent in another conventional country is entitled to claim the priority right, provided that the application is filed within twelve months of such earlier filing.

The convention currently has 176 contracting member countries which makes it one of the most widely adopted treaties worldwide. In respect to African countries, except for Cape Verde, Eritrea, Ethiopia, South Sudan, and Somalia, all the remaining countries are members of this treaty.

4.3. Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS):

The Agreement on Trade-Related Aspects of Intellectual Property Rights came into force on January 1, 1995, and is one of the most comprehensive IP treaties to date, not only considering the scope of its regulations but also because all members of the World Trade Organisation (WTO) are its parties. Many provisions of the TRIPS agreement were inspired by the Berne Convention for the protection of literary and artistic works by the Paris Convention for the protection of Industrial property. Countries found interest in ratifying TRIPS as opposed to other IP-related treaties as it is a mandatory requirement to adhere to the WTO.

The TRIPS Agreement introduced IP Law into the international trading system for the first time and remains till today the most comprehensive international agreement on IP. Regarding patents, the TRIPS Agreement prevented the requirements of patentability, the rights conferred to patent holders, revocation and term of patent rights, the burden of use, and provisions concerning non-authorized usage of the patent. TRIPS Agreement also has provisions regarding Trademarks, Geographical Indications, Industrial designs, Protection of Undisclosed Information, and Dispute settlement.

As of July 29, 2016, there were 164 contracting parties to the TRIPS Agreement. Most African countries are members of this organization. However, Algeria, Comoros, Equatorial Guinea, Ethiopia, Libya, Sudan, and Sao Tome and Principe are observers, while Eritrea, South Sudan and Somalia are not part of TRIPS.



4.4. Patent Cooperation Treaty (PCT):

The PCT was concluded in 1970 and entered into force in 1978 with amendments and modifications in 1979, 1981, and 2001 and facilitates transnational patent application procedures for patent holders that protect their invention in several jurisdictions. Applicants can file an international patent application at a receiving office and a search is conducted by an international searching authority and a written opinion is issued regarding the patentability of the invention. Afterward, applicants should enter the national phase to have their patents granted in each PC member state.

PCT has enabled that the international protection of patents is less bureaucratic and less expensive and provides applicants with around eighteen additional months to enter national phases which helps to postpone major costs. PCT regional phase applications are possible in the OAIP, which is automatically effective in its member states.

As of August 1, 2016, PCT had 150 member states and many African countries are members except Burundi, South Sudan, Ethiopia, Eritrea, and Somalia.

4.5. The International Union for the Protection of New Varieties of Plants (UPOV):

UPOV is an intergovernmental organization based in Geneva, Switzerland. It was established in 1961 by the International Convention for the Protection of New Varieties of Plants Convention (the UPOV Convention). UPOV administers the UPOV Convention, the purpose of which is to ensure that its member acknowledges the achievements of breeders of new varieties of plants by granting them an intellectual property right based on a set of clearly defined principles. Protection of plant varieties accelerates agricultural development and stimulates investment in research and development for the development of new plant varieties, which in turn facilitates the growth of the seed industry and ensures the availability of quality seeds and planting materials.

The opportunity to obtain certain exclusive rights in respect to new varieties provides successful plant breeders with a better chance of recovering their costs and accumulating the funds necessary for further investment. Without such rights, there would be nothing to prevent others from reproducing the new variety and selling it on a commercial scale with no benefit accruing to the breeder.

Benefits of New Plant Varieties Protection:

- Economic benefits, such as varieties with improved yields which lead to a reduction in the price of products for consumers, or improved quality leading to high-value products with increased marketability.
- Health benefits, for example through varieties with improved nutritional content.
- Environmental benefits, such as varieties with improved disease resistance or stress tolerance and,
- Pleasure benefits, such as that afforded to ornamental plants.

4.5.1. UPOV Acts:

The first Act was drafted in 1961, principally by industrialized governments seeking to protect plant breeders in their markets and overseas markets. The UPOV was later revised in Acts adopted in 1972, 1978, and 1991.



The 1978 UPOV Act:

The 1978 UPOV Act adopts most of the International IPR obligations set including a definition of applicable subject matter and protected material, eligibility requirements, exclusive rights, national treatment, reciprocity, terms of protection, and exceptions and limitations to exclusive rights. Under the 1978 Act, the minimum scope of the plant breeder’s right requires that the holder’s prior authorization is necessary for the protection for purpose of commercial marketing, the offering for sale, and the marketing of propagating materials of the protected variety. The plant variety to be eligible for protection under the 1978 Act has to be 1) Novelty/ new 2) distinct from existing or commonly known varieties, 3) homogenous or uniform and, 4) stable.

The 1991 UPOV Act:

The limited scope of the 1978 Act led to several member states of the UPOV to adopt a revised Act with enhanced rights to the plant breeders. The major revisions of the revised Act included: subject matter requirements, eligibility requirements, breeders' exclusive rights in protected material, national treatment requirements, terms of reference, and exceptions and limitations.

Comparison of UPOV 1978 Act and UPOV 1991 Act

Subject	UPOV 1978 Act	UPOV 1991 Act
Minimum scope of coverage	An increasing number of genera or species are required to be protected, from five at the time of accession, to 24 eight years later.	An increasing number of genera or species is required to be protected, from 15 at time of accession, to all genera and species 10 years later (5 years for member states of earlier UPOV Act).
Eligibility Requirements	Novelty, distinctness, uniformity, and stability.	Novelty, distinctness, uniformity, and stability.
Minimum exclusive rights in propagating material	Production for purposes of commercial marketing; offering for sale; marketing; repeated use for the commercial production of another variety.	Production or reproduction; conditioning for propagation; offering for sale; selling or other marketing; exporting; importing or stocking for any of these purposes.
Minimum exclusive rights in harvested material	No such obligation, except for ornamental plants used for commercial propagating purposes.	Same acts as above if harvested material obtained through unauthorized use of propagating material and if the breeder had no reasonable opportunity to exercise his or her right concerning the propagating material.
Prohibition on dual protection with patent	Yes, for the same botanical genus or species.	No.



Breeders' exemption	Mandatory. Breeders are free to use a protected variety to develop a new variety.	Permissive, but breeding and exploitation of new variety "essentially derived" from earlier variety require right holder's authorization.
Farmers' privilege	Implicitly allowed under the definition of minimum exclusive rights.	Allowed at the option of the member state within reasonable limits and subject to safeguarding the legitimate interests of the right holder.
Minimum term of protection	18 years for grapevines and trees; 15 years for all other plants.	25 years for grapevines and trees; 20 years for all other plants.

4.5.2. Africa and Intellectual Property Rights for Plant Varieties:

The entry into force of the Trade-Related Aspects of Intellectual Property Rights (TRIPS) on 1 January 1995 reversed Africa's relationship with the Intellectual Property Rights for Plant Varieties. Except for Kenya, South Africa, and Zimbabwe, no other African country had intellectual property rights system for plant varieties before TRIPS. However, the obligations set out in article 27.3(b) of TRIPS for all WTO members to protect plant varieties through patents, an effective sui generis system, or a combination of systems, heralded revisions to the intellectual property laws and policies on the continent. Africa's response to Article 27.3(b) of TRIPS was the Organization of African Unity (now African Union –AU) African Model for the Protection of local communities, farmers, and breeders and the Regulation of Access to Biological Resources (African Model Law) adopted in 2000. Grounded on the dynamic social, economic, and political realities in Africa, the African Model Law seeks to balance small-scale farmers, farming communities, and commercial plant breeders' interests. The African Model Law rejects patents for plant varieties and the wholesome adoption of the 1991 version of UPOV. Instead, it presents a TRIPS compliant model sui generis option that provides access and benefits sharing principles from the Convention on Biological Diversity (CBD), farmers' rights from the International Undertaking on Plant Genetic Resources for Food and Agriculture (IUGRFA), and plant breeders' rights from UPOV 1978 and 1991. Despite the commendable efforts at creative designing, the model law, and its historic significance as an African-rooted response to the international debates on the overlapping and conflicting international treaties for plant varieties, the Model Law failed to gain traction in Africa. No African country has adopted it. On the contrary, there is increasing pressure through a coalition of global North countries, International Organizations, and multinational firms for Africa to adopt UPOV 1991 styled plant breeders' rights system.

4.5.3. Resistance to the UPOV 1991 Act:

Many developing nations, particularly those in Africa, have resisted ratifying the 1991 Act or adopting it as the standard for their plant variety protection laws. The Foreign Affairs Ministers of more than 50 Africa member states of the African Union stated at a January 1999 meeting calling for a hold on the IPR protection for plant varieties until an Africa-wide system has been developed that grants greater recognition to the cultivation practices of indigenous communities. However, in a subsequent meeting of OAIP member states, the patent officials from 16 Francophone African nations recommended that their countries adopt the 1991 Act. However, in Africa, only Tunisia, Kenya, and South Africa are



independent African UPOV member states. Tunisia ratifies the 1991 Act in August 2003, whereas Kenya and South Africa are parties to the 1978 Act.

5.0. Drone Technology:

Drones are described as remotely piloted aircraft systems (RPAS), having a propulsion system, a programmable controller with or without the satellite navigation system, automated flight planning features, and capable of carrying payloads such as cameras, sensors, spraying systems, and so forth. Other acronyms used interchangeably with Remotely piloted aircraft systems (RPAS) includes unmanned aerial vehicles (UAVs) or unmanned aircraft systems (UAS), the latter is combined with ground-based controller and the communication system. Drones have many applications. These include, but are not limited to, land mapping and surveying, land tenure and land use planning,



inspection monitoring and surveillance, cargo delivery, scientific research, management of agricultural assets and insurance, and crop/infrastructure damage assessment.

Drones are classified into two functional systems:

- Fixed-wing system
- Error (rotating) wings system.

The fixed-wing system generates its lift as it moves to enable it to sustain velocity through the air whereas the rotor is highly manoeuvrable and can hover and rotate with a flight controller.



5.0.1. Use of Drones in Agriculture:

Drone technology is a phenomenal innovation with the potential to transform the way routine manual activities are carried out in agriculture to modernise farming. Drones are designed to carry sensors that can provide real-time information about the crop status or livestock movement so that decisions on agricultural operations and management are made more efficient and precise.

Drones can either be remotely controlled over wireless communication or can be programmed to travel the predefined path using complex navigation algorithms running on onboard controllers. It can be retrofitted with different configurations of payloads of sensors with digital imaging capabilities such as multispectral, high-resolution camera systems and actuators, for the field survey, crop scouting, spraying, and spreading applications such as surveillance on livestock and fisheries. Using data captured through cameras mounted on drones and data analytics, farmers can precisely calculate the

land sizes, classify crop types and varieties, develop soil maps along with pest management and properly plan the harvesting of their crops.

The use of drones can be advantageous in the case of pesticide spraying, replacing labour-intensive and hazardous conventional methods particularly in difficult areas such as hills.

