

#### **Research Article**

## Open Access



# Sheep grazing to eliminate weeds in an organic 'Valencia' orange orchard in the Huasteca Potosina

#### Abstract

The Huasteca Potosina is one of the areas with orange orchards, where agrochemicals are applied to obtain an adequate harvest. However, year after year, producers are required to produce organically in the orchards, which makes it necessary to look for environmentally friendly alternatives for activities such as fertilization and elimination of weeds. This study describes using a portable cage for grazing sheep as an alternative to eliminating weeds in an organic 'Valencia' orange orchard. The cage prototype is functional as the sheep direct the cage towards the weeds and do not cause damage to the trunks and branches of adult and young trees. Additional benefits are obtained, such as fertilization by manure and urine, economic benefits by reducing labor costs and the sale of sheep, and an environmentally friendly method of eliminating weeds.

Keywords: environmentally friendly, weeds, organic orchard, grazing, small species, valencia orange

Volume 8 Issue 1 - 2024

Omegar Cruz-Arvizu,<sup>1</sup> Sandra L Castro-Garibay,<sup>2</sup> Pedro I Ventura Medina,<sup>1</sup> Andrea G Pacheco Chacón<sup>1</sup>

<sup>1</sup>Postgrado de Fruticultura, Colegio de Postgraduados, Campus Montecillo, Texcoco, México <sup>2</sup>Departamento de Investigación y Desarrollo, Clase Azul

México, Tepatitlán de Morelos, México

**Correspondence:** Omegar Cruz-Arvizu, Colegio de Postgraduados, Postgrado de Fruticultura, Carretera México-Texcoco Km. 36.5, Texcoco, Estado de México, Email omegar.cru@gmail.com

Received: January 22, 2024 | Published: February 08, 2024

### Introduction

Agricultural production is based on chemically synthesized fertilizers and agrochemicals to be applied on weeds, pests, and diseases that affect crops, justifying that better yields are obtained at harvest time.1 However, the environmental and health damage caused by the excessive use of agrochemicals has led to the search for sustainable alternatives for agricultural production. In Mexico, the orange-producing states are Veracruz, San Luis Potosí, Tamaulipas, Nuevo León, Puebla, and Yucatán. In most orange orchards, production is carried out conventionally (use of agrochemicals). However, some producers started organic production more than ten years ago, and others are interested in starting this process, mainly because oranges fetch a better price.<sup>2</sup> The producers commented that the most common activity carried out in the orchards is the elimination of weeds, especially in the rainy season, by manual cutting with a machete or hoe or with brush cutters, tractors, or a combination of some of these, either for elimination in the drip zone or in the whole plot. Still, mulching, mainly with leguminous plants, is also a commonly used practice.2

An option rarely applied in fruit orchards in Mexico is the grazing of animals to eliminate weeds. Although this is a regular activity in agroforestry systems,<sup>3</sup> in fruit orchards is not, as it can cause considerable losses due to browsing (falling of flowers and fruit) and damage to the trunk of both adult and young trees. However, this system has been implemented in oil palm<sup>4</sup> and vine plantations,<sup>5</sup> so it can be used in fruit orchards if adequately implemented. Yet animal grazing provides advantages to farmers, such as eliminating weeds in an environmentally friendly way, maintaining beneficial insects (pollinators, pest predators), fertilizing by manure and urine, and fattening animals for later sale.<sup>6</sup> Due to the multiple benefits that grazing animals provide and the potential damage they can cause to fruit trees, this work aims to use a mobile cage for grazing sheep as an alternative to eliminating weeds in an organic 'Valencia' orange orchard.

## **Material and methods**

it Manuscript | http://medcraveonline.con

In the La Esperanza, San Luis Potosi community, a 2.5 ha plot of 'Valencia' oranges grafted on sour oranges was chosen. The owner

of the organic orange orchard was interviewed to learn about the history of the orchard, as well as agronomic aspects such as pruning, fertilization, and general orchard management. The plot was chosen because the land is flat, which facilitated the implementation of the cage prototype, and because the producer migrated to organic management of his plot six years ago and is interested in acquiring and learning about environmentally friendly agronomic management alternatives. The optimal number of animals in the cage are six, so they have enough space to walk undisturbed.

#### Prototype of the mobile cage

The prototype cage was implemented in March 2023. It is made of 1 x 1.5 in stainless steel tubular measuring 3.0, 2.0, and 0.8 m in length, width, and height, respectively, with four 9-in-diameter rubberized plastic tires to support the weight of the entire metal structure. Three types of mesh were used: cyclone mesh, 10.5 gauge, and diamond size of  $6.9 \times 6.9$  cm, which was placed on three of the four side faces of the cage and the remaining face (small face) a door was placed to facilitate access to the sheep (Figure 1E); sheep netting, 11 gauge and hole size of  $15 \times 15$  cm set on the remaining side face (Figure 1B), this mesh was used to facilitate the sheep to direct the cage and they can feed outside the cage. For the roof, 22-gauge chicken wire with a 2.5  $\times$  2.5 cm hexagon size was used (Figure 1B).

#### Results

#### Agronomic aspects and on-farm management practices

The plot is 53 years old with orange production; the plantation arrangement is staggered at  $6 \times 6$  m; the average annual yield is 39 Mg ha<sup>-1</sup>. Orange production was done conventionally using chemical fertilizers and herbicides, but organic management was introduced six years ago. The practices carried out are pruning of dry, non-productive branches, elimination of weeds, and fertilization with The Organics Materials Review Institute (OMRI)-certified products, all of these with payment of wages.

