



DignifAI
AGRITECH

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PRECISION AGRICULTURE

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PRECISION AGRICULTURE

Improving decision making for farmers around the world



The Agriculture Industry and Technology are combined together to create a new term: Precision Agriculture, which seeks to use Artificial Intelligence and new technologies to increase efficiency and profit for crops while lowering costs and the use of resources as land, water, and a reduction in fertilizers, herbicides, and insecticides.

Proper data collection about climate, pest, soils, crops, and temperature can be analyzed and used to farm plant crops in a more efficient and precise way, saving time and money. These practices also help farmers use natural resources in a more sustainable manner increasing food availability for the population.

The population is increasing at a high-speed rate. Scientists believe that, by the year 2050, the population will be around 9.8 billion worldwide. This is why we need to produce enough food for everyone. Precision Agriculture is a solution for facing climate change, degradation of fertile soil, depletion of water sources, and resistance to herbicides. For this reason, investments in this area have increased especially in recent years.

The 2030 Agenda for Sustainable Development adopted by all the members of the United Nations recognizes that ending poverty requires strategies to improve agriculture while tackling climate change. The need for more sustainable agriculture to growing food could lead to social and economic equality and preservation of the environment.

Latin America

INNOVATION AREAS







The integration of technology in Agriculture improves productivity and empowers farmers to make better and informed decisions. An important factor in Precision Agriculture is the application of Artificial Intelligence which connects a massive amount of data to inform farming decisions and adds some value using Machine Learning applications for enhancing crops and solving sustainability problems.

GPS devices on tractors, self-driving tractors, lasers on fields, GIS annotation, drones, and robotic automatization are some of the many technologies farmers are applying these days. The use of technology in agriculture peaked in the global market with a value of \$ 432.2 million in 2016. It is expected to continue growing: by the year 2025, the market value of the agriculture industry is expected to reach the goal of \$ 2.628 million.

Artificial Intelligence is making Precision Agriculture smart enough to help people grow their crops 20% faster using 90% less water.

Agriculture is one of the most promising fields in the world economy. In 2016, the estimated value added by the agriculture industry was estimated to be less than 1% of the United States' gross domestic product. The Environmental Protection Agency (EPA) estimates that agriculture contributes \$330 trillion in annual income to the economy.

INNOVATION AREAS IN AGRICULTURE FOR LATIN AMERICA THIS YEAR:

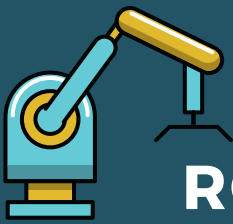
-  Soil analysis and environmental assessment.
-  Drones and satellite images.
-  Remote sensors.
-  Data analysis and support for decision making
-  Smart irrigation systems.
-  Task mechanization.

The growth of Agriculture Technology in the region promotes more affordable technologies impacting the producers and the environment. Climate change and the depletion of natural resources such as soil and water are in need of more efficient and less consuming agricultural practices.

Machine learning technology allows farmers to save up to 30% in expenditure for equipment and operations, combining the use of data analysis collected by drones and robots. Every day more and more bots are created to assist farmers in the daily process of harvesting healthy crops faster, at proper times, and with more precision.

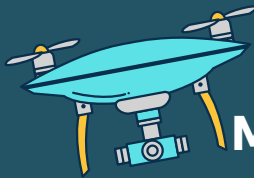
Uses

HOW ARE COMPANIES USING AGRITECH



ROBOTS

Companies are developing and programming autonomous robots to handle essential farming tasks such as harvesting at a higher volume and faster than human workers. Stand-alone machinery is growing fast in agriculture. Smart irrigation systems are key in Latin America due to the effects of climate change on water and energy consumption.



MONITORING

Companies are developing computer vision and algorithms to process data taken by drones and/or technology-based software to monitor the health of crops and soil. Greenhouses and vertical farms are gaining interest because they optimize production with better use of resources and less use of disease control products.



ANALYSIS

Machine learning models are being developed to monitor and predict various environmental factors that impact crop yields, such as climate changes.

Several applications include heater control, automated irrigation, the use of pest control through pheromone aerosol dispersion, light and heat control, weather prediction, network sensors, drones, phase tracking, satellite photography and sensors, the use of prediction analysis related to pests and diseases through software and analytical tasks.



Most digital technologies in Latin America include satellite images, drone data, wheatear station sensors or ground sensors, geolocation, mobile technology, etc. The use and development of Artificial Intelligence in agriculture solutions is beginning to grow in the region, the same as processing information.