Artificial Intelligence (AI) and machine learning can be combined with Normalized Difference Vegetation Index (NDVI) imaging technology-based high-resolution images captured by drones to develop an understanding of soil conditions, plant health, and crop yield prediction. Every individual plant can be located separately and analysed using image processing algorithms if it is stressed. Using this result, farmers can take preventive action to ease the spread of the disease to other crops. Timely actions can be taken to prevent losses from biotic stresses such as insect-pest and diseases, optimize fertilization, rationalize irrigation and reduce the impact of climate change and unpredictable weather using analysed insights from data collected by drones and satellite-based remote sensing. Drone applications in agriculture are however limited by country policies on its use context.

5.0.2. Potentials of using Drones in Agriculture:

- i. Soil analysis and field planning: Drones can be used for soil and field analysis for irrigation, planting planning, and nitrogen level in the soil. Along with this, a drone is helpful to produce accurate 3-D maps that can be used to conduct soil analysis on soil properties, moisture content, and soil erosion.
- ii. Seedpod planting: Although invented but seldom prevalent just yet, some companies have come up with additional attachments below the drone system able to shoot pod containing seed and plant nutrients into already prepared soil. This helps reduce planting costs.
- iii. Crop Monitoring: Drones can be used to set crop monitoring routes by gathering geospatial and temporal datasets at pre-defined scales that relate to crop development and health. Data analytics help in getting insights into crop health much before being visible by manual field scouting.
- iv. Crop Spraying: Drones can carry suitable-sized reservoirs which can be filled with fertilizers, herbicides, or pesticides for crop spraying on large areas in less time.
- v. Irrigation: Drones loaded with thermal, multispectral, or high-spectral sensors can identify the parts of a field with moisture deficits using multispectral indices which help in planning timely irrigation to the identified areas with precision.
- vi. Crop Health Assessment: Plants reflect visible and near-infrared light and its intensity varies with health status and stress levels experienced by plants. Drones fitted with sensors capable of scanning crops using visible and near-visible infrared light can be used to track crop health over a period of time and also to monitor response to remedial measures.
- vii. Crop Surveillance: It is nearly impossible to estimate the overall status of crops in large fields. Drone-based agricultural mapping can help farmers remain area-wise updated on the plant's status and point out which field areas require attention. Drones inspect the field with infrared cameras and determine light absorption rates to estimate the state of crops. Based on real-time and accurate information, farmers can take measures to improve the state of plants in any spot of the field.
- viii. Controlling weeds, insects, pests, and diseases: Apart from soil conditions, drones can also detect and inform farmers about field areas inflicted by weeds, diseases, and insect pests. Based on this information, farmers can optimize the use of chemicals needed to fight infestation, hence reducing the expenses and contribute to better field health.
- ix. Tree/Crop biomass estimation: crop/tree canopy density and distance from the ground surface can be measured using ultra-compact LiDAR sensors mounted on drones. This enables



estimation of the tree/crop biomass charge derived from a differential height measurement that forms the basis for estimating timber production in forest and production estimates in crops.

- x. Scaring birds: Birds are a major problem after sowing seeds of many crops. This needs labour to protect. A couple of drone flights can scare the birds away from fields.

5.0.3. Challenges of Drone Adoption and use in Africa Agriculture:

Regulation of civilian airspace in Africa is the responsibility of National Civil Aviation Authorities (NCAAs) which control both the development and enactment of regulations. NCAAs are national government statutory authorities and hence are the primary regulators of drone usage within the national space. The deployment of drone technology in Africa has its challenges, which may be classified under four broad categories; namely

- i. **Technological:** An average farmer cannot analyse the drone images as it requires specialised skills and knowledge to translate them to any useful information. Under these circumstances, the farmers have to acquire the skills and knowledge of software of image processing or hire skilled personnel with the analysis software. More importantly, a skilled workforce is required by the UAV industry whose competencies range from planning flight itineraries, piloting UAVs, operating GIS, and data analysis software, interpreting data, and providing agronomic or spatial planning advice.
- ii. **Economic:** Most agricultural drones used in surveying have fixed wings and the initial costs may be high based on the features and sensors necessary for executing its intended use. The initial cost is also proportional to the payloads and flight duration capacities apart from sensors and other features.
- iii. **Social:** There exist social challenges, which span a range of issues including security, the right for privacy, data acquisition, storage, and management, causing harm or nuisance to people and animals, damaging property, employment, etc.
- iv. **Legal and regulatory:** UAV regulations are still in their infancy in Africa, the making and the presence of too restrictive, or even disabling regulations governing the import and use of UAVs can hinder the development of a very promising industry, which could attract and engage educated youth in rural areas. The African Union has no drone policy framework at the regional level to expedite individual countries' drone regulations development.

Other challenges include capability, reliability, and battery autonomy; commercial batteries for small UAVs allow 24-40 minutes flight fully charged before battery replacement is required. Also, UAV's reliance on communications from a ground operator for control makes them vulnerable to signal loss from interference, flying out of range, or hacking. Another big area of concern is privacy. Flying UAVs with cameras, scanners, and sensors could allow unscrupulous individuals to anonymously collect and record sensitive or damaging information on civilians, businesses, and other organizations.

5.1. Drone Use in Egypt:

Drone use in Egypt is heavily restricted. Some several strict laws and procedures need to be followed before acquiring, importing using, and when flying drones in the country. According to the Egyptian Civil Aviation Authority, (ECAA), which is the only agency responsible for regulating drone usage in Egypt, flying a drone is "technically legal" if you obtain permission from the Egyptian Civil Aviation Authority. However, it remains very difficult to acquire a permit to operate a drone.



Egypt enacted stringent legislation in 2017 that prohibited the use and trade of drones. This law makes it illegal to import, manufacture, sell, collect, or possess drones unless you receive a permit from the Ministry of Defense.

5.1.1. General Rules and Regulations of Drone Use in Egypt:

- i. You MUST FIRST obtain permission from the Egyptian Civil Aviation Authority before operating your drone in the country.
- ii. Do not fly your drone over people or large crowds
- iii. Respect the privacy of other people when flying your drone
- iv. Do not fly your drone over airports or in areas where aircraft are operating
- v. You must fly your drone during daylight hours and only fly in good weather conditions,
- vi. Do not fly your drone in sensitive areas including government or military facilities. Also, the use of drone cameras in these areas is prohibited.
- vii. Do not fly above 400 ft.
- viii. Do keep your drone within direct visibility,
- ix. You may only use automatic manoeuvres if you can intervene as a pilot at any time during the operations.

5.2. Drone Use in Tunisia:

In Tunisia, one needs to have a permit to use drones. However, it is almost impossible to get this permission. A drone use application in Tunisia passes through four ministries:

- Ministry of National Defence
- Home Office
- Ministry of Equipment and Housing
- Department of Transportation.

The application should also be delivered personally and in quadruplicate at the Ministry of Equipment in the aviation department. It consists of several documents and can take up to a month to process. If the permit is issued, it will be valid for one month only.

5.2.1. The General Drone Laws in Tunisia

- i. Do not fly your drone over people or large crowds
- ii. Respect other people's privacy when flying your drone
- iii. Do not fly your drone over airports or in areas where aircraft are operating
- iv. You must fly your drone during daylight hours and only in good weather conditions
- v. Do not fly a drone in sensitive areas including government or military facilities. The use of drone or camera drones in those areas is prohibited.

A draft bill (government decree relating to the regulation of technical conditions applicable to RPAS System used only for air traffic over the territory of the Republic of Tunisia and the condition for practicing) has been drawn awaiting debate and approval. The draft is attached in Annex 2.

5.3. Drone Use in Ghana:

Drones in Ghana are widely used for various purposes in agriculture, health, and other logistics. Ghana became the first country in Africa to deliver Covid 19 vaccines to remote places within Ghana.

RPAS use in Ghana is governed by the Civil Aviation Authority Directive Part 28. The directive delineates classes of RPAS operations as:



- i. Small RPAS: Unmanned aircraft with a maximum take-off weight up to 1.5 kg and shall be flown only within the visual line of sight of the pilot.
- ii. Light RPAS: Unmanned aircraft with a maximum take-off weight of more than 1.5 kg but less than 7kg and shall be flown only within the visual line of sight of the pilot.
- iii. Large RPAS: Unmanned aircraft with a maximum take-off weight of more than 7 kg which shall be flown either within VLOS of the pilot or BVLOS of the pilot with prior authorization of the authority.

Any operations above 400ft AGL or BVLOS must comply with the commercial RPAS requirements. For large BVLOS operations, a special certificate of airworthiness (restricted category) or an experimental certificate issued by the authority is required. Detect and Avoid traffic and Sense and Avoid all other hazards such as hazardous meteorological conditions, terrain, and obstacles are required. The directive appears to allow for authorization by the authority for the conduct of BVLOS operations under VFR if the area is void of other traffic (one of several possibilities).

5.3.1. General Rules for flying a Drone in Ghana:

- i. All drones must be registered with the GCAA. Registration fees may cost up to \$4,000, and failure to register a drone can result in a 30-year prison term.
- ii. Do not fly within 10 kilometres (6 miles) of airports or helipads.
- iii. Do not fly drones higher than 400 feet vertically.
- iv. Visual line of sight must be maintained with drones.
- v. Drone insurance is required.
- vi. Drones may only be operated at night with a special permit from the GCAA.
- vii. Drones may not fly in restricted areas.
- viii. Goods may not be dropped or transported via drone without prior special authorization.
- ix. The drone operator must be at least 18 years of age.
- x. Flight into icy conditions is prohibited.
- xi. Drones may not be operated in congested areas of cities, towns, or settlements. Additionally, drones may not be flown over crowds.
- xii. Drones may not fly within a 30-meter (98 feet) radius of buildings or vehicles without prior express permission

5.4. Drone Use in Burkina Faso:

Burkina Faso drone operations are governed by a Decree under the civil aviation authority. RPAS Regulation (Related to ICAO Annex 2): Civil Aviation Regulation Annex Regles De L'air (RAF 02) 3.1.9. states: *"A remotely piloted aircraft is operated in such a way as to pose the least possible risk to persons, property or aircraft, and following the conditions specified in Appendix 4 of the ICAO Annex 2"*.

The regulations are for international air navigation, i.e. operations by certified RPAS operating in controlled airspace as per conventionally piloted aircraft and covers:

- General operating rules
- Certificates and licenses
- Request for a permit.

Contact: Agence Nationale de L'Aviation Civil (ANAC) du Burkina Faso; 01 BP 1158. Ouagadougou 01, Burkina Faso; Tel: +226 50306488/ 50316332; Email: info@anacburkina.org.



5.5. Drone Use in Niger:

Drone use is allowed in Niger, but several drone regulations need to be followed when flying a drone in the country. At a minimum, a good rule of thumb for flying in Niger would be to follow these rules for flying your drone (these rules are taken from the U.S.'s Federal Aviation Administration's rules for flying a drone):

- i. Do not fly your drone over people or large crowds
- ii. Respect other people's privacy when flying your drone
- iii. Do not fly your drone over airports or in areas where aircraft are operating
- iv. You must fly your drone during daylight hours and only in good weather conditions
- v. Do not fly a drone in sensitive areas including government or military facilities. The use of drone or camera drones in those areas is prohibited.
- vi. Fly at or below 400ft.
- vii. Fly at or under 100mph
- viii. Yield right of way to manned aircraft

UAS Regulations:

Decision number 298 issued 5th August 2019 appears to adopt Remotely Piloted Aircraft regulations.

