2. Definition of SPA

Have you ever tried to talk to anyone about the definition of Sustainable Precision Agriculture (SPA)? If you did, surely you had come to the conclusion that it is not easy to define what is SPA, because the relative importance of certain aspects of the definition varies from person to person and therefore the difficulty of finding a unique definition.

Recently, the International Society of Precision Agriculture (ISPA) has released this definition:

"Precision Agriculture is a management strategy that gathers, processes and analyses temporal, spatial and individual data and combines it with other information to support management decisions according to estimated variability for improved resource use efficiency, productivity, quality, profitability and sustainability of agricultural production."

Although several other definitions can be found in the literature (The University of Sidney, n.d.; European Parliamentary Research Service (EPRS), 2016; Fountas, Aggelopoulou, & Gemtos, 2016); "Precision Agriculture - an overview | ScienceDirect Topics," n.d.), Project SPARKLE partners produced a definition taking into consideration a brainstorm done with 26 people and in the end they arrived to several relevant keywords associated to SPA (Figure 1) and at the same time to a simple definition for SPA:

Sustainable Precision Agriculture consists in **managing resources effectively with technology in order to achieve agricultural sustainability throughout the value chain**.

Right	Intra-field variation
Time	Management
Amount	Optimizing
Place	Preserving resources
Manner	Agri-economic
Sources	Agri-environmental
Processes	Agri-social
Efficiency	Sustainability
Treating	Traceability
Calibrated	Value chain
Differently	
Technology	

Figure 1 - List of keywords used to define Sustainable Precision Agriculture.

Managing resources effectively with technology means to increase the efficiency of agro-economic, agro-environmental and agro-social processes. To do this, we must treat differently what is different using calibrated and resilient technology.

Why calibrated technology? Well, it does not seem to make much sense to carry out a differentiated application of fertilizers with an applicator at a variable rate that is not calibrated, otherwise how can we ensure that we are putting the right quantities in the right place? By the way, why resilient? A technology that works today should be able to work tomorrow otherwise it's not interesting to use it because in this type of activity the answers in most cases have to be immediate. For instance, we cannot wait for a few days to do a phytosanitary treatment, simply because we do not have differential correction in GNNS (GPS).

In short, what is different and brings us different economic returns should be treated differently with calibrated and resilient technology in order to obtain higher net income (economic, environmental and social).

Sustainability has to do with the economic, environmental and social processes. Without much difficulty and with very few exceptions, I can say that if we maximize economic processes we will maximize environmental processes. If, any farmer can produce 15 t/ha of product with 200 kg/ha of nitrogen he will not use for sure 300 kg/ha of nitrogen, thus, economic efficiency usually brings environmental efficiency.

With regard to the efficiency of social processes, we can say that these will actually depend on where the agricultural activity is practiced. In developed countries one of the greatest social problems is usually the lack of skilled labour in the fields, as such, robotics will surely be a solution to this kind of social problem. However, in some developing countries, robotics can create a serious social problem. As so, the technology and social balance are a key issue to consider in this type of economic activity.

If we consider that the three operational aspects of precision agriculture are economy, agronomy and technology and if we did a survey to several people about the percentage importance of each of them in precision agriculture, I think we would have interesting results. I verify that when people hear about precision agriculture, they immediately think of technology, assigning a relative importance of approximately 60 % to this variable when compared to agronomy (20%) and economy (20%).

I believe, contrary to common perception, that the weight of the economy is winning, rounding in my opinion the 50% because it is certain that any farmer would prefer to have only 10 t/ha of corn at a price of 300 €/t than 18 t/ha of corn at a price of 150 €/t. The weight of agronomy is, in my view, the second largest weight in this equation, and in my opinion around 40%, indeed I even say that agronomy is the software of precision agriculture, because, in the current state of the art, without the agronomic models for decision-making technology does not know what to decide, even more when we all know that a low chlorophyll content can mean at the same time lack of water or excess of water and a high chlorophyll content, can mean at the same time a very high vegetative development of the crop, or a very high weed infestation.

I do not mean that the 10% of technology is not really important, however technology alone at this moment, still does not solve anything, in fact, may even worsen. Running a bad agronomic model can be worse than dealing with everything uniformly (Figure 2).

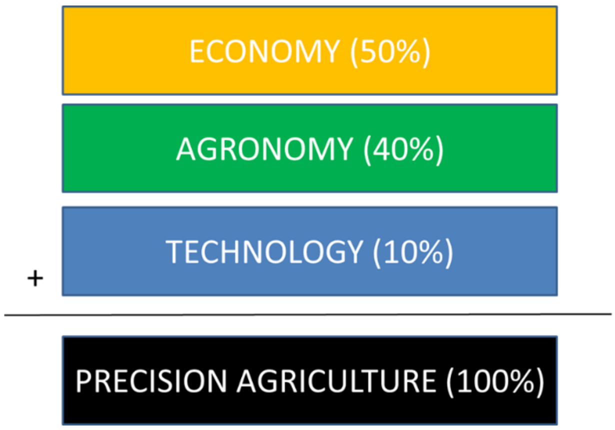

Figure 2 - Weight of the operational aspects of precision agriculture.

In summary, sustainable precision agriculture needs: i) a good agronomy (precision agriculture software), that is why precision farming is far more demanding from a technical point of view than conventional farming; ii) a business vision, because we cannot forget that it is an economic activity and that it must be sustainable; and iii) an appropriate technology, not any, to the implementation of the correct agro-economic models for the best performance of the entire production system.

In conclusion for SPA: i) is more important to buy the knowledge of where to place the fertilizer than the fertilizer itself; ii) it is preferable to know what technology to buy than to buy the technology and not know what to do with it; and iii) it is preferable to produce less but with a higher economic return, than producing a lot, with negative returns.

Bibliography and links

European Parliamentary Research Service (EPRS). (2016). *Precision agriculture and the future of farming in Europe, Scientific Foresight Study*. Brussels. https://doi.org/10.2861/020809

Fountas, S., Aggelopoulou, K., & Gemtos, T. A. (2016). Precision Agriculture. In *Supply Chain Management for Sustainable Food Networks* (pp. 41–65). Chichester, UK: John Wiley & Sons, Ltd. https://doi.org/10.1002/9781118937495.ch2

Precision Agriculture - an overview | ScienceDirect Topics. (n.d.). Retrieved July 1, 2019, from https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/precision-agriculture

The University of Sidney. (n.d.). What is precision agriculture? Retrieved June 17, 2019, from https://sydney.edu.au/agriculture/pal/about/what_is_precision_agriculture.shtml

https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/precision-agriculture

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

https://www.ispag.org/