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An autonomous mobile robot for feeding outdoor pigs

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Introduction

The objective of this work is to develop a rational feeding technique for outdoor pigs and at the same time improve the outdoor system with regard to environmental impact and health. For a rational and competitive free ranch system ensuring high animal welfare and low environmental strain automation is crucial.

Small robots and the concept of decentralized animal husbandry make it possible to renew the organic agriculture. The landscape should be a multi functional agro-forestry with relative small fields. The farm animals could use the same type of housing and are placed integrated with the fields. This is expected to secure a better utilization of nutrients and better survival for useful insects and micro organisms. The small fields are flexible and could fit to the variation in soil structure topography. This type of precision agriculture has possibility of increasing biodiversity.

The FeederAnt. An example on the use of robot technology in organic farming

The farm animals should be envisioned as an integrated part of the crop rotation, performing the soil preparation or collect crops after harvest and spread the manure all over the grass paddocks. The distance from the housing unit to the field is short and the application of the deep litter easy for e.g. small animals and plant nursing robots. The housing unit could be used for pigs, calves and poultry in a rotation, which make the system flexible and reduce the risk of disease. New technologies will help rationalizing the animal management by making it easy to use wireless control and develop autonomic self-propelled nursing robots.

The paper presents the concept of an autonomic feeding system for outdoor piglets. Initial results are presented using a remote controlled feeding unit (a prototype of the FeederAnt) to feed several pens with piglets. The FeederAnt drives into the grass paddocks twice a day and position itself in a new location for each feeding. This should help to distribute the manure from the animals all over the grass paddock to prevent point leaching of nutrients. The positioning will be based on GPS, and the control computer will be provided with rout plan program.

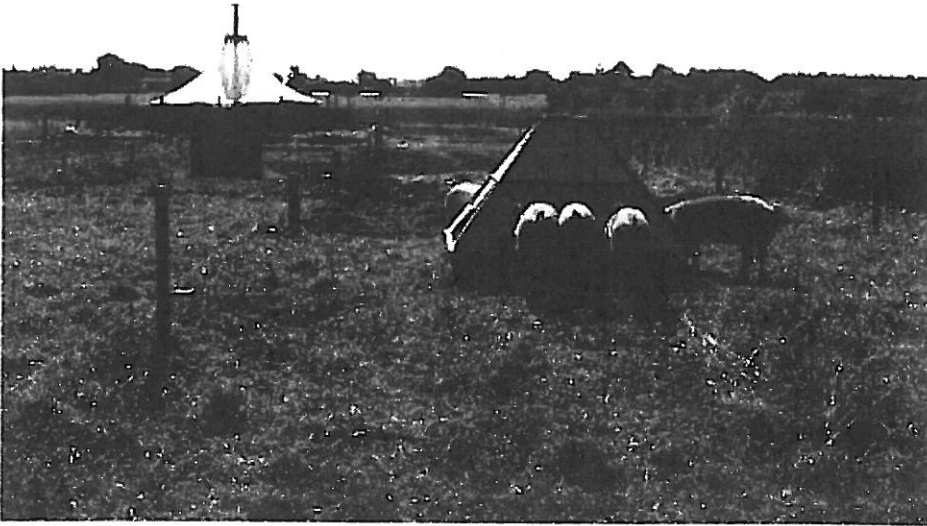


Figure 1. Buildings, farm equipment and fields should support a living soil and healthy animals and humans. A new organic concept with fully integrity and decentralised equipment.

The FeederAnt saves many stationary feeding tables and reduce the daily manual feeding routines. Further, it is expected that the problem with vermins will be solved since no feed residues will be left within the pens.

The prototype FeederAnt consist of tow main parts, - a pyramidal feeder with one trailing wheel in each corner and a remote controlled mobile propelling unit in the centre of the feeder. The pyramidal feeder is feed store in the upper part, and in the lover part is four creeps, one at each side of the feeder to obtain one eating place for each pig in the batch/pin. The edge-length of the pyramid is two metre. The mobile unit is a four wheel module from a commercial Spider ILD01 slope mower. The build together mechanisms consist of a vertical steel bar in each corner which sticks through an eye on the pyramidal feeder. Herby the mobile unit can slide up and down freely and always secure good foothold. Furthermore the mobile unit does not have to carry the full weight of the feeder. The propelling mobile unit is provided with batteries and electrical driven (1100 W, 24 V DC). The vision is to use solar energy as energy source partly directly from PV panels on the robot partly by charging from a stationary plant with solar cells.

The basic robot unit consisting of carrying frame, driving- and navigation system may be used for other tasks. Here the robot may be supplied with tools for sowing, plant nursing, crop harvest, cutting of grass etc...

References

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