Contact: Niger's National Agency of Civil Aviation- Agence Nationale de l'Aviation Civile du Niger (ANAC); BP 727, Niamey, Niger. Email: anacniger@hotmail.com. Tel: +227 20723267.

5.6. Intellectual Property Rights and Drone Use:

Drones have launched into commercial popularity as a relatively low-cost and accessible way to capture videos and photographs. Wildlife scientists, filmmakers, real estate marketers, agribusinesses, college instructors, and resource extraction companies have all taken advantage of camera-mounted drones to collect images for commercial distribution and use.

While so much time and effort go into the creative process when developing marketing materials and shooting stills, sound recordings, or action footage; ownership of the work product is a key issue. Ownership is determined by who possesses the IPR associated with the work product. Key among these IPR is the copyright rights.

Images, sound recordings, and footage captured by drones are no different from those captured by the traditional camera lens, ensuring that rights to distribution and use (essentially copyright rights) flow to the party paying for their production is mission-critical. Copyright and other IPR to work products generated by drones are subject to agreement between the drone pilot, the drone services company, and the customer. Under the "work-made-for-hire" doctrine, if you hire employees to fly the drones, all copyrightable data created by an employee is automatically the property of the employer, even if you don't have a written agreement with your employee spelling this out.

Increased commercial use of drone technology has brought an increase in the risks inherent in the sale and distribution of works subject to copyright. Images and videos captured by drones are protected by the Copyright Act. Therefore, drone services companies must consider the interaction of the copyright law and day-to-day business operations including employee relationships and copyright licensing agreements. However, the methods used to capture the data through cameras mounted on drones or video are however patentable and protected by the various national patent laws.



5.7. Recommendations that Enhance Drone Adoption and Use in Africa:

1. **Enhance Technical Skills Training and Knowledge Enhancement for Drones:** African countries need to enhance their internal training and skills development for people and officials within the National Civil Aviation Authorities. The lack of professionals who can assess risks and implement appropriate safeguards, and the difficulty in establishing appropriate commercial arrangements, maintenance service, and public liability insurance create major challenges in operating drones. Only a few individuals or officials within civil aviation authorities are assigned to handle all issues related to drone regulations due to a lack of knowledge on drone operations. This also makes enforcement of relevant regulations a challenge or are improperly expedited.
2. **Stakeholders Involvement in the Development of Drone Policies and Regulations:** The private sector needs to be proactive in the development of regulations while the government must have the goodwill to involve the private sector. The private sector needs to propose viable business models and explain how they are planning to use the drones to the responsible authorities to prevent regulators from making restrictive policy frameworks and regulations.
3. **Harmonization of Drone Policies across Africa:** Many African countries do not have precise regulations for drone operations. This is due to a lack of knowledge and capacity by officials and stakeholders within the national territories. Harmonizing drone operation frameworks and policies that can be integrated into national laws by member states can help different countries to easily adopt and ascribe to a single protocol and regulations for drone operations just like the EU.
4. **Government Commitment to Drone Regulations:** Government commitment is a factor needed in the implementation of drone policy frameworks and enforcement of regulations. The drone technology promises unique benefits to farmers and youth. To sustain this innovation, there is a need for inclusive innovation in the sense of involving the public by way of awareness-raising about the drone technology and training potential users on how to handle and operate the drones, and developing the needed policy frameworks to make drone use safer and more acceptable.

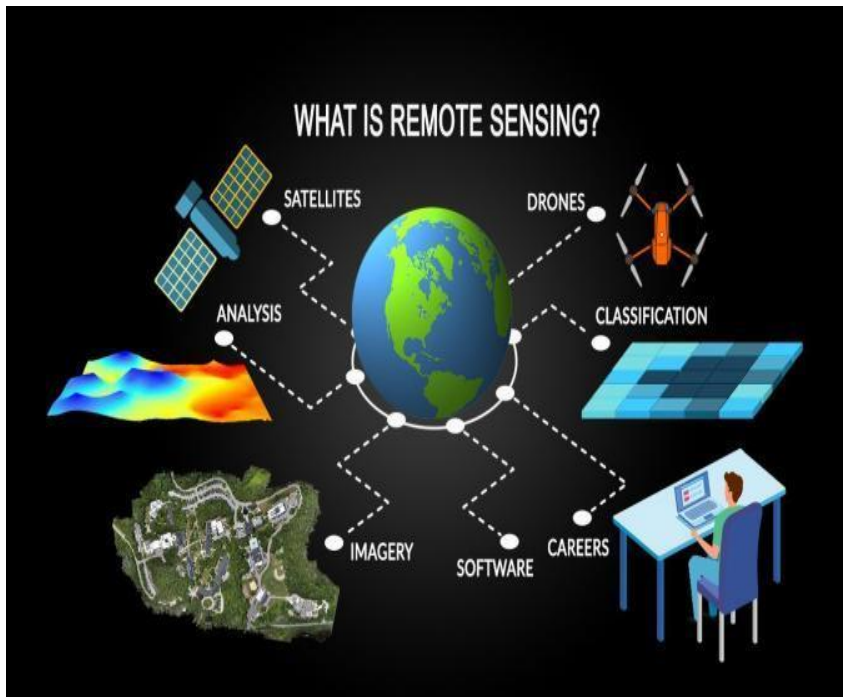
6.0. Remote Sensing Technology

Remote sensing is a type of geospatial technology that samples emitted and reflected electromagnetic (EM) radiation from the Earth's terrestrial, atmospheric, and aquatic ecosystems to detect and monitor the physical characteristics of an area without making physical contact. This method of data collection typically involves aircraft-based and satellite-based sensor technologies which are classified as either passive sensors or active sensors.



Passive sensors respond to external stimuli, gathering radiation that is reflected or emitted by an object or the surrounding space. The most common source of radiation measured by passive remote sensing is reflected sunlight. Popular examples of passive remote sensors include charge-coupled devices, film photography, radiometers, and infrared.

Active sensors use internal stimuli to collect data, emitting energy to scan objects and areas whereupon a sensor measures the energy reflected from the target. RADAR and LiDAR are typical active remote sensing tools that measure the time delay between emission and return to establish the



location, direction, and speed of an object. The remote sensing data gathered is then processed and analyzed with remote sensing hardware and computer software, which is available in a variety of proprietary and open-source applications.

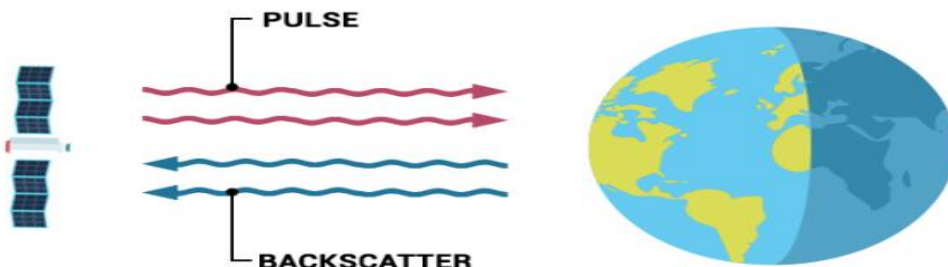
6.0.1. Types of Remote Sensors:

The two types of remote sensing sensors are:

- Passive sensors
- Active sensors

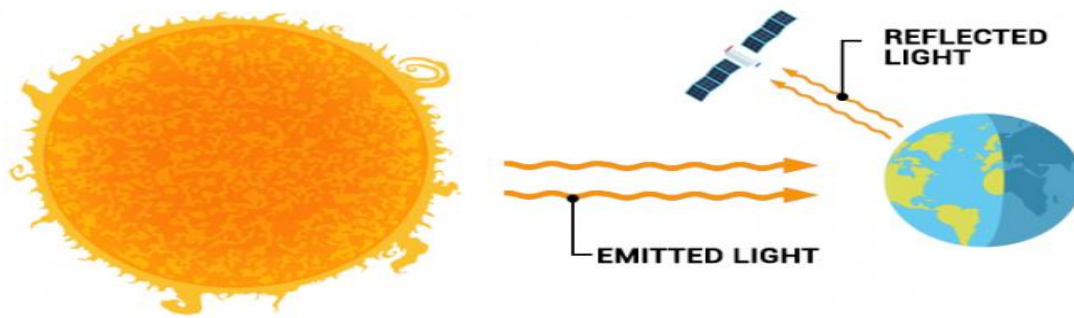
The main difference between **active sensors** is that this type of sensor illuminates its target. Then, active sensors measure the reflected light. For example, [Radarsat-2](#) is an active sensor that uses synthetic aperture radar.

Imagine the flash of a camera. It brightens its target. Next, it captures the return light. This is the same principle of how active sensors work as illustrated below.



Passive sensors measure **reflected light emitted from the sun**. When sunlight reflects off Earth's surface, passive sensors capture that light. For example, [Landsat](#) and [Sentinel](#) are passive sensors. They capture images by sensing reflected sunlight in the electromagnetic spectrum.

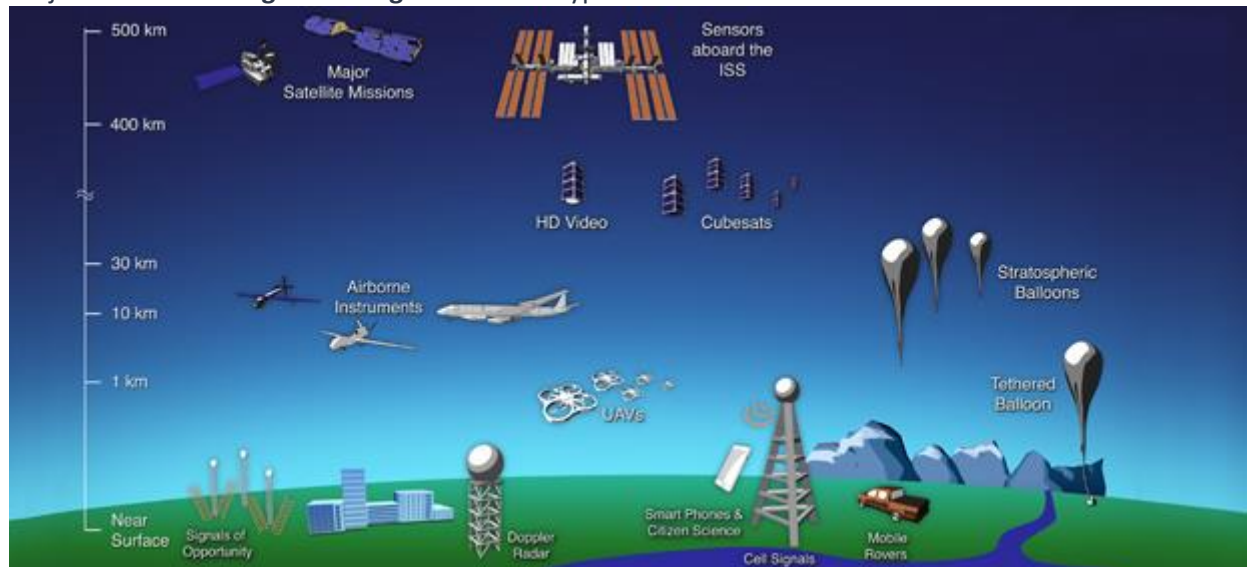




Passive remote sensing measures reflected energy emitted from the sun. Whereas active remote sensing illuminates its target and measures its backscatter.

