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Organic Farming Principles and Practice in Hansta Gard Farm in Uppsala, Sweden

Hagos Arefaine
Department of Animal Nutrition and Management, Swedish University of Agricultural Science, P.O. Box 7070, SE-750 07 Uppsala, Sweden

Abstract
Green revolution of food production policy contributes to environmental degradation, green house gas emission, contamination with chemicals, water pollution and increment of antibiotic resistant disease. Such greater impact of conventional farming on climate change, environment, as well as the increasing awareness of customers to safe and healthy food leads to new thinking of sustainable agricultural approach. As a result, organic farming has been suggested as a possible solution. Now days, most Organic farms are located in Australia, USA, UK and Europe. Hånsta Gård farm is one among the organic farms in Sweden, located in the town of Vattholma which is 20 kilo meter north of Uppsala. Hånsta farm has been implementing in accordance with European Union (EU) legislation of organic farms i.e. all animals in the farm have free access to outdoor and sufficient animals per hectare. The farm has been doing interesting work on optimizing nutrient cycling through integrated crop livestock production system, optimized tillage system, crop rotation with legume grass lay. Furthermore, the farm is conducting interesting research projects on perennial wheat, agro forestry (forest garden) to reduce tillage frequency, efficient carbon sequestration and to bring alternative for future food production without tractors. Accordingly, Hånsta farm achieved remarkable results on biodiversity and reduction of energy consumption as well as green house gas, but still shows minus sign due to its emission of C_2O, CH4 and N_2O to the environment. Hence, further research is needed to reduce the emission, to confirm the uncertainties related to N_2O emission, C sequestration, appropriate waste recycling and use of renewable energy source like biomass energy to replace fossil fuel.
Keywords: Organic farm, climate change, green house gases

Introduction

From mid of 20th centuries, agricultural revolution though intensive application of chemical fertilizers, biotechnology, pesticides and herbicides resulted much higher productivity per hectare (Rundgren & Parrott, 2006). However, such food production policy contributes to enormous impact on environment due to green house gas (Methane, CO_2 and N_2O) emission, contamination of chemicals, soil degradation, water pollution and increment of antibiotic resistant disease (Melece *et al.,* 2009). Such greater impact of conventional farming on climate change, environment, as well as the increasing awareness of customers to safe and healthy food leads to new thinking of sustainable agricultural approach (Rundgren & Parrott, 2006). As a result, organic farming has been suggested as a possible solution (Kladivko, 2001).

Now days, most Organic farms are located in Australia, USA, UK and Europe. Hånsta **Gård** , is one among the organic farms in Sweden, located in the town of Vattholma which is 20 kilo meter north of Uppsala. During our field visit we understood that the farm follows organic principles and practice i.e. produce milk, egg, meat and crop without use of inputs like synthetic fertilizers, herbicides, pesticides rather implementing environmentally sound practice through strategies like nutrient recycling, crop rotation with legume, application of organic manure, reducing tillage frequency and agro forestry. Since the issue of organic farming is very broad, this paper mainly focuses on the key principles that have been implemented on Hånsta farm.

Discussion

Hånsta farm has been implementing in accordance with European Union (EU) legislation of organic farms i.e. all animals in the farm have free access to outdoor and sufficient animals per hectare. The farm has been doing interesting work on optimizing nutrient cycling through integrated crop livestock production system and achieved positive results on avoiding chemical fertilizer by manure, cost of transportation of manure and reduction the Green house gas emission. However, farm didn't consider the emission of CH4 released as a result of fermentation of forage diets by cattle's and sheep (Mcdonald *et al.,* 2002).

Hånsta farm is also practicing crop rotation with legume grass lay as a means of weed & pest control, fertilizing the soil through nitrogen fixation and to reduce N_2O emission. This reduction in N_2O emission might be due to the fact that legumes utilize the nitrogen for Nitrogen fixation. On the other hand, (Kladivko, 2001) revealed that higher N_2O emission was recorded in soils fertilized by manure than synthetic fertilizer. There is no much information about the effect of soil type on N_2O emission (Kladivko, 2001). This showed further research is needed to confirm whether N_2O emission is really reduced through organic farming practice or not.

Optimized tillage system is another new practice of Hånsta Gård farm were spring and winter cereals planted simultaneously. Beside to this, the farm is conducting research on perennial wheat breeds aiming to reduce fuel cost and to allow for less soil organic matter disturbance. The International Federation of Organic Agriculture Movements standards (IFOAM, 2002) suggested that organic farmers should apply minimal tillage practice to optimize soil organic matter for Carbon sequestration, conserve soil moisture, minimize nutrient leaching and top soil erosion. In contrast to this, Kladivko (2001) strongly argue that soil tillage is very essential to have good seed bed preparation, root growth and weed control. In Hånsta farm, crop rotation is also used as weed controlling mechanism, but in practices it not yet efficient. Rundgren & Parrott (2006) reported that crop field without tillage showed higher weed problem than to conventional crop farm who practice herbicides and frequent tillage.

The farm is also conducting interesting research in Agro forestry (apple tree strip in the crop field and forest garden) for efficient C sequestration and to bring alternative for future food production without tractors. But, Altieri (1999) stated that agro forestry may lead to more crop yield reduction due to computation to water, nutrient, and light. However, in an appropriate agro forestry system, the crop lower yield could be compensated by benefit (fruit, C storage and biomass energy) obtained from perennial trees grown on field (Rice & Greenberg, 2000).

Farm subsidies are another strategy which could help to mitigate climate change (Melece *et al.,* 2009). Today, EU provides 1000 kr/ha subsidies to the member state farmers to promote more environmentally friendly farming system and to become competent at world market. However, If conventional farming are unaffected by subsidies and organic farming is increases, there will be more land in use which could create huge environmental degradation (Melece *et al.,* 2009). For subsidies to be effective and encourage organic farming, EU should either reduce the amount of subsidies or introduce tax on input like synthetic fertilizer, herbicides and pesticides to conventional farming (Melece *et al.,* 2009). On the other hand, if the number of conventional farming highly decreases and organic farming increases then there will be less food available due to lower yield from organic farming. These are both undesirable alternative for the market, the environment and people. Rundgren & Parrott (2006) argue that organic farming is not sustainable to feed the world due to 20-30% lower yield per hectare than conventional farming. In contrast to this, studies in Latin America revealed that, farmers who apply organic production technique gain up to 50 % more yield compare to conventional farmers (Altieri, 1999). The average milk yield of organic and conventional farming is 6,000 and 9,000 kg/cow/year (Mcdonald *et al.,* 2002). However, Last year, during our field visit to Solvalla Östanå farm which is 46 km north of Uppsala, we observed that the farm is organic and environmentally certified and the average milk yield is 11,000 kg/ cow/year. This showed that the yield of organic farming is highly depends on proper management practice.

Conclusion

Over all, organic farming is better way of creating sustainable environment and producing healthy food. Accordingly, Hånsta farm achieved remarkable results on biodiversity and reduction of energy consumption as well as green house gas, but still shows minus sign due to its emission of C_2O, CH4 and N_2O to the environment. Hence, further research is needed to further reduce the emission, to confirm the uncertainties related to N_2O emission, C sequestration, appropriate waste recycling and use of renewable energy source like biomass energy to replace fossil fuel.

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