



Cattle fattening systems and environmental regulations in Turkey

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ABSTRACT

The livestock sector is an important part of the agricultural sector in Turkey. Animal production consists of approximately 24% of agricultural production. Cattle fattening and husbandry in Turkey has in the past caused environmental problems, with increasing population being against fattened cattle products. In particular the development of intensive farming at industrialized scale has led to water and air pollution.

In Turkey, the total number of agricultural enterprises is not known exactly, but is estimated to be around 30000, of which 90 % are small-farm holdings. In most of these, closed fattening systems are used. The waste in fattening operations is high, e.g. cattle manure and waste of raw materials used in livestock feed, among others. Atmospheric concentrations of NH_3 increased by 50% in the last 30-40 years and it has been determined that cattle fattening manure contributed 81% of this, compared to 2% from other industries. In relation to these effects, there are several direct and legal implications and regulations. This study examined the relationship between the environment and impacts of animal husbandry related to these activities, and the status of current legal regulations.

Key words: Cattle fattening, legal regulations, environment, waste

INTRODUCTION

As population growth and prosperity in Turkey increases, the demand for cattle products has increased. Efforts to meet this demand should also consider environmental protection as a matter of priority to ensure sustainable production.

The livestock sector is an important component of the agricultural sector, contributing approximately 24%. Livestock provide milk, leather, and meat among other products needed as industrial raw material. Animal husbandry needs to be linked to resources management to avoid destruction of the environment. Cattle fattening and husbandry in Turkey has in the past caused environmental problems, with increasing population being against

fattened cattle products. In particular, the development of intensive farming at industrialized scale has led to water and air pollution.

Open cattle fattening enterprises in Turkey: In Turkey, open (extensive) cattle fattening is generally well understood and widely applied due to its low fixed investment and labor costs. Generally the most suitable for fattening are male calves and bullocks. With fattening in the open, one cycle lasts for duration of 4-10 months (Yüceliyiğit *et al*, 1993).

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Although, cattle fattening in the open (extensive) is easier than in closed (intensive) systems, and recommended by several organizations (e.g. Agricultural Bank, the Ministry of Agriculture and Rural Affairs, Turkey Development Foundation, the American Feed Grains Council) it is not sufficiently developed in Turkey (Gündoğmuş *et al.*, 1998). Farms are mostly small-scale enterprises. In Turkey, there are few intensive cattle fattening farms and they have low capacity; the maximum operating capacity of 1000 animals was established by Turkey Development Foundation in Ankara / Çubuk.

To supply the needs of the growing population in Turkey, red meat production in intensive cattle fattening systems have developed in the city environment. However, these have negative environmental effects that should not be ignored. Intensive farming has an impact due to soil, water and air pollution.

In fattening in the open, animals walk around freely in a fenced area. Drinkers, maneuvering space and drainage locations are also available in the fattening shelters, in addition to tanks, silos and offices. The waste in extensive fattening systems consists of cattle manure and waste of raw materials used in livestock feed, among others

Animal manure waste: Liquid manure and solid wastes result from fattening animals. When liquid manure comes into contact with the air, NH_3 can pass into the air. According to a survey result, atmospheric concentrations of NH_3 increased by 50% in the last 30-40 years and it has been determined that animal manure contributed 81% of this (Topbaş *et al.*, 1998). Ammonia gas is irritating to eyes and the respiratory tract, while liquid ammonia coming into direct contact with skin causes chemical burns; aqueous ammonia also has a negative effect on the endocrine glands. High concentrations of ammonia can have toxic effects on plants and soil organisms. In research on plants, adverse effects have been found to occur on wheat, cabbage, sunflower and tomato leaves after exposure to 40 ppm ammonia gas for 1 hour (Topbaş *et al.*, 1998). On the other hand, liquid ammonia (urea) can flow and leak into the soil, where it can mix and pollute with groundwater (www.fao.org).

Cattle manure contains 5 kg / UV (Unit value) of dry matter, 15000 mg / l average BSB₅, 0.21 kg / UV N, 0.04 kg / UV, P (Gilding & President, 1990). Phosphorus does not cause pollution of the environment. However, nitrogen is rapidly oxidized to ammonia and ammonium nitrate, and moved into ground water. Surface waters

have high concentrations of ammonium, which indicates several problems. Ammonium concentrations in surface waters are required to be between 0.2 – 1.5 mg / l. If nitrate concentrations exceed 4.5 mg / l in drinking water, health problems emerge. To minimize contact with air and leakage into water, manure should be stored in well closed structures. In the shelter, animal get dirty with manure, and bacteria and smell spread more easily (Alagöz *et al.*, 1996).

In Colombia, regulations require that manure storage must be at least 15 and 30 m away from the public water sources and storage should not exceed nine months. Place where manure is used must be at least 30 m away from water resources (Topbaş *et al.*, 1998).

Barnyard manure benefits the soil with both organic matter and the wide scope of microorganisms. Barnyard manure regulates the structure of soil; improves soil water holding capacity, color, and warmth; and on the other hand, it prevents wind and water erosion. To be useful manure should have a stable C / N (carbon / nitrogen) ratio of 60 / 1 for fresh cattle manure (Aydeniz & Brohi, 1991). Given as fresh manure to the soil, it is not useful to the plants. Cattle give an average of 20-30 kg manure per day (Aydeniz & Brohi, 1991). Based on the calculated average over 25 kg, cattle manure production in Turkey is estimated at 109 million tons. About 58% of manure produced in Turkey is burnt and 10% is applied to soil. Compared to coal and wood, the heating value of manure is lower than coal but close to wood. Turd is made from animal manure, and when burning its smell is hardly unpleasant. Especially for the eastern region of Turkey, turd is an important source of energy. Approximately 20% of Turkish energy production constitutes of turd (Topbaş *et al.*, 1998) and is especially important in the rural areas, in the absence of another alternative.