Remote sensing uses a sensor to capture an image. For example, airplanes, satellites, and UAVs have specialized platforms that carry sensors.

Major **remote sensing technologies** and their typical altitudes.



Each type of sensor has its advantages and disadvantages. When you want to capture imagery, you have to consider factors like **flight restrictions**, **image resolution**, and **coverage**. For example, satellites capture data on a global scale. But drones are a better fit for flying in small areas. Finally, air planes and helicopters take the middle ground.

 UAVs and Drones	 Airplanes and Helicopters	 Low Earth Orbit Satellites
<p>ADVANTAGES</p> <ul style="list-style-type: none"> -Very high resolution imagery -Programmable flight paths -LiDAR capabilities 	<p>ADVANTAGES</p> <ul style="list-style-type: none"> -High resolution imagery -Pilot-flown flight paths -LiDAR capabilities 	<p>ADVANTAGES</p> <ul style="list-style-type: none"> -High to coarse resolution imagery -Large coverage extent
<p>DISADVANTAGES</p> <ul style="list-style-type: none"> -Very small coverage extent -Visual line of sight 	<p>DISADVANTAGES</p> <ul style="list-style-type: none"> -Small coverage extent -Flight operation 	<p>DISADVANTAGES</p> <ul style="list-style-type: none"> -Coverage limited to orbital path -Cloud obstructions

6.0.2. Applications of Remote Sensing:

Remote sensing technology is used in a wide variety of disciplines in thousands of different use cases, including most earth sciences, such as meteorology, geology, hydrology, ecology, oceanography, glaciology, geography, and land surveying, as well as applications in military, intelligence, commercial, economic, planning, agriculture, and humanitarian fields. However, it is in the field of agriculture that remote sensing has found significant use.

Some typical remote sensing examples include:

- **GIS remote sensing:** Geographic Information System (GIS) is a system designed to capture, store, manage, analyse, manipulate, and present geographic or spatial data -- satellite remote sensing provides an important source of spatial data. Remote sensing and GIS work together to gather, store, analyse, and visualize data from virtually any geographic position on Earth.
- Irrigation and soil moisture monitoring and management are major components of remote sensing in agriculture.
- Doppler radar measures meteorological events such as wind speed and direction within weather systems as well as precipitation intensity and location. Another application is aerial traffic control.
- A primary application of light detection and ranging (LiDAR) is vegetation monitoring, however, it is also applied in cases of weapon ranging and laser illuminated homing of projectiles. LiDAR may also be used to detect and measure the concentration of various chemicals in the atmosphere.

6.0.3. Remote Sensing Applications in Agriculture

- Crop production forecasting:** Remote sensing is used to forecast the expected crop production and yield over a given area and determine how much of the crop will be harvested under specific conditions.
- Assessment of crop damage and crop progress:** In the event of crop damage or crop progress, remote sensing technology can be used to penetrate the farmland and determine exactly how much of a given crop has been damaged and the progress of the remaining crop in the farm.
- Horticulture, Cropping Systems Analysis:** Remote sensing technology has also been instrumental in the analysis of various crop planting systems. This technology has mainly been in use in the horticulture industry where flower growth patterns can be analysed, and a prediction made from the analysis.
- Crop Identification:** Remote sensing has also played an important role in crop identification especially in cases where the crop under observation is mysterious or shows some mysterious characteristics.
- Crop acreage estimation:** Remote sensing has also played a very important role in the estimation of the farmland on which a crop has been planted.
- Crop condition assessment and stress detection:** Remote sensing technology plays an important role in the assessment of the health condition of each crop and the extent to which the crop has withstood stress. This data is then used to determine the quality of the crop.
- Identification of planting and harvesting dates:** Because of the predictive nature of the remote sensing technology, farmers can now use remote sensing to observe a variety of factors including the weather patterns and the soil types to predict the planting and harvesting seasons of each crop.



- viii. **Crop yield modelling and estimation:** Remote sensing also allows farmers and experts to predict the expected crop yield from given farmland by estimating the quality of the crop and the extent of the farmland. This is then used to determine the overall expected yield of the crop.
- ix. **Identification of pests and disease infestation:** Remote sensing technology also plays a significant role in the identification of pests in farmland and gives data on the right pests control mechanism to be used to get rid of the pests and diseases on the farm.
- x. **Soil moisture estimation:** Soil moisture can be difficult to measure without the help of remote sensing technology. Remote sensing gives the soil moisture data and helps in determining the quantity of moisture in the soil and hence the type of crop that can be grown in the soil.
- xi. **Irrigation monitoring and management:** Remote sensing gives information on the moisture quantity of soils. This information is used to determine whether a particular soil is moisture deficient or not and helps in planning the irrigation needs of the soil.
- xii. **Soil mapping:** Soil mapping is one of the most common yet most important uses of remote sensing. Through soil mapping, farmers can tell what soils are ideal for which crops and what soil require irrigation, and which ones do not. This information helps in precision agriculture.
- xiii. **Monitoring of droughts:** Remote sensing technology is used to monitor the weather patterns including the drought patterns over a given area. The information can be used to predict the rainfall patterns of an area and tell the time difference between the current rainfall and the next rainfall which helps to keep track of the drought.
- xiv. **Land cover and land degradation mapping:** Remote sensing has been used by experts to map out the land cover of a given area. Experts can now tell what areas of the land have been degraded and which areas are still intact. This also helps them in implementing measures to curb land degradation.
- xv. **Identification of problematic soils:** Remote sensing has also played a very important role in the identification of problematic soils that have a problem sustaining optimum crop yield throughout a planting season.
- xvi. **Crop nutrient deficiency detection:** Remote sensing technology has also helped farmers and other agricultural experts to determine the extent of crop nutrient deficiency and come up with remedies that would increase the nutrient level in crops hence increasing the overall crop yield.
- xvii. **Reflectance modelling:** Remote sensing technology is just about the only technology that can provide data on crop reflectance. Crop reflectance will depend on the amount of moisture in the soil and the nutrients in the crop which may also have a significant impact on the overall crop yield.
- xviii. **Determination of water content of field crops:** Apart from determining the soil moisture content, remote sensing also plays an important role in the estimation of the water content in the field crops.
- xix. **Crop yield forecasting:** Remote sensing technology can give accurate estimates of the expected crop yield in a planting season using various crop information such as the crop quality, the moisture level in the soil and the crop and the crop cover of the land. When all this data is combined it gives almost accurate estimates of the crop yield.
- xx. **Flood mapping and monitoring:** Using remote sensing technology, farmers and agricultural experts can be able to map out the areas that are likely to be hit by floods and the areas that lack proper drainage. This data can then be used to avert any flood disaster in the future.
- xxi. **Collection of past and current weather data:** Remote sensing technology is ideal for the collection and storing of past and current weather data which can be used for future decision making and prediction.



- xxii. **Crop intensification:** Remote sensing can be used for crop intensification that includes the collection of important crop data such as the cropping pattern, crop rotation needs, and crop diversity over a given soil.
- xxiii. **Water resources mapping:** Remote sensing is instrumental in the mapping of water resources that can be used for agriculture over given farmland. Through remote sensing, farmers can tell what water resources are available for use over a given land and whether the resources are adequate.
- xxiv. **Precision farming:** Remote sensing has played a very vital role in precision agriculture. Precision agriculture has resulted in the cultivation of healthy crops that guarantees farmers optimum harvests over a given time.
- xxv. **Climate change monitoring:** Remote sensing technology is important in monitoring climate change and keeping track of the climatic conditions which play an important role in the determination of what crops can be grown where.
- xxvi. **Compliance monitoring:** For the agricultural experts and other farmers, remote sensing is important in keeping track of the farming practices by all farmers and ensuring compliance by all farmers. This helps in ensuring that all farmers follow the correct procedures when planting and when harvesting crops.
- xxvii. **Soil management practices:** Remote sensing technology is important in the determination of soil management practices based on the data collected from the farms.
- xxviii. **Air moisture estimation:** Remote sensing technology is used in the estimation of air moisture which determines the humidity of the area. The level of humidity determines the type of crops to be grown within the area.
- xxix. **Crop health analysis:** Remote sensing technology plays an important role in the analysis of crop health which determines the overall crop yield.
- xxx. **Land mapping:** Remote sensing helps in mapping land for use for various purposes such as crop growing and landscaping. The mapping technology used helps in precision agriculture where specific land soils are used for specific purposes.

6.0.4. Remote Sensing and IPR:

Remote sensing satellite system gathers raw data which have no copyright value itself. However, the technological process to acquire the data is under a patent regime because every satellite system uses its technique. More often, the dissemination of data follows a different procedure for a different satellite system.

The role of trademarks has small significance because the trademark is with the outer body of the satellites used but cannot be on the process. Trade secrets are there but also very difficult to pinpoint them from outside. Processed data or value added to the raw data on the other hand can be protected by copyright rights.

Spatial data contain information that can be used for different use by different entities. Questions here arise relating to its ownership, authorised use, future use, and implied quality. One of the most important questions concerns whether this data can be protected by IPR. Closely related to this question is whether these rights can exist in data generated with public money. In this respect, rules and regulations regarding access to and licensing of public remote sensing data are of interest. From the nature of IPR, protection of remote sensing data as such must be sought in copyright protection. In this respect, it must be noted that copyright does not extend to raw data, but only to enriched data. In the same sense, copyright does not extend to ideas, but only to the form of expression of ideas. Concerning IPR and spatial data, another question is whether or not the data were created using public money. The rule is different from one country to another. In some countries, the government claims



the copyright of the data made by public money but in others, the government has no such rights which they create.

Ownership of processed data from spatial data should be addressed before, during, and after the work. Having a clear policy as to who has ownership of data is thus very important. The policy would also spell out who has rights of release, on what conditions, and how costs are either to be covered or shared.

6.0.5. International Agreements for IPR Protection of Spatial Data:

The following are international agreements that relate to the protection of spatial data:

- i. **Outer Space Treaty (1967):** This treaty outlines international cooperation and mutual assistance in space exploration and development. Articles IX, X, and XI provide the requirements of cooperation and mutual assistance.
- ii. **The Principles Relating to Remote Sensing of Earth from Outer Space (1986):** This provides a remedy of the conflicts between the developing nations and the developed world especially the USA. The principles are safeguards to control remote sensing activities in outer space.
- iii. **The Berne Convention (1971):** The Convention consists of two principal components. The main body of the agreement defines the functions and operations of international copyright protection for protected works. The second component is the appendix of the convention which provides a special mechanism for developing nations to gain access to copyrighted material.
- iv. **The Universal Copyright Convention (1971):** The Convention provides that if a nation is a member of the Berne Convention, it cannot withdraw its name as a member of the Universal Copyright Convention.

