

The Use of Weed Control Robot (WCR) for Achieve to the Sustainable Agriculture

Behzad Sani

Department of Agriculture, Shahr-e-Qods Branch, Islamic Azad University, Tehran, Iran

Abstract: Today, weeds control is very difficult because they are resistant to the herbicide due to excessive use of chemical herbicides in agriculture. Many studies have shown that mechanical and biological control of weeds can be much less damage to the environment of chemical herbicides. Develop of biological herbicides in agriculture was slow due to high prices and this subject the researchers to move toward the elimination of agricultural weed mechanically. This work was originally done by a many number of workers because and workers' rights didn't work was ultimately economic value. Now solve this subject by the use of robotic technology in agriculture has been studied and a many number of agricultural researchers with the help of computer scientists move towards making robots to remove the weeds. Of course this is difficult due to excessive weeds similar to the plants, but the final results will help to increase crop and save the environment by eliminating chemical herbicides.

Keywords: Sustainable agriculture, Weed Control Robot (WCR), weed mechanical control

INTRODUCTION

Mechanical weed control may involve weeding the whole crop, or it may be limited to selective inter-row or intra-row weeding. Machines can be used to kill weeds by burying, cutting or uprooting. Tools without a cutting action are only effective on small weeds. Inter-row implements have been designed that control weeds within the crop row by directing soil along the row to cover small weeds. With slow germinating crops inter-row weeding may have to be delayed until the crop seedlings emerge. In some situations it may be possible to include a few seeds of a fast germinating crop in the seed mixture to give an early indication of the position of the crop row. Mechanical weeders range from basic hand tools to sophisticated tractor driven or self-propelled devices. These may include cultivating tools such as hoes, harrows, tines and brush weeders, cutting tools like mowers and trimmers, as well as implements like thistle-bars that may do both. Two wheeled pedestrian or walking tractors are a smaller alternative that can power a similar range of implements. Custom-made basket or cage-wheeled weeders, with gangs of rolling wire cylinders, offer another way to deal with seedling weeds in a friable soil. The choice of implement, and the timing and frequency of its use may depend on the crop and on the weed population. Some implements, such as fixed harrows, are thought more suitable for arable crops, while others like inter-row brush weeders may be considered to be more effective for horticultural use (Fig. 1 to 3) (Organic Weed Management, 2007).

MATERIALS AND METHODS

A mobile agricultural robot named Lukas weeds fields in Sweden, according to innovations-report,



Fig. 1: Tine cultivator with hilling up discs



Fig. 2: Rod weeder: spring steel tines pull out shallow rooted weeds



Fig. 3: Interrow cultivator for walking

Germany. With its infrared cameras and a computer running some specialized software, Lukas can recognize the difference between crops and weeds and remove automatically the weeds. It could be used for all

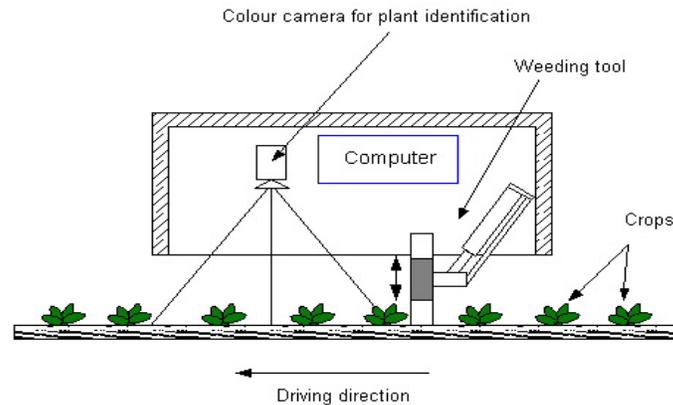


Fig. 4: A module with weeding-tool and a computer vision system for plant identification (Baerveldt *et al.*, 2004)

vegetables that are grown in rows, like lettuce, cauliflower, and carrots, or sugar beets, for which it has originally been designed. This robot is not ready yet to enter the market, but it should greatly benefit ecological growers by reducing costs and by eliminating the need to find people willing to do this work (Fig. 4) (Jablonski, 2005). The world-wide problem of environmental pollution caused by excessive use of herbicides and the increasing cost of chemicals call for alternative methods for crop protection. A potential way to reduce chemicals is to employ precision techniques for various types of agricultural operations so that chemicals can be used where they have an optimal effect at a minimum quantity. It will even be possible in some operations to abandon the use of chemicals and apply other methods, e.g., mechanical weed control. There is political interest in the European Union in increasing the amount of ecologically grown products. The goal is that about 5-10% of the total field area should be processed by organic farming methods by the year 2005. Organic farming is not only a political goal; there is also a push from the market. More and more customers are asking for products that are organically grown. This has led to a problem for companies that need to increase their supplies of organically grown products to meet customer demands. For example, it is difficult to extend the amount of organically grown sugar beets at the present because weed control in the seed line of sugar beets is done by human labor, which implies high costs and difficulties in recruiting workers. The motivation for the work reported here is to reduce the amount of herbicides used for crop protection in agriculture by replacing chemical weed control by mechanical weed control. The elimination of chemical weed control is one of the requirements for a crop's being "ecologically grown" (Baerveldt *et al.*, 2004).

RESULTS AND DISCUSSION

Final results will help to increase crop and save the environment by eliminating chemical herbicides (Fig. 5).

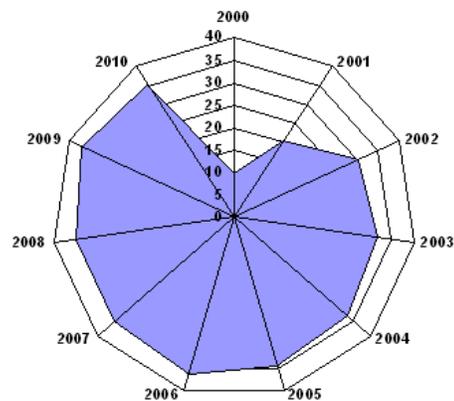


Fig. 5: The use of herbicide in 2000 to 2010 at Iran's farm

A study showed that an autonomous agricultural mobile robot for mechanical weed control in outdoor environments. The robot employs two vision systems: one gray-level vision system that is able to recognize the row structure formed by the crops and to guide the robot along the rows and a second, color-based vision system that is able to identify a single crop among weed plants. This vision system controls a weeding-tool that removes the weed within the row of crops. The row-recognition system is based on a novel algorithm and has been tested extensively in outdoor field tests and proven to be able to guide the robot with an accuracy of ± 2 cm. It has been shown that color vision is feasible for single plant identification, i.e., discriminating between crops and weeds. The system as a whole has been verified, showing that the subsystems are able to work together effectively. A first trial in a greenhouse showed that the robot is able to manage weed control within a row of crops (Astrand and Baerveldt, 2002).

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