For fattening in areas without vegetable production, manure disposal has been a problem. There is no value of manure in most parts of Turkey and therefore, it is difficult to sell manure. Further, for land owners, carrying manure to the land is expensive. In most fattening enterprises, the manure is generally dumped on the free space. From here, the water leaks into underground water and groundwater is contaminated, dirty water flows to the surface and disrupt the quality of surface water resources, it also affects the air quality.

Biogas is an energy source that is superior to many well-known sources of energy. Biogas is primarily manure and plant wastes that are subjected to airless conditions of fermentation. It comprises of 50-60%



methane; 30-40% carbon dioxide and a small amount of H₂, N₂, H₂S gas that is colorless and odorless g. After obtaining biogas from manure, the nitrogen and phosphorus in the remaining residues constitute rich manure (Deniz, 1987; Aydeniz & Brohi, 1991).

Waste of raw materials used in livestock production: Intensive cattle fattening systems require intensive labor and feed input. In Turkey, almost all feed are from crop production. Forage crops grown in fields sown area is around 5% (Fidan & Kiral, 1994). In countries with advanced cattle fattening systems, the rate is closer to 25%. Fodder crop production without excessive fertilization and pest control, is beneficial to agricultural soil and soil fertility. Fodder crop rotation can increase productivity and protect agricultural land from degradation.

There are 456 feed processing factories in Turkey, but most lack laboratories, equipment and other facilities (Anonymous, 1993). Concerns related to animal and human health can lead to discarding of feed raw materials, e.g. corn with excessive moisture; materials of animal origin such as feed meal, bone meal that contain too much oil; poorly stored fodder and feed leading to spoilage. To ensure suitable raw materials, fodder crop production should avoid excessive soil fertilization and spraying. To minimize wastage the content of feed material and the different preservation methods should be observed (Düzgüneş *et al.*, 1983).

Other waste: In Turkey, the most common animal disease is foot and mouth, rinderpest, rabies, tuberculosis and glanders. Veterinary medicine used to treat these diseases and animal carcasses may pollute the environment (Anonymous, 1996). Measures should therefore be taken to ensure veterinary medicines and dead animals do not harm the environment.

Environmental regulations: Village Law; dates since April 7, 1340 and numbered 68, applies in rural areas to regulate animal related pollution. Article 13 governs fountains and wells and placement of garbage and manure away from roads and pathways. Law 23 regulates handling of diseased animals, and requires

government officials to be informed and the diseased animals to be kept separate from healthy ones.

Other laws regulating animal husbandry include Municipal Law, Law on Public Hygiene and Environment Act. No. 1471. These laws give guidance and regulations on protection of streams, rivers fountains; slaughterhouse operations, elimination of dead animals within the municipal boundaries. , appropriate use and protection of water, soil and air; and quarantine,

International contracts: One of the key agreements is dated February 18, 1987 and the Council of Ministers decision No. 87/11520 dated March 18, 1987 in the Official Gazette No. 19404. This agreement provides for the protection of land from waste; preservation of the ozone layer and methane gas reduction from animal into the atmosphere due to cattle fattening. Other international contracts related to protection of the Ozone Layer are the Vienna convention and the Montreal Protocol.

Regulation No 6 / 3346 arising from cabinet decision of August 6, 1964 relates to Agricultural Quarantine Regulation of animal disease. Other regulations give general principles relating to environmental protection as listed in table 1:

Manure composting facilities must comply with the following principles : a) Method that works with ventilated manure compost and plant waste, air filter or similar measures to be implemented for cleaning air; b) Anthrax control measures; c) Install other appropriate facilities for loading and unloading.

According to instruction No. 1593 in Articles 268-275 of the Law on Public Hygiene of Health and Welfare Ministry, all institutions and organizations authorized by law to operate these facilities are required to obtain emission permits. For permission, stables and chicken farms within the boundaries of Municipalities should adhere to the following:

- a) 7000 chicken maximum capacity
- b) 14000 slaughtered chicken capacity.
- c) 700 cattle and 2000 small ruminant animals



Table 3: Various air pollutants that must be monitored for long and short-run limit values (mg/m³) (Anonymous 1999).

Pollutant Type	Formula	Short-Term Limit	Long-Term Limit
Sulfur Dioxide (general)	SO ₂	150	400
Sulfur Dioxide (Industrial)	SO ₂	250	400
Sulfur trioxide (general)	SO ₃	150	400
Sulfur trioxide (Industrial)	SO ₃	250	400
Carbon monoxide	CO	10000	30000
Nitrogen Dioxide	NO ₂	100	300
Nitrogen Monoxide	NO	200	600
Chlorine	Cl ₂	100	300
Chlorine Hydrogen	HCl	100	300
Hydrogen fluoride	HF	-	10
Ozone and photochemical Oxide	O ₃	-	240
Hydrocarbons	HC	-	140
Hydrogen sulfide	H ₂ S	-	40
Particles (general)	-	150	300
Particles (industrial)	-	200	400
in the Particles Pb	Pb	2	-
in the Particles Cd	Cd	0,04	-
Collapsing dust (general)	-	350	650
Collapsing dust (industrial)	-	450	800
In the collapsing dust Pb	Pb	500	-
In the collapsing dust Cd	Cd	7,5	-
Thallium in the collapsing dust	Tl	10	-

Noise regulation: The regulation dated December 11, 1986 protects the physical and mental health of people, and peace that the noise will disrupt. Specific periods are described and noise limits to avoid causing discomfort to the animal and people in designated living areas.

Water Pollution Control