It is worth mentioning that the report of results is focused on the elimination of weeds; for the 2.5 ha, 15 working days with a machete (USD 13.5/day) or four working days with a brush cutter (USD 59/

Int J Avian & Wildlife Biol. 2024;8(1):8-10.



©2024 Cruz-Arvizu et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and build upon your work non-commercially.

day) are required, the service is re-contracted 15 weeks later. In 2022, unrestricted sheep grazing began, causing minor damage to fruit, branches, trunks, and young plants on the plantation. However, the benefit of saving money in wages and selling sheep was evident, so adaptations were necessary to continue grazing animals.

As seen in Figure 1, the cage is fully functional as the elimination of weeds is complete. Using this prototype in the plot conditions mentioned above takes 21 days to eliminate weeds and start the cycle again. When sheep graze in the orchard, weed removal takes longer than using day labor. Still, fertilization with urine, manure, and sheep sale are some tangible benefits of using this method.

The price to develop the mobile box is about \$204 USD, while the six sheep are \$525 USD; although the initial investment can be expensive, this can be recovered in the medium term, with the sale of sheep, in addition that females with reproductive age can give birth up to twice a year, making circular economy to obtain animals and use them for the same purpose.



Figure 1 Prototype of a cage for grazing sheep in an organic orange orchard in the Huasteca Potosina. (A) Orange orchard with presence of weeds, (B) Mesh used in the construction of the cage, (C-E) Grazing sheep, (F) Functionality of the cage.

## Discussion

It is necessary to change the current model of agricultural production, especially the use of agrochemicals to eliminate weeds, pests, and diseases. The worldwide use of beneficial microorganisms is an effective tool to mitigate many pests and diseases.<sup>7</sup> Applying organic certified products (OMRI) for fertilization and biostimulation is essential for environmentally friendly agriculture.<sup>2</sup>

Animal grazing is a common practice in agroforestry systems, mainly using cattle.<sup>3</sup> However, there is evidence of sheep grazing in alfalfa fields in Sonora, Mexico, to eliminate weeds and increase alfalfa productivity in the second and third harvests.<sup>8</sup> Sheep grazing has also been implemented in saffron fields,<sup>9</sup> with satisfactory results. Grandin<sup>10</sup> mentions that grazing cattle, sheep, and goats is a beneficial alternative for sustainable agriculture. Implementing and operating the sheep grazing cage to eliminate weeds is a suitable alternative because of the multiple benefits obtained from this practice. Recent evidence is reported by Andrieu et al,<sup>11</sup> with agroecological designs made in conjunction with farmers for grazing with pigs and cows. Although this study was reported as a pilot test, scaling it up with neighbouring farmers would provide an opportunity to take quantitative data on animal weight gain and further strengthen the study.

Citation: Cruz-Arvizu O, Castro-Garibay SL, Medina PIV, et al. Sheep grazing to eliminate weeds in an organic 'Valencia' orange orchard in the Huasteca Potosina. Int J Avian & Wildlife Biol. 2024;8(1):8–10. DOI: 10.15406/ijawb.2024.08.00206

Sheep grazing to eliminate weeds in an organic 'Valencia' orange orchard in the Huasteca Potosina

## Conclusion

The mobile cage is fully functional in the field conditions tested; the sheep did not cause any damage to the adult and young trees in the orchard; it is possible to implement the cage in orchards of other fruit trees to eliminate weeds in an environmentally friendly way.

## **Acknowledgments**

To Mr. Eligio Cruz.

## **Conflicts of interest**

The authors declared that there are no conflicts of interest.

#### References

- Rodriguez GN. Subjective production of exposure to agrochemicals. A scoping review. *Cien Saúde Colet*. 2019;24(3):781–792.
- Gómez CMA, Gómez TL, Schwentesius RR, et al. Agroecological guide for organic orange production. *Universidad Autónoma Chapingo*. 2017. p.67.
- Román Miranda ML, Mora Santacruz A, González Cueva GA. Agroforestry systems with important timber and non-timber species in the dry tropics of Mexico. *Advances in Agricultural Research*. 2016;20(2):53–69.

- Tohiran KA, Nobilly F, Zulkifli R, et al. Cattle-grazing in oil palm plantations sustainably controls understory vegetation. *Agriculture, Ecosystems & Environment.* 2019;278:54–60.
- Niles MT, Garrett RD, Walsh D. Ecological and economic benefits of integrating sheep into viticulture production. *Agronomy for Susteinable Development*. 2017;38(1):1–10.
- Popay I, Field R. Grazing animals as weed control agents. Weed technology. 2017;10(1):217–231.
- Cruz Cárdenas CI, Zelaya Molina LX, Sandoval Cancino G, et al. Using of microorganisms for sustainable agriculture in Mexico: considerations and challenges. *Mexican journal of agricultural sciences*. 2022;12(5):899–913.
- Bell CE, Guerrero, JN, Granados, EY. A comparison of sheep grazing with herbicides for weed control in the irrigated Sonora Desert. *Journal* of *Production Agriculture*. 1996;9(1):123–129.
- 9. Ghorbani R, Rashed Mohassel MH, Makarian H, et al. Effects of sheep grazing on weed control in saffron fields. *Acta Horticulturae*. 2007.
- 10. Grandin T. Grazing cattle, sheep, and goats are important parts of a sustainable agricultural future. *Animals (Basel)*. 2022;12(16):2092.
- 11. Andrieu N, Dorey E, Lakhia S, et al. Introducing sheep for agroecological weed management on banana plantations in Guadeloupe: A co-desing process with farmers. *Agricultural Systems*. 2024;213:1–2.