

Discrimination of Weeds in Cotton Fields in Sikasso

Bourama COULIBALY¹, Dr Kya Abraham Berthé², Dr Awa Soronfé Doumbia³, Dr. Bernard Sidibé⁴

¹Research and Training Center for the Textile Industry (CERFITEX) of Ségou

²Faculty of Science and Technology of the University of Science and Technology of Bamako

³Research and Training Center for the Textile Industry (CERFITEX) of Ségou

⁴Département de Génie Industriel, Ecole Nationale d'Ingénieurs, Bamako, Mali

Abstract: *The identification of weeds in the Sikasso area has led to targeted spraying. The choice of the spraying period was specified by the local weather station, which gives the climatic parameters of the field more precisely the soil moisture parameters. The Gospectro is shipped on the front of a compatible Galaxy Smartphone. The image is analyzed in real time to identify weeds from the rest of the agronomic scene and then to separate the weeds from the crop in the field. The Gospectro is a device that transforms a smartphone or digital tablet equipped with a camera into an ultra-compact and powerful spectrometer. It is sensitive over the entire visible range (400nm-750nm) and can measure emission spectra, transmission or reflection.*

Keywords: Adventice, Gospectro, discrimination system, local weather station and targeted spraying

1. Introduction

According to the United Nations (FAO) research report in August 2009, weeds should be considered the natural enemy of farmers. The report says that, according to a leading environmental research organization, New Zealand's Land Care, weeds cause about \$ 95 billion each year in global food production lost, compared to \$ 85 billion for pathogens, \$ 46 billion for insects and \$ 2.4 billion for vertebrates. [1]

In the face of this universal danger, it is urgent to develop very effective weed management methods. Among:

- Good identification of different species of weeds allows targeted spraying;
- A good knowledge of the physical state of the soil makes it possible to choose the ideal period of spraying;
- And a spectral discrimination of the weeds allows an effective spraying on

The entire cotton field even weeds present in the inter rank of the crop.

The spectrometer used consists of a Gospectro compatible Galaxy Smartphone.

This article will guide researchers and politicians in their approach and have a deep knowledge on the impact of the diversification of weeds on plants in the cotton areas of Sikasso.

2. Methods and Materials

2.1 Methods

We proceeded by the following methods to discriminate weeds in cotton fields at Sikasso Yorosso circle:

- Field Survey;
- Physical Analysis.

a) Field survey:

The field survey in our study area provided data on the nature of the herbicide used, the nature of the fertilizer used, the different types of weeds, and the collection of samples for analysis. spectroscopic. In this survey we went to the study area to get a feel for the physical state of the place and to obtain the data near the services according to the survey sheet established.

b) Corpus analysis

An observation of the nature of the study areas taking into account its morphological state in recent years has allowed us to discover effective methods to control weeds. It also helped to better understand the effects of herbicides. By also identifying the grass species that better adapt to the spraying conditions.

c) Physical analysis

Spectroscopy of the herbs informed us about the spectral difference of the plants (crops and weeds). The existence of different species of grasses has allowed understanding their interdependence and their distribution in the field.

An analysis of these components made it possible to propose an alternative to the use of chemicals in weeding the field.

2.2 Material

- Fact sheets;
- Leaves of weeds;
- Visible UV spectrometer;
- GoSpectro Spectrometer;
- Smartphone compatible with GoSpectro Spectrometer.

3. Results and Discussion

3.1 Result

Thanks to the data obtained from the field survey, we were able to identify the different types of weeds, the nature of herbicide used in cotton fields in Sikasso Yorosso circle.

1) Weed identification

Weeds in cotton fields are classified according to their resistance to conventional herbicides in the Sikasso region of Mali.

Common weeds that are not resistant to any herbicide used are:

- *Dactyloctenium aegyptium* (L.) Willd
- *Lathyrus latifolius* L
- *Setaria Pumila* (Poir).Roem.
- *Briza maxima* L.
- *Dactylis glomerata* L
- *Eulisine indica* L Gaertn
- *Digitaria sanguinalis* (L.) Scop
- *Cynodon dactylon* (L.) Pers

Weeds that are resistant to traditional Ikokadigné herbicide but not Sherif herbicide are:

- *Merremia umbellata*
- *Boerhavia erecta*
- *Corchorus aestuans*
- *Senna obtusifolia*

Conventional herbicide-resistant weeds used in the Sikasso area of Yorosso Circle are:

- *Cyperus esculentus*
- *Cyperus longus*
- *Cyperus rotundus*

2) Optimization or reduction of the herbicide used

To optimize or reduce the herbicides used in the cotton fields, we have designed a local weather station to know the soil moisture. Herbicides are used in cotton fields depending on soil moisture.

a) The nature of the herbicide used

The herbicides used in cotton fields in Sikasso Yorosso Circle Weed are categorized into two categories according to their periods of use:

• Pre-treatment herbicide

These are herbicides used before germination of cotton depending on soil moisture to prevent the appearance of certain weeds. It is the Coregnena 500EC collar, Diuralm 80wg and Floreal collar.

• Herbicide Treatment

These are herbicides used after two weeks of sowing cotton seeds in the fields, with the appearance of weeds. The herbicides used for this treatment are: the Ikokadigné and Sherif Gala.

b) The local weather station

This weather station has been designed and used for soil moisture monitoring in fields favorable to the use of herbicides. The station was able to characterize the soil condition for an ideal identification of the herbicide use period.