7.0. Smartphone Applications In Smart Agricultural Practices:

Introduction:

Although agriculture and mobile apps technology may appear disconnected on the face of it, there is an increasing amount of evidence to suggest that making use of mobile and cloud-based applications not only addresses the effectiveness of agricultural practice but also addresses sustainability challenges which create financial value for both smallholder farming systems as well as large agricultural-based companies. The introduction of such mobile technology, portable and wireless devices has led to the creation of innovative services and applications that are used within the agricultural chains in both developing and developed countries. The nature of the adoption of these technologies in these two markets does however show some variations. In developed countries, mechanization is more advanced and the agricultural labor force is significantly small. Here, mobile applications tend to be implemented further up the value chains. In developing countries, where a large proportion of the workforce is employed in the agricultural sector, mobile technology is more commonly used to deliver services for producers and traders.

Traditionally, farmers have used their perceptual sensorial systems to diagnose and monitor the health and needs of their crops. However, human processes only basic perceptual systems with accuracy levels that can change from human to human which are largely dependent on the levels of stress, experience, health, and age. To overcome this problem, in the last decade, with the help of the emergence of smartphone technology, new agronomic applications were developed to reach better,



cost-effective, more accurate, and portable diagnosis systems. Conventional smartphones are equipped with several sensors that could be useful to support near real-time usual and advanced farming activities at a very low cost. Therefore, the development of agricultural applications based on smartphone devices has increased exponentially in the last few years. However, the great potential offered by smartphone applications is still yet to be fully realized.

Smartphones powered by novel sensing technologies, artificial intelligence (AI), and machine learning (ML) algorithms create a new intelligent intermediary layer between people and systems to solve efficiently complex problems or even address many daily problems. Despite the enormous potential for applied mobile technologies in agriculture, there is slow adoption in the use of this technology in agriculture compared to other business domains. However, the concept of mobility has been valued and adopted due to the recognition of mobile applications' potential. The need for new platforms to help and facilitate the tasks of farmers is growing and becoming an indispensable tool at personal, social, and professional levels. The data collected in precision agriculture may appear in different formats, with specific content and heterogeneous structures. For this reason, it is an added value to develop systems to which the farmer can directly and intuitively access. Mobile applications allow allocating all different information in one place that farmers can access. Farmers can get crop maps, monitor their crops in real-time, receive alerts and perform tasks from their mobile smartphones.

7.1. Role of ICT, Smartphones, and Mobile Applications in Agriculture:

The unavoidable importance of ICT and its application in precision agriculture has created a new concept called e-agriculture which focuses on improving agricultural development through the use of various technologies. E-agriculture may involve the use of techniques such as GIS, remote sensing, and wireless devices that require access to PC and/or the internet and/or mobile devices. The use of mobile communication technologies (MCT) brings another sub-concept called m-agriculture. MTC includes all types of handheld devices such as basic mobile phones, smartphones, or tablets. M-agriculture may involve the collection of remote data such as data from automated weather stations or systems and sensors used in location-based monitoring. This fact represents an ongoing and growing challenge to design and develop new technology strategies that enable farmers to access data and use it as specific information for better decision-making.

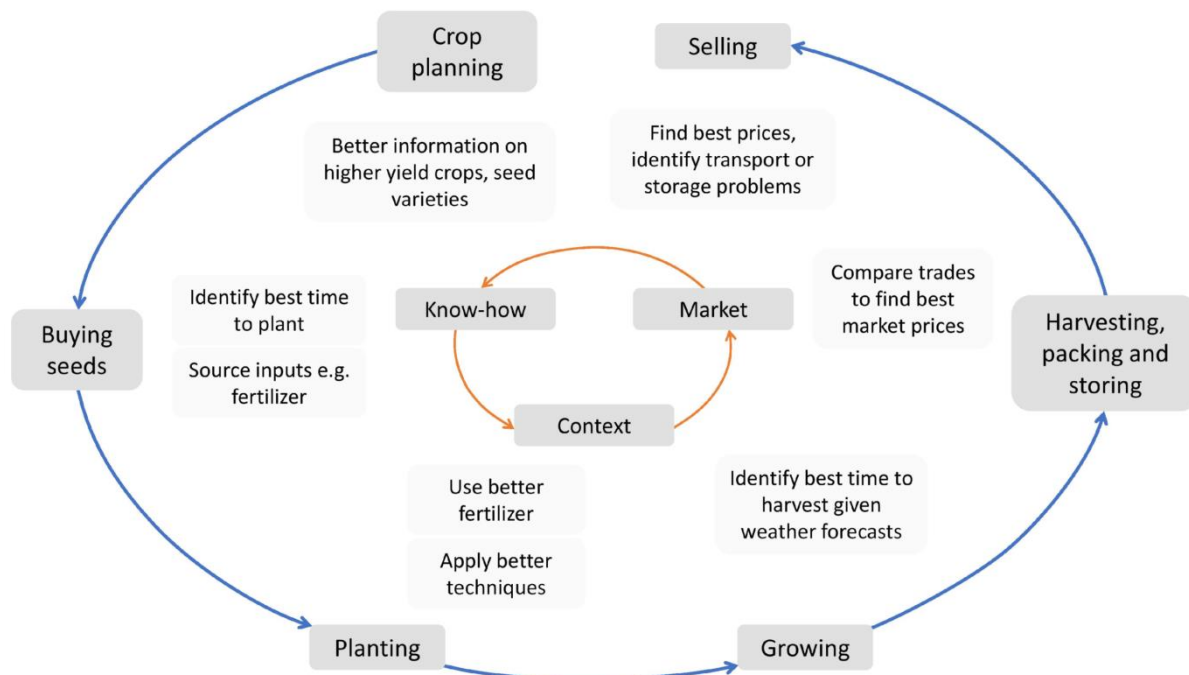
Farmers Information Needs

Farmers nowadays have a great need for information from crop planning to final product. This information varies according to the crop calendar, however, there are some categories of information that are common to different epochs and independent of the crop type or its location. These categories are :

1. Know-how: which helps farmers with fundamental information such as what to plant and which varieties to use.
2. Contextual information such as weather, best practices for cultivation in the localities.
3. Market Information such as prices, demand indicators, and logistical information.

Fig: Information needed from farmers through the agricultural cycle





Agricultural Smartphone Applications:

Aiming to merge agricultural knowledge with digital technology, a variety of applications have been developed according to farmers needs which can mainly include:

- i. Agricultural management information
- ii. Agricultural information resource
- iii. Agricultural calculator
- iv. Agricultural news
- v. Weather and
- vi. M-government information.

Others are learning and reference, diseases and pests, market data, conference, business, and field mapping.

Three categories emerge here:

1. Crop Operations
2. Farm Management
3. Information System

1. Crop Operations:

- a). Crop Protection and Diagnosis
 - Pest and diseases detection and diagnosis
 - Weed identification and treatment
 - Soil and plant diseases
- b). Crop Nutrition and fertilization
 - Crop nutrition monitoring
 - Spraying management
 - Fertilization application



- c). Crop Irrigation
 - Crop hydric status and irrigation decision
 - Support irrigation
- d). Crop Growth and Canopy Management
 - Track canopy growth
 - Calculate LAI (Leaf Area Index)
- e). Crop Harvest
 - Estimation of productivity
 - Indicators of quality

2. Farm Management:

- a). Field Mapping and Soil Information
 - Field location and area calculation
 - Identification of sample collection points
 - Soils agricultural indicators- colour, PH, NPK, carbon content, etc.
- b). Machinery Management
 - Machinery cost estimator
 - Real-time trajectories monitoring
 - Machinery monitoring, activities, efficient use, stability, etc.
- c). Control of Farm Activities
 - Manage field tasks
 - Manage farm workers activities

3. Information System:

- Agricultural tips and knowledge
- Market Information
- Relevant news
- Chat with experts
- Climate

7.2. The Legal IPR System for Smart Mobile Applications:

Copyright

Copyright protects computer programs that are the basis for mobile applications. It may also protect the screen displays generated by mobile applications independently from any protection granted to the underlying computer program. It will not protect an idea, but only the expression of that idea. Copyright benefits from existing without formality and as such there are few costs associated with acquiring this protection. It also has a considerable length of protection although that may not be of much consequence to mobile application developers.

Summary of the basics of copyright as it may apply to mobile applications.

Purpose	• It grants rights that allow the author to control the reproduction of the work in question
What does it protect	It protects against unauthorised copying of works of authorship
What is required for protection	• In order for copyright to subsist, the relevant work must be original It must be a specific expression of an idea



What rights are granted, including:	<ul style="list-style-type: none"> • Right of reproduction (copying) • Right of adaptation (the right to make derivative works) • Right of making available to the public (the right of distribution). • These rights are jurisdictionally specific
How are the rights established	<ul style="list-style-type: none"> • Copyright arises automatically once there is the creation of a protected work
Duration of the right	<ul style="list-style-type: none"> • The term of copyright protection is the duration of the life of the author plus seventy years
Ownership	<ul style="list-style-type: none"> • Copyright is typically owned by the author of the work • Exception is when the work is created in the course of employment • Common law: the employer will own the copyright • Civil law: employee (author) will own the copyright

Patents

Patent rights are different from copyright in that they do not arise automatically. To be granted a patent there is an application process that typically requires a fair amount of resources, both financial and temporal. Though acquiring a patent may be expensive, a business with a patent portfolio will typically attract more attention and have more appeal to investors. As with copyright, it is important to be clear who owns a particular patent as it is possible to have joint ownership or employer ownership.

Summary of the basics of patents as they may apply to mobile applications.

Purpose	<ul style="list-style-type: none"> • Grants exclusive rights over an invention in return for disclosure of the invention in a manner that would allow someone skilled in the art to reproduce it.
What it protects	<ul style="list-style-type: none"> • An invention can be either a product, process, or method.
What is required for protection	<ul style="list-style-type: none"> • That the invention must be new, not obvious/requires an inventive step, and capable of industrial application.
What rights are granted	<ul style="list-style-type: none"> • A right to prevent others from making, using, or selling the patented invention without the patent owner's consent. • Typically, jurisdictionally-specific grant of rights. • The exception is patents granted by the EPO. • This grants a bundle of national rights for the jurisdictions chosen by the applicant.
How the rights are established	<ul style="list-style-type: none"> • For a patent to be granted, it must be registered. • The process of registration. • Formalities examination. • Substantive examination. • Process of registration may take a few years.
Duration of the right	<ul style="list-style-type: none"> • Typically, the term of protection is up to twenty years.



Ownership	<ul style="list-style-type: none"> Typically, the owner of the patent is the inventor or joint inventors, unless created in the course of employment. Laws may vary as to how inventions created during employment are treated.
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Utility models

Functioning similarly to patents, utility models generally require a more limited financial outlay and have less stringent criteria to receive protection. However, utility models are not available in all countries and may not be available for software-related inventions in a given country. These rights have a usually shorter duration than patents. Utility model schemes are highly jurisdictionally specific and if a developer is looking into securing this type of protection, it would be essential to obtain the details for the applicable jurisdictions.

Summary of the basics of utility models as they may apply to mobile applications.

Purpose	<ul style="list-style-type: none"> Protects minor or incremental innovation.
What it protects	<ul style="list-style-type: none"> Protects primarily products.
What is required for protection:	<ul style="list-style-type: none"> There is a less strict novelty requirement than in patents, depending on the jurisdiction. <ul style="list-style-type: none"> 'Absolute' novelty not often required. The inventive step may not be necessary at all and if it is required, the threshold is lower.
What rights are granted	<ul style="list-style-type: none"> Similar to patents, the rights may include preventing others from making, using, or selling the utility model without the owner's consent. In some countries, these rights may require substantive examination before becoming enforceable.
How these rights are established.	<ul style="list-style-type: none"> It needs to be registered. However, in most cases there is no substantive examination before registration.
Duration of the right	<ul style="list-style-type: none"> Typically, seven to ten years.

Trade dress under trademarks and unfair competition laws

Trade-dress is typically used to protect the appearance of a product and may not be instinctively considered when dealing with mobile applications. However, GUI may warrant this type of protection. The GUI has a great impact on its acceptance by users. There is both the option to obtain protection through registration of trade dress or unregistered protection via unfair competition laws. Although there is an additional cost consideration when registering the mark, there is no uniform global position regarding unfair competition and consequently, there is greater uncertainty in relying on this type of protection.

Summary of the basics of trade-dress as it may apply to mobile applications.

Purpose	<ul style="list-style-type: none"> To protect 'get up' features of products or services that serve as indicators of origin.
What it protects	<ul style="list-style-type: none"> The appearance of a product. <ul style="list-style-type: none"> For mobile applications, this can be the protection of the graphical user interface (GUI).



What is required for protection	<ul style="list-style-type: none"> • For a registered trademark, the subject matter of the application must be clearly defined, not descriptive, and should have a degree of distinctiveness. • It cannot be functional in nature. • If it is an unregistered mark, it is usually necessary to show that the sign applied to a product or service is distinctive and serves as an indication of origin.
What rights are granted	<ul style="list-style-type: none"> • The exclusive right to use the trademark or unregistered sign in the context of the relevant goods or services and to prevent infringement.
How these rights are established	<ul style="list-style-type: none"> • Can either be registered or unregistered
Duration of the right	<ul style="list-style-type: none"> • Perpetual subject to renewal.

Designs

The laws in place to protect designs are not internationally uniform and there may be variations in terms of the type of protection afforded. Design laws mainly protect external appearance as seen with trade dress. The design of a mobile application’s GUI may be crucial for its success, providing greater appeal to its consumer. Some jurisdictions have design patents and, consequently, they undergo registration which requires certain standards to be met. In other jurisdictions, there is the possibility for a registered design outside of the patent law framework. A design cannot be functional and what is considered functional is a matter of domestic legislation. The term of protection granted to a design also varies between jurisdictions.

Summary of the basics of designs as it may apply to mobile applications.

Purpose	<ul style="list-style-type: none"> • The creative activity of designing aesthetic or ornamental features of mass-produced items.
What it protects	<ul style="list-style-type: none"> • It protects the original ornamental and non-functional features of an industrial article or product.
What is required for protection	<ul style="list-style-type: none"> • Differs by jurisdiction. <ul style="list-style-type: none"> ✓ In the US and China, the applicant must show that the design satisfies novelty and inventive steps. ✓ Under a registered community design (RCD) the requirements are novelty and individual character. • The design must not be considered functional.
What rights are granted	<ul style="list-style-type: none"> • Protection against infringing use by a third party.
How these rights are	<ul style="list-style-type: none"> • Design protection may be either registered or unregistered. • Jurisdictionally specific.
Duration of the right	<ul style="list-style-type: none"> • Varies by jurisdiction, e.g. <ul style="list-style-type: none"> ✓ In China, the duration is ten years from the date of filing ✓ In the EU, RCDs may be valid for five years from the date of filing and can be renewed in five-year terms for a maximum of twenty-five years.

Trade secrets

Trade secrets protect information that has commercial value by its secrecy when reasonable steps are taken to keep it secret. This protected information may be technical but could also relate to other important business details such as business plans or financial projections. Trade secrets do not require any formal registration, so these rights can be attractive as there is a little upfront cost associated with them. Notwithstanding, costs may nevertheless arise from ensuring appropriate business practices are in place to keep critical information secret. Trade secrets are not protected against independent creation or reverse engineering.

Summary of the basics of trade secrets as they may apply to mobile applications.

Purpose	<ul style="list-style-type: none"> Provides a level playing field by preventing competitors from gaining unfair advantages through unfair business practices.
What it protects	<ul style="list-style-type: none"> Trade secrets protect information that has commercial value by its secrecy. It may protect formulas, practices, processes, design, instrument, pattern, commercial method, or compilation of information.
What is required for protection	<ul style="list-style-type: none"> Varies by jurisdiction International standards state that: <ul style="list-style-type: none"> ✓ The information must be a secret or It must have commercial value because it is a secret ✓ It must have been subject to reasonable steps by the rightful holder of the information to keep secret
What rights are granted	<ul style="list-style-type: none"> It protects the unauthorised disclosure or use of information deemed trade secrets
How these rights are established	<ul style="list-style-type: none"> Trade secrets do not require any procedural formalities for protection
Duration of the right	<ul style="list-style-type: none"> Potentially indefinite

8.0. SustInAfrica Outputs

8.1. Bluleaf- Realtime Irrigation Management Smartphone Application

Bluleaf (<https://www.bluleaf.it/en/home-eng/>) is a complete and smart technology-based solution designed to help farmers and agronomists manage everyday activities in the field. Bluleaf is based on a Decision Support System (DSS) platform that integrates weather and soil sensors with soil water balance and irrigation scheduling models. The tool can help for smart water management support enabled through a daily water balance, calculated on data from the field, weather, and farm features. Through the nutritional balance, it's possible to know and provide just what your crops need in terms of nutrients. The water-nutritional balance of the lots is made based on FAO models and standards. The system elaborates the irrigation and fertilization advice according to the strategy defined by the user. Moreover, thanks to disease forecasts and the treatments record permit the optimization of plant protection products. Soil-plant sensors allow to calibrate the parameters of the balance model in real-time, by doing so it is possible to have suggestions about irrigation, nutrition, and plant protection treatments; it is also possible to implement geo-referencing of fields and achieve vigor and stress maps, maps for the distribution of the variable rate of seeds and fertilizers, as well as keeping updated field registers for traceability.

Bluleaf has firstly developed 10 years ago thanks to regional and EU funds. The present Bluleaf software has been extensively experienced in a real environment, with the involvement of important



Italian Apulian farms and in diversified agricultural production systems (fruits, grapevine, olive, and industrial crops).

In short term, the main beneficiaries of Bluleaf are farmers where after an appropriate local calibration, the DSS supports better management of the water resources in terms of sustainable use, saving, and efficiency, and it helps to plan for specific irrigation scheduling strategies according to farm productive goals while considering the constraints in the use of limited resources. Its secondary benefits include better energy efficiency, cost reduction per unit of output, better utilization of natural resources, and weather forecasting. In terms of ecosystem services, Bluleaf benefits include water provisioning (supply for non-drinking purposes) and cultural services (enable scientific investigation or the creation of traditional ecological knowledge and education and training). The medium- or long-term beneficiaries along farmers include consumers and society through better quality of products, a reduction of time and labour, and better management of natural resources.

The scale of adoption of Bluleaf are plots that are field units that have homogeneous characteristics of climatic conditions, soil confirmation, etc. On small scale, there are more benefits for the environment than for technology developers while for big farms both farmers and developers enjoy benefits. To be operational about two weeks are required, however, this depends on calibration, data availability, and fieldwork. The data required are soil parameters (texture, chemical-physical analysis, profile), characteristics of the crop (phenological phases, type of plant), type irrigation system, water quality, and management strategies. The first year requires substantial efforts for calibration. From second year limited efforts. Data consultation can be both on PC and smartphone/tablet. Hence, farmer's understandings and their basic skills regarding mobile phone/pc use are also considered as required skills for its successful utilization. Otherwise, knowledge transfer activities, continuous professional development, and training from agricultural experts and services will be required. In terms of equipment, Bluleaf requires an agrometeorological station, soil and plant sensors, and flow and pressure meters. The adoption requires an initial investment cost of €80 per plot/year and €3.000 circa for a complete toolset for crops and weather monitoring. Bluleaf is instrumental to SDG 6 (ensure availability and sustainable management of water and sanitation for all) and SDG 12 (Responsible Consumption and Production) helping farmers to adopt sustainable practices and report that information.

8.2. InsectaMon – AI-based tool for pest monitoring

InsectaMon is an AI-based pest insect monitoring system proposed for the SustainAfrica project. The technology is very as there is little to no experimental proof of concept for the technology. The core development will still be done during the SustainAfrica project lifetime. It will be calibrated and tested on different sustainable farming practices in Ghana with pineapple, in Burkina Faso with cotton, and Tunisia with olive.

As an innovation, InsectaMon combines technology and knowledge. The tool will be developed, heavily relying on future-oriented ICT combining affordable sensor technology with a smart intelligent design based on machine learning. From the technology side, it needs support from artificial intelligence and new networks which should be implemented on this device. Expert knowledge like entomologists is needed to support the implementation in different contexts. The combination of technology and knowledge development is more necessary for the later upscaling of this technology in different heterogeneous territorial contexts. InsectaMon is categorized as smart farming technology because it is connecting database knowledge, technology knowledge, and farmer's knowledge into a new information system. The main benefit is to improve the quality of goods and services by temporal and spatial monitoring of insects on species level so farmers can better decide how to implement crop



protection over the season. In terms of ecosystem services, the primary benefit is related to pest and disease control. The innovation helps also to maintain or improve crop yields which are also related to the provisioning of abiotic services (biomass grown for nutritional purposes). The indirect benefits are related to the increased knowledge of the farmers because new tools gather information on insect dynamics without necessarily needing other sophisticated technologies. New soil maps derived from approximate soil sensing provide new insight into their fields. Other benefits could be reached if implemented on a national scale because interconnections are taking place. In short term, the main beneficiaries of InsectaMon are farmers generating new knowledge and share information. On medium- and long-term benefits are connected to farmers, agricultural and extension services, and technology firms (start-ups). The aim of technology is field scale. It can also be adapted on a larger scale if the information is feed into the information system. The idea during the SustInAfrica project is to focus mainly on the field level. Principally it is scalable technology if the technology is spread among farmers.

The technology needs yellow sticky traps, cloud models to transfer data, internet access and computer systems, a smartphone with good camera resolution, and information transfer. Image data and smartphones are needed to know which type of species they have in the field. Artificial models anyway help to reduce the time efforts. To be operational the time necessary is about a week. Basic technical knowledge is primarily needed to implement sticky traps. Product training and technical training are needed but can be done by local experts trained by technology developers. However, to generate info not much training is necessary. Guidelines can be developed to guide the farmers to make the best out of monitoring. The initial investment cost for an integrated system is about 1000 Euro. InsectaMon can impact SDG 2 (Zero Hunger) and SDG 12 (Responsible Consumption and Production).