Mobile telephony in Precision Agriculture offers climate information and crop indicators for free, helping farmers planning their crops, controlling pests, and predicting weather conditions, bringing digitalization to low-income farmer communities.

Studies show that large farms, about 5,000 acres, can generate input costs of \$24.50 per acre on average, and increase output gains by 42\$ per acre using precision agriculture technologies. Within 10 years, this could be a fully developed industry, changing the food system by creating more available food at a lower cost, using fewer chemicals, producing less waste, and saving more natural resources.

Nowadays, almost 15% of all greenhouse gas emissions and 70% of freshwater consumption are results of agriculture. Extreme temperature changes in climate are becoming threats to farmers which influence our global food supply. Today, the world produces 150% more food than 6 decades ago, but the land and the available water sources have been detrimental.

Sensors and computer imaging allow farmers to analyze their crops more efficiently in order to choose better treatment and make more intelligent decisions while monitoring in real-time. Farmers can now decide where to plant, selecting the best seeds and soil, they can decide how to address disease and pest control as well, and have the possibility of better managing weather conditions or land use. All these data have become important in the future of farming, achieving to reduce for example almost 90% of herbicides in some cases.

A good example in Latin America is the company *Tierra de Monte* based in Mexico. They use microbiological technology to create sustainable agriculture that does not need chemicals and is more productive. In 2018, they covered around 15,000 hectares, impacting over 10,000 people and replacing about 5,000 liters of insecticides and 7,000 fungicides using their products.

Icrop is a Brazilian company that develops technology-based solutions for irrigation systems management to opti-

mize water use and reduce energy costs, now monitoring close to 740,000 hectares of irrigated land.

Space AG in Peru captures data using drones and satellite images and digitalize maps of the farms to generate alerts related to irrigation or harvests forecast, covering more than 75,000 hectares for several agribusinesses in the region and has provided important data during the phenomenon of El Niño for flooded areas.

Precision farming goes along with several advantages for both the producer and the entire economy, one of them is Increasing crop yields. Higher yields mean there is more food available and higher profits for farmers. In a study conducted in 2012, it was determined that small changes in the use of nitrogen and phosphate, managing nutrient imbalances and inefficiencies, could achieve up to 79% yield of worldwide main cereals (a 29% increase in global production).

Higher yields imply that it is possible to increase production without the need to expand the agricultural area, which in turn implies less deforestation and depletion of natural resources. Reducing the amounts of fertilizers and other chemicals can generate huge benefits in terms of greenhouse gas reductions and less contamination of soils and freshwater from crop runoff.

Implementing crop monitoring with drones and other remote sensing techniques will allow monitoring diseases, pests, and other plagues in a more controlled, quicker, and contained way.

However, as promising as precision farming may seem, it is still unclear whether it can be successfully adopted by small and medium-sized farmers, at least in the near future. Which are the most desirable technological solutions for them, and for the context of Latin America and the Caribbean, must be carefully explored.





Data labeling is playing a huge role in AI projects for agriculture, but even more a trustworthy collection of data. Many projects fail due to the lack of quality data and appropriate labeling, most of the time because raw data is constantly arriving but it is inconsistent, unstructured, and too varied for the matter. Drones, cameras, and sensors give high-resolution images and collect raw data which needs to be labeled accurately, quickly, and at low cost.

It is surprising that 80% of the time consumed in an AI project is spent in processing data and labeling to create Machine Learning models. Given this scenario, it is not rare to see that almost 19% of agriculture companies fail to adopt an AI due to the lack of data quality.

This is why at **Dignify** we concentrate our efforts in getting to know the client and its needs, to see the fundamental issues that might keep them from using the technology required to grow their businesses, using our dedicated project management flow and our trained annotators' team, supervised to follow specifics quality control guidelines.

PRECISION AGRICULTURE: LESS IS MORE

DignifAI works with businesses and universities that are developing Computer Vision and Machine Learning models to improve the decision-making capacity of farmers. Precision agriculture software can help farmers and agriculture businesses improve yield rates by optimizing the use of resources –such as water, fertilizers, herbicides, and nitrogen– and reducing their waste. It also improves decision-making by analyzing real-time data on livestock rotations, drought conditions, and soil.

DIGNIFAI AGRITECH CASE STUDY



AARHUS UNIVERSITET

Client: Aarhus University - Denmark

Annotation Task: Polygon Image Annotation.

Data-set Size: 2,500 agriculture drone images

Complexity: Wide-range, images from 10 min/task to 45 min/task depending on the number of plant bushels and the level of detail.

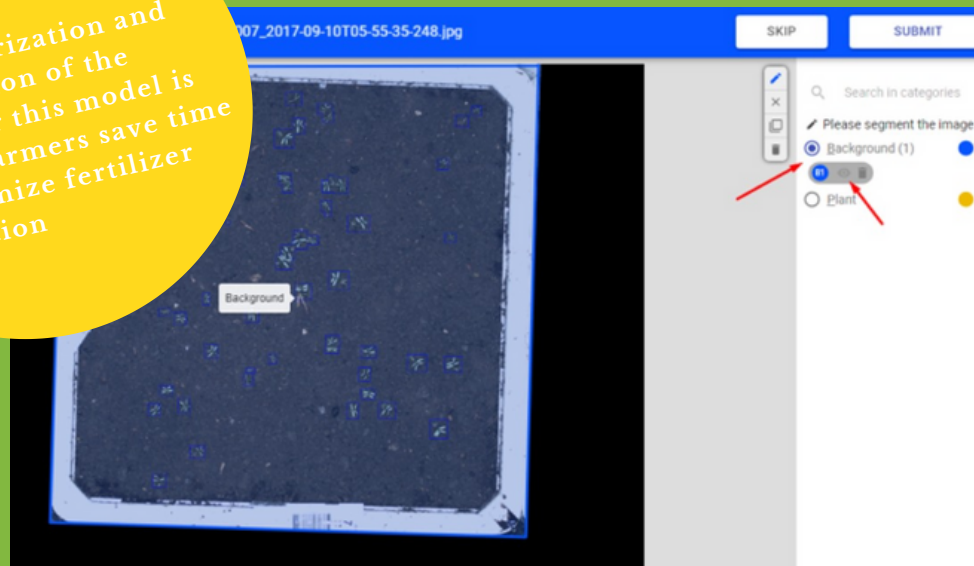
APPLICATION

The client was developing a Precision Agriculture software with dual image recognition capability:

- To categorize soil, pasture, and plant agglomerations in different fields.
- To segment color contrasts of each category based on dryness and crop health.

GOAL

The categorization and segmentation of the images for this model is helping farmers save time and optimize fertilizer distribution



DIGNIFAI'S SERVICES

Data acquisition on farms can generate hundreds of millions of data and over time the crop productivity could increase enormously and can be better predicted. This is a very heavy process that will rely on the quantity and also the quality of the data acquired. Both customer and data analyst (developers) need accurate labeling, organization, and consistency in order to deliver the best results.

DignifAI provides services that seek to fill the voids of misleading annotation in Latin America assembling a team of analysts involved in sectorized projects with a specific sector project management and a quality control training that is customized for each client or project. Our company has the advantage of being based in Latin America, getting to know intrinsic pain and gain points for each client managing specific CPI metrics and verification in an unbiased environment. A well-conformed team with continuous verification for annotations can lead up to 50% in reducing costs for client's requirements.

WHAT SERVICES OR SOLUTIONS CAN YOU EXPECT FROM US?

Image Classification:

Bounding Box and Polygons for:

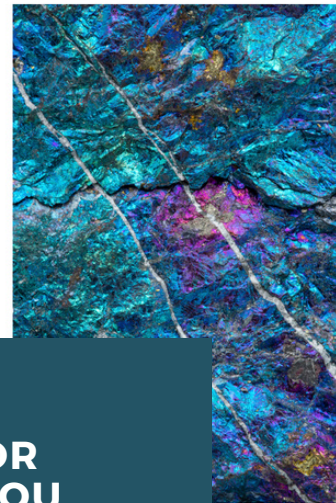
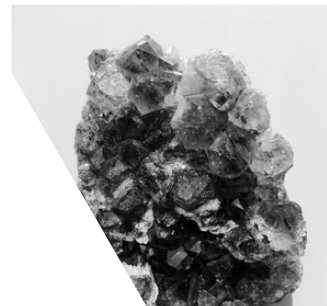
- Crop Disease Detection
- Crop and Weed Detection
- Ripeness monitoring and detection

Video Classification:

- Growth Monitoring
- Nutrient Deficiency
- Chemical Toxicity
- Insect Attack

Satellite Image Analysis:

- Productivity Soil Detection
- Mineral and Organic Detection
- Crop Monitoring
- Animal Detection
- Weed Detection



Spotlight Market Allies

PINDUODUO

At Dignify we value the commercial effort of our allied companies in the search for resolution of problems in the agricultural sector with the tools provided by Artificial Intelligence.