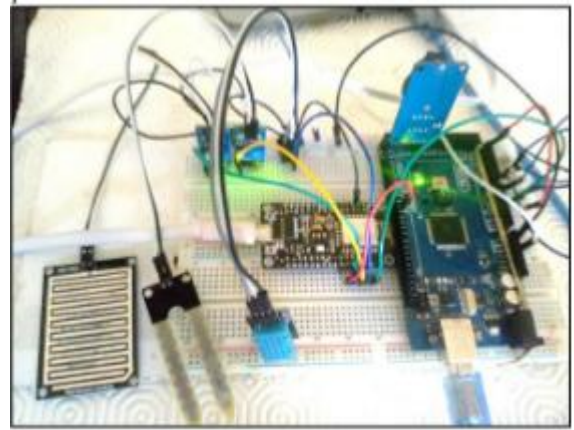


Figure 1: Prototype of the local meteorological station.

Our prototype was made from an ArduinoUno board, a WiFi module, a RTC clock module, a temperature and humidity sensor, a rain detection sensor, a soil moisture sensor and a photoresistor.

3) Spectral discrimination of weeds

The spectral signature of weeds is very different from that of soil and cotton in different wavelengths. Our system is based on a Gospectro integrated on a hand-held sprayer. The Gospectro is used with a compatible smartphone. This allows better spectral discrimination of weeds in cotton fields. The spectral signature of non-ordinary weeds is classified as follows:

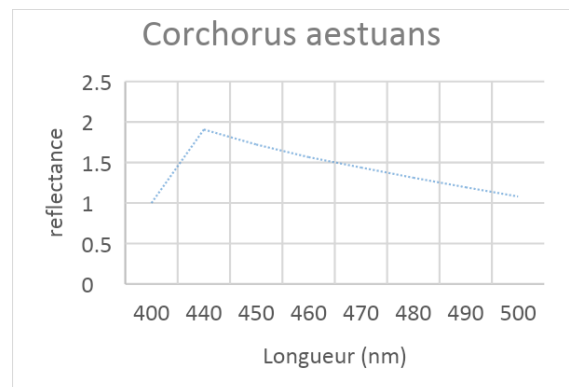


Figure 2: The spectral signature of corchorus aestuans

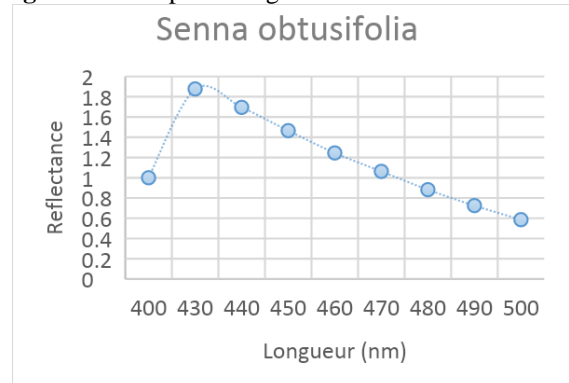


Figure 3: The spectral signature of Senna obtusifolia

We clearly see that the different lengths of weeds are different from each other. It is therefore possible to classify the bad in the cotton fields finally to discriminate them.

4. Discussion

The DetectSpray system, one of the best known systems, allows localized spraying using a sensor placed in the inter-row to detect weeds and treat them [2]. Based on the difference between the spectral response of soil and plant, this system can only detect the presence of vegetation and not identify it. Currently, the Weedseeker is a system marketed by Ntech Industries and based on this approach. Although this system relies solely on the use of two wavelengths (infrared and green), other multi spectral imaging systems have been developed in the laboratory (Martin-Chefson 1999, Vioix 2004) [3], [4]. Although these systems are effective for weed discrimination on field crops, but do not require high portability. The Gospectro is very useful for any application of measurement or spectral characterization of light emission and absorption reflection requiring high portability in the field. And no researcher has worked on identifying the different species of weeds present in Sikasso. The determination of the different types of weeds allows a targeted action and the judicious choice of the method of weeding in cotton fields.

5. Conclusion

This article presents an approach that has not been explored until now in agriculture (and more specifically in spraying), which relies on the identification of different types of weeds and soil moisture parameters in cotton fields, in order to choose the technique. adequate for weeding more precisely the chemical weeding. This work is necessary to export embedded systems for localized spraying. In addition, this model could also be used to test in the laboratory new prototypes of weeding (chemical or mechanical) based on the identification of weeds on the cultivated plots. So this article proposes a method of reducing the use of herbicide in cotton fields in Sikasso.

References

- [1] ONG Africa RICE.
- [2] Aitkenhead, M. J., Dalgetty, I. A., Mullins, C. E., McDonald, A. J. S. et Strachan, N. J. C. (2003). "Weed and crop discrimination using image analysis and artificial intelligence methods." *Computers and Electronics in Agriculture* **39**(3): 157-171.
- [3] Vioix, J. (2004). Conception et réalisation d'un dispositif d'imagerie multi spectrale embarqué: du capteur aux traitements pour la détection d'adventices. Le2i - UP-GAP. Thèse de Doctorat, Dijon, Université de Bourgogne
- [4] Martin-Chefson, L. (1999). Détection des adventices dans les cultures céréalières par traitement de l'image multi spectrale. Thèse de Doctorat, Cergy-Pontoise, Université de Cergy-Pontoise.
- [5] M. Molto, B. Martin, A. Gutierrez, Pesticide loss reduction by automatic adaptation of spraying on globular trees, *Journal of Agricultural Engineering Research*, Vol. 78, Issue 1, 2001, pp. 35-41.