8.3. Farmerline's Mergdata

Mergdata is Farmerline's cloud-based mobile and web software application that enables organizations to digitally collect data from farmers, farms, and farming communities. It is an easy-to-use offline data collection application that can be run on compatible Android smartphones and tablets.

On Mergdata, data forms are created by administrators from the Mergdata web platform and pushed to registered mobile devices where they can be accessed offline by the agents, enumerators, or data collectors.

Mergdata has the capability to aggregate data related to customer profiles, surveys, maps, traceability, and other vital metrics. The application is web-based and is accompanied with an Android application to be used by field agents and enumerators. The web platform provides users with the tools to create and analyse data collected with the android app.

The Mergdata Web Platform runs in a web browser. It is a web-based application, so it can run on any device with browser capability e.g., desktop computers and laptops. It is compatible with browsers like Google Chrome, Mozilla Firefox, Safari, Opera, and Microsoft Edge etc.

8.4. Sustainable landscape and soil management systems and farming management knowledge

The knowledge-based innovations associated with SustInAfrica include sustainable landscape and soil management systems as well as farming management knowledge and notification infrastructure for end-users. These innovations include Integrated pest management (IPM) and sustainable soil



management (SSM) practices to promote sustainable farming and soil management practice, reinforcing the benefits from conserving soils' biodiversity functions, prioritizing desertification problems, and encouraging knowledge transfer in related fields. IPM can be characterized as technology-based while SSM (e.g., intercropping) is knowledge-based. Both IPM and SSM can be characterized as process innovation, i.e., a new or significantly improved methods of production or delivery of the product. This includes significant changes in techniques, equipment, and/or software. In agriculture, these can be referred to as organization management innovations. The SSM could contribute to the improvement of soil fertility, soil water, and nutrient availability, climate change mitigation (carbon sequestration and storage), and regulate pests and disease. This is translated into higher resilience, and work safety. The IPM could reduce extra input, increase yield, reduce environmental impact and contribute to sustainable intensification by increased input stability and food availability. The SSM could contribute to better conditions for growing and harvesting food (provision service) and erosion prevention and maintenance of soil fertility (regulation and maintenance service). Disease and pest regulation is an ecosystem service provided by IPM practices. Both SSM and IPM provide several advantages not only for farmers but whole communities from reduced soil erosion and health benefits from reduced pesticide use. While benefits of IPM can be observed in a shorter time, for SSM benefits for CO₂ sequestration can be seen in 5-10 years while for intercropping 1-2 years. To enjoy full benefits technical training is essential especially for farmers which do not have experience in farming practices. Moreover, motivation and time are mainly required for this kind of practice. In terms of equipment, agricultural components and communication systems will be needed. The IPM requires yellow sticky traps while SSM requires seeds and compost-making machines and facilities. Some of the SDGs addressed by IPM and SSM are SD1 (No poverty), SDG2 (Zero Hunger), SDG 3 (Good health and well-being), SDG 13 (Climate action), and SDG 15 (Life on land).

9.0. Conclusion and Recommendations:

9.1 Conclusion

IPR protection and enforcement encourages local research and innovations but in Africa effective IPR protection remains a distant goal. Weak IP systems and enforcement mechanisms have resulted in widespread piracy of innovations and rising rates of IP infringements. The situation has skewed domestic creativity towards innovations that will provide quick returns and discouraged local researchers, institutions and investors from undertake research and development on innovations with long term benefits.

Many countries in Africa including Egypt, Tunisia, and Ghana have acceded to international treaties and enacted national legislation for IPR protection and enforcement. However most national IPR protection and enforcement mechanisms have remained weak and dysfunctional and mandated institutions are largely unable to tackle IP infringements and violation of rights.

Burkina Faso and Niger have not enacted local legislation to tackle IPR issues. Their IP protection is guided by the principles of their membership to the African Intellectual Property Organisation (OAPI) of which they are signatories. OAPI encompasses most of African French-speaking countries with a current membership of 17 States.

Where countries have enacted national legislations to guide the IP rights and protection in line with the international treaties which they are signatories to, local legislation can be very restrictive when it comes to adoption of innovations under development by SustainAfrica, particularly the importation,



ownership, and usage of drones. Software piracy is very high with most SustInAfrica countries recording software piracy indices of less than the global average of 4.1 from a scale on maximum 7.

Limited human resources and institutional capacities on IPR matters are a matter of concern in Africa including Egypt, Tunisia, Ghana, Niger and Burkina Faso. The lack of expert knowledge and weak, under resourced, institutions contributes to the weak legal and structural systems and hinders the development of strong IP protection regimes. Researchers generally have limited awareness of IPR rights and protection mechanisms in their countries, rarely consider the need for intellectual property registration or consult qualified institutions for advice.

Drone use in Africa is limited by restrictive policies on importation, ownership and usage. While many countries like Ghana, Kenya and South Africa have embraced the use of drone technology in enhancing information capture and dissemination, other have restricted the same citing security protection. Drone use in agriculture for information gathering and dissemination has proved to be valuable in increasing decision making for good agricultural practices. Drones have been used to deliver crucial supplies to “difficult to reach” regions within short time periods. During the height of the Covid 19 pandemic in Ghana drones were used to deliver essential supplies rural health centres.

Though drone use in agriculture is expanding rapidly, farmers, farmers’ organisations and local extension service in most of the SustInAfrica countries currently lack the capacity to interpret data generated by the drone instruments. Information currently generated from drones is rarely disseminated beyond research institutions.

9.2 Recommendations

- 1. IP Legislation:** With the exception of countries that have already acceded to the international treaties, conventions and protocols, national governments should enact national legislations to encourage research, innovations and protection of IP.
- 2. IP and R&D Awareness campaigns:** Countries should invest in raising the awareness of citizens of the benefits to the nation from investment in research and innovations and the need for fair IPR. There is often a public perception that IPR infringements and piracy are either “victimless crimes”, or only affect large international companies who can afford to write-off losses from small scale IP infringements. As large multinational companies are often the only companies with the knowledge and resources to prosecute IPR infringements, IPC enforcement may even be perceived as neo-colonial. Awareness campaigns will motivate individuals, research institutions, academia and investors to invest in new innovations which will support the economic growth of a country.
- 3. IP short courses:** The relevant IP regulatory agencies in each country should run short courses on intellectual property rights for stakeholders and work with academia to develop appropriate IPR modules for Science, Technology, Engineering, Mathematics (STEM) students; for law and business students and as part of career development / continuous professional development (CPD) for law enforcement officials.
- 4. IPR Enforcement:** IPR infringements have stifled research and innovations. It is therefore recommended that the governments should establish and strengthen IPR enforcement agencies with the requisite logistics and human resources capacities to tackle IP infringements and publicise the expected punishment resulting from infringement of IP rights and piracy of IP properties.



5. **Review of the roles of IPR Enforcement agencies:** In some countries current IPR enforcement requires policy level review. In most countries local police forces are unlikely to have the legal expertise to investigate and prosecute IPR infringements, which may be better handled by other agencies, like Trading Standards Agencies. All stake holders should be given the opportunity to submit their recommendations to policy reviews.



10.0. Bibliography:

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IPR Toolkits Ghana: <https://www.stopfakes.gov/servlet>.

Judicial Training on Intellectual Property in Tunisia: available at <https://www.idlo.int/where-we-work/middle-east-and-north-africa-tunisia>.

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The Economic Impact of Counterfeits: available at <https://www.tjprc.org/publishpapers/2-32-1373.pdf>.

The Egyptian IP Legal System: available at <https://www.worldtrademarkrevies.com>.

Trademark, Patent and Copyright: available at <https://www.abounaja.com/office/tunisia>.



Deliverable D5.2
IP Frameworks- Report in IP Frameworks in each SustInAfrica
Country available in the Dashboard



TRIPS – Trade-Related Aspects of Intellectual Property Rights; available at <https://www.wto.org/English/tratop-e/trips-etrips-e.htm>.

UPOV: Supporting Food Security with Plant Variety Protection: <https://www.wipo.int/wipo-magazine/en/2019/01/article-007.htm>.

WIPO Legal Frameworks, Department for Promotion of Industry and Internal Trade available at <https://www.dipp.gov.in/international-co-operation/world-intellectual-property-organization>.

Your guide to IP Horizon 2020 available at; <https://www.iprhelpdesk.eu/intellectual-property-helpdesk-ec.europe/regional-helpdesk/european-ip-helpdesk/europe-ip-guides-en>.



11.0. Annexes:

Annex 1: Main Country IPR Administration Contacts:

IPR Administration Contacts Egypt:

<p>Copyright Office: Intellectual Property Office of Egypt Supreme Council of Culture Ministry of culture 44 Elmessaha Street, Dokki, Giza Email: culture.comp@yahoo.com</p>	<p>Industrial Property Office: Egyptian Patent Office Academy of scientific Research and Technology 101 Kasr El Ainy Street P.O Box 11516; Cairo Email: patinfo@egypo.gov.eg</p>	<p>Trademark and Industrial Design Office Internal Trade development Authority Ministry of Trade and Industry 4 Nasr Road, Cross Makram Ebeid Nasr City, Cairo. Email: Egypt.id@gmail.com</p>
<p>Software Registration: Intellectual Property Protection Office Information Technology Industry Development Agency (ITIDA) Smart Village Building (B5) Cairo-Alexandria Road; Giza Egypt 12577.</p>		

IPR Administration Contacts in Niger:

<p>Copyright Office: Tunisia Organization for Protection of Copyright and Related Rights (OTDAV) 7, Avenue Mohamed Melki, 1005 El Omrane Tel: +216 71957115; 71957102; 71957109; 71957097 Email: otpda@planet.tn Tunis</p>	<p>Industrial Property Office: National Institute for Standardization of Industrial Property (INNORPI) Rue de l'assistance n8 par rue Alain Savary BP 57 Cite El Khadra, 1003, Tunis Tel: +216 98352777,+216 71806758 Email: innorpi@planet.tn; contact@innorpi.tn</p>
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IPR Contacts in Ghana:

<p>Copyright: Copyright Office of Ghana Ministry of justice Private Mail Bag; Accra Tel: +233 302229190 Email: info@copyright.gov.gh; info@mojagd.gov.gh</p>	<p>Trademarks: Registrar General's Department Ministry of Justice Email: Kumasi@rgd.gov.gh Kumasi; Ghana</p>
<p>Patents:</p>	<p>Industrial Designs</p>



Registrar General's Department Ministry of Justice Email: info@rgd.gov.gh Ghana	Industrial Designs Office Registrar General's Department Ministry of justice Ghana
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IPR Contacts in Niger

Copyright Office Niger Copyright Office (BNDA) Ministry of Culture Revival, Arts and social Modernization (BNDA) Email: bnnda.niger@yahoo.fr Tel: +227 96573803	Industrial Property Rights National Agency for Industrial Property and Promotion of Innovation Ministry of Mines and Industrial Development (ANA2PI) Email: Tel: +227 96973317; 90340888, 96030626 Niger
OAIP Liaison Office Directorate of Industrial development Ministry of Trade, Industry and Promotion of Private Sector Email: an2pi.oapi@gmail.com Tel +227 20752053; +227 90340888 Niger	

IPR Administration Contacts in Burkina Faso:

Copyright Office Burkinabe Copyright Office (BBDA) Ministry of Culture, Arts and Tourism Email: infos@bbda.bf ; bbda@fasont.bf Tel: +22650324750 Ouagadougou.	Industrial Property Office: General Directory of Industrial Property Ministry of Trade, Industry and Craft Email: Tel: +226 70253778; +226 76620241 Ouagadougou.
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Annex 2: Draft Government Decree on RPAS Systems and Usage in Tunisia

Article 1: This Governmental decree sets the conditions applicable to Remotely Piloted Aircraft system (RPAS) only used in air traffic over the territory of the Republic of Tunisia and the conditions for its exploitation. The provisions of this government order do not apply to:

- Private airships,
- Governmental remote-control aircraft,
- Remote-control aircraft used in enclosed or covered spaces;

Article 8: The exploitation of RPAS system in airspace is subject to a license issued by the Ministry of Transport and Logistics in accordance with this governmental decree and after consulting the National Civil Aviation Council.