As we continue to grow and develop our social and service values, we support and spread the knowledge of companies such as Pinduoduo which, since established, has made agriculture its priority to develop strategies for greater productivity and the integration of the industry into the digital economy.

Founded in 2015 in China, Pinduoduo is the biggest online marketplace for agricultural products in China. We wanted to get some insights into the achievements of this company on the voice of Ada Yang, Head of Social Community at Pinduoduo, and this is what she expressed to us:

Q: What message is Pinduoduo trying to convey with its recent push into the Digital Agriculture space, and what does it say about the expectations of Rural Digitalization?

A: Agriculture is an industry that is closest to everyone's life but sadly it is also the industry with the least amount of digitization. We have made agriculture a strategic priority because food is the most basic of needs and any improvements in its production, distribution, and consumption will benefit the greatest number of people.

In China, farming has one of the lowest rates of digitalization, meaning there is potential for outsized gains in productivity from integrating the industry into the digital economy.

Q: Pinduoduo co-organized the Smart Agricultural Competition in 2020. What were the main lessons of this event in terms of the role Artificial Intelligence is impacting the AgriTech space?

A: By co-organizing the competition, we sought to gather the top minds in technology and agronomy to develop "one-click planting" solutions by digitizing and standardizing the planting process. This is so that we can demonstrate to the farming communities that technology can be accessible, affordable, and make a meaningful difference in their livelihood and production. The application of precision agriculture technologies can help improve their productivity and, by extension, their incomes and their livelihoods.

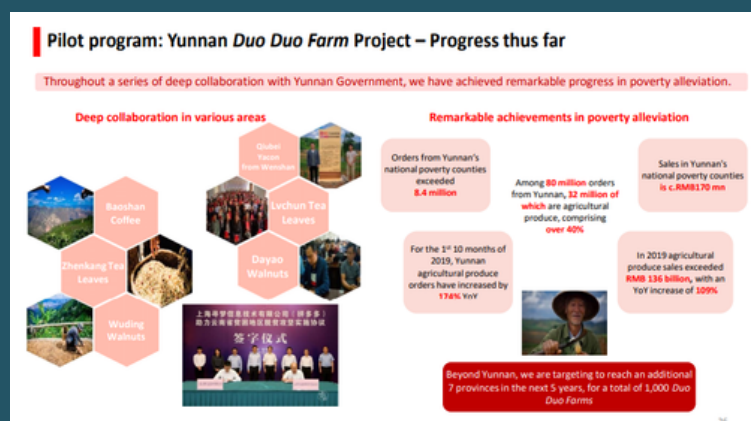


"Technology is the force multiplier that helps both the people who grow the food and the people who eat it," Andre Zhu, Senior Vice President of Pinduoduo, said recently in an interview. "Investing in agriculture benefits the greatest number of people. We are happy to play the role of matchmaker and enabler."

Q: How is Artificial Intelligence playing a role in "Regenerative Agriculture" and "Precision Agriculture" solutions, and what are the most accessible applications being seen in terms of cost and complexity?

A: We hope to facilitate the development and adoption of cost-effective precision agriculture and analytical tools so that farms can raise their agricultural yields and lower the costs of growing, moving, and selling food. Depending on the crop and local geographical and weather conditions, a range of technologies from smart sensors, greenhouse to drip irrigation could be most suitable.

On the distribution side, by bringing more farmers into the digital ecosystem, they are able to access more buyers, widening their avenues to sell their products for better pricing. A bigger and more diversified customer base also reduces the risks of unsold crops, one of the causes of food waste, thereby contributing to more sustainable agricultural practices.



At DignifAI we have also been studying the Duo Duo Farms program, launched by Pinduoduo in 2018. We believe that this type of public-private collaboration can be successfully replicated in Latin America to address the same challenges seen in our regional supply chains.

The Duo Duo Co-Op farms program is addressing poverty alleviation by leveraging e-commerce technology to solve the structural challenges with agriculture produce circulation. The goal is to shorten agriculture supply chains from 6-8 links to 2-3 links, integrating demand and supply via distributed AI + product flow and offering merchant services.

One of the most successful collaborations of the Duo Duo program has been with the Yunnan government to promote the production and distribution of Baoshan Coffee, Zhenkang Tea leaves, Wuding Walnuts, and other local produce. The first year resulted in agricultural sales growth of 109% YoY, agricultural production growth of 174% YoY, and over 40% of new orders from the province representing agriculture produce. The Duo Duo program has the goal of launching a total of 1,000 Duo Duo farms in seven different provinces by 2023.



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WANT TO KNOW MORE?

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