Article 9: To obtain a license for using RPAS system in the light category, the following conditions must be present:

- Preparing a study for a project feasibility,
- Provide the financial and human aspects of the project,
- Develop procedures for the operations to be conducted approved by the General Administration of Civil Aviation,
- Establishing procedures for coordinating with the departments entrusted with providing air traffic services,
- The RPAS system to be exploited must be defined in accordance with this Governmental decree,
- The applicant or the legal representative of the moral person has not been convicted by an intentional crime,

Article 10: Operations of the exploitation of RPAS system in the light category are limited to the following conditions:

- Natural or legal persons,
- Flights within the visual range of the pilot at a maximum horizontal distance of 200 meters,
- Altitudes not to exceed 100 meters above the ground,
- Remote-control aircraft belonging to the class C2.

Article 11: Air operations are carried out for the light category in accordance with the following conditions:

- Not to be performed over a gathering of people in the open air,
- The possibility of overflying people not involved in air operations.

Article 14: Before starting operations, the remote pilot must:

- Obtain updated information regarding the intended use of the RPAS system on flight restrictions or conditions published by the relevant departments,
- Being able to exploit the environment,
- Ensure that the RPAS system is in a condition that allows the programmed flight to be carried out safely and that its mass, including payload, does not exceed the maximum take-off mass specified by the manufacturer or the category to which it belongs,



- Submit a detailed flight program to the air traffic services structure 72 hours in advance. During the flight, the remote pilot must:
 - o Responding to the requirements of the RPAS operations to be implemented,
 - o Ensuring the safety of exploiting the operations of the RPAS system on the surface of the earth and on the ground,
 - o Respect restrictions relating to the area of flight and the use of airspace,
 - o Use of the RPAS system within the limits contained in the instructions provided by the creator,
 - o Perform a visual survey of the surrounding airspace in order to be able to view any other aircraft in a way that does not pose a danger to them. To apply this condition, a remote pilot may be supported by a remote co-pilot,
 - o The remote is located in the pilot's line of sight from the distance. A clear and effective communication must be established between them
 - o keep the RPAS System within the pilot's visual range,
 - o Not to use a RPAS system to drop materials or transport dangerous goods, except for items related to agricultural, horticultural or forestry activities, the transfer of which does not conflict with the legislation in force,
 - o Not to fly near or within the areas where emergency operations are taking place,
 - o Respect the rights related to personal life and the environment and use the RPAS system in a manner that minimizes disturbance to people or animals.

Article 15: In order to obtain a license to exploit RPAS system in the special category, the following conditions must be met:

- Develop a private activity guide to be approved by the General Direction of Civil Aviation at the Ministry of Transport and Logistics. The content of this guide is set in accordance with Annex No. II of this Governmental decree,
- Preparing a study to assess the operational risks of the intended exploitation to be approved by the General Administration of Aviation Civil in the Ministry of Transport and Logistics,
- Establish risk mitigation measures to reduce the risks of air operation and bring it to an acceptable level,
- Establishing procedures for coordination with air traffic services,
- The RPAS systems to be used shall be equipped and comply with the definition requirements in accordance with this government decree,
- The legal representative has not been convicted of bankruptcy or has been convicted of a felony or misdemeanour its subject is dishonourable, for which a context of imprisonment exceeding three months.

Article 16: In order to exploit the systems of RPAS of the special category, the operator must provide the General Administration of Civil Aviation at the Ministry of Transport and Logistics, in order to ratify the following documents:

- Private activity guide,
- Operational Risk Assessment Study for the mission,
- Measures to reduce risks for the operations to be carried out.



Article 17: When assessing operational risks, the operator of RPAS system shall take into account at least the following elements:

- Characteristics of the area and the conditions in which the operation will be carried out,
- The category of airspace and its effect on air traffic and air traffic management,
- The remote-control aircraft design characteristics and capabilities,
- Type of operation,
- Organizational factors,
- Safety risks,
- The dangers of personal life,
- Impact on the environment.

The operator of RPAS system regularly assesses the appropriateness of measures taken to reduce risks and updates them when necessary.

Article 46: The person who may fly a RPAS system must be a licensed pilot and have a medical certificate of aptitude.

Article 77: The maximum permitted height is 150m.

Article 78: Before the start of each flight, the remote pilot must provide the relevant air traffic structures with the following data:

- Characteristics of RPAS system,
- Scheduled flight date and time,
- take off place,
- the name of the operator,
- mission area,
- The name and phone number of the pilot,
- maximum moving height,
- type of remotely piloted aircraft.

The relevant security authorities must also be informed at least 72 hours before the start of a flight that coordinates with the relevant air traffic structures.

Article 84: Any foreigner wishing to take aerial photographs or record images or data outside the visible spectrum for commercial or scientific purposes, or for aerial inspection or overflying a territory The Republic of Tunisia, in order to shoot advertising clips, to submit a request to the General Direction of Civil Aviation at the Ministry of Transport and Logistics to obtain a temporary license for this purpose at least one month before the date of the start of the mission. This license shall be issued by the Minister of Transport and Logistics after consulting the Minister of Interior and the Minister of National Defense.

Article 85: To obtain the license required under Chapter 84 of this Governmental decree, the concerned person must submit a request for this purpose to the General Direction of Civil Aviation at the Ministry of Transport and Logistics, one month prior to the date of mission. This request must be accompanied by the following documents in three (3) copies:

- Administrative documents related to the applicant which belong to public establishment, private company, studies office, or topographical expert,
- Technical characteristics of the cameras and digital capture devices used,
- camera calibration certificate,
- aerial photography mission program,



- The areas to be photographed and mentioned in the application form represented by a circle specifying the geographical position coordinates and rays according to the global geophysical system WGS 84,
- Identity of pilots and operators of aerial photography operations,
- licenses or training certificates issued by foreign civil aviation authorities,
- Copies of identity documents, such as a national identity card or passport,
- An insurance contract covering the civil and professional liability of the user.

Article 86: The license for aerial photography is personal and may not be transferred in any form and must contain the name of the agent assigned to carry out the mission.

Article 87: The temporary license is valid for the period corresponding to the period of mission mentioned in the application form in accordance with the provisions of Article 85 of the Governmental decree and is renewable based on a demand justified for the purpose.

Article 88: The departments of the National Centre for Cartography and Remote Sensing supervise the development and printing of aerial photographs, which are obligatory in the Republic of Tunisia, and only a copy of the data is delivered to the license holder after processing it.

Article 89: The National Centre for Mapping and Remote Sensing supervises the activities of the remotely piloted aircraft during flight or taking pictures. The daily flight program for flights is not accepted unless it is approved by the representative of the centre.

Article 90: The license holder shall compulsorily exploit the images taken from the air within the framework of the licensed activity and only he shall bear the responsibility of marketing or exploiting them for any other purpose.

Annex 3: Farmerline - Social software

Farmerline Ltd (<https://farmerline.co/>) is a Ghanaian social enterprise that develops ICTs (web and mobile applications) to communicate and collect data to/from smallholder farmers in rural regions of West Africa. It was launched in 2013 in Ghana and it has been operating for the last 8 years in Cameroon, Malawi, Nigeria, and Sierra Leone, reaching 200,000 farmers, while Mexico and Peru have shown an interest in the technology. The main aim of Farmerline is to create prosperous farmers and thriving agri-businesses. This is done in different ways. One is to provide direct support to farmers through the platform or organizations which use the platform to support farmers. Another is to provide field knowledge and training to smallholder farmers with target objectives to make farmers more profitable. Farmerline provides connects farmers to markets, finance, weather forecast, new farming tips, inputs dealers, and equipment services. The distribution network in Ghana includes warehouses, trucks, motorcycles, and agro-input shops. This is accomplished by an information service that sends SMS and voice messages on weather forecasts, market prices, new farming techniques, agrochemical applications, and finance. This is delivered to the mobile phones of farmers in local languages to bridge the illiteracy gap. The benefits of Farmerline are linked only to farmers but to various stakeholders. It helps farm input companies to know in real-time which input they need to aggregate for farmers, traders who know where the increase in yield is coming from and be able to predict harvest and prepare adequately logistics, the government which will be relief from providing direct support to farmers because farmers now make more yield and more money, policymakers expand to areas where the focus has been not previously. Additionally, funders know where more funded will be needed. The main output in terms of ecosystem services is the provisioning of abiotic services (biomass grown for nutritional purposes). Farmerline's innovation can be implemented in any African country where smallholders are faced with challenges of access to timely and relevant information. Because most of the technologies have been focused on large-scale farmers the target scale adoption of Farmeline is small-scale farmers who often are left out from technological innovation. If actors are embedded with



Farmerline they see the benefits and find out what works best for them. If the focus is smallholder farmers Farmeline provides information by voice messages, so no skills are required. Otherwise, if smartphone-based services are used farmers should have a smartphone and should be able to read and write. Hence, soft skills are highly needed so farmers can understand the services and interact well with service providers. Farmerline provides trial version and pay-per-use services. Communication systems are needed. A cost item is a cost for charges on mobile networks that the farmers use. The primary SDG that Farmerline address is SDG1 (No poverty) and SDG2 (Zero Hunger).



Annex 4: EU Request for revision of deliverable submission for the project "SustInAfrica (861924)".

On date 31/08/2022, the officer "Alina KOZACENKO" has requested the revision of the submission for the deliverable with title "IP Frameworks" and number "2" for the project "SustInAfrica (861924)".

Request for revision comment:

A well-structured deliverable, and highly rich in content. Report gives a detailed overview of the IP landscape and frameworks for five countries in Africa named: Egypt, Tunisia, Ghana, Niger and Burkina Faso. It highlights different types of IP in each country, the relevant laws, regulations, protocols and treaties applicable to IP protection as well as the agencies responsible for managing the IP in each of the countries. Nevertheless, in the report, there is absence of recommendations on how some of the highlighted challenges across the different IP types in listed countries could be improved based on the vast knowledge from the cross-cutting review. Besides, it makes use of a different template compared with other deliverables in other work packages. Please make a few generic and conclusive statements on how the challenging IP landscape could be improved based on experience from the vast review as a separate conclusive paragraph (sect. 9). Please use the common project template for the deliverable as in other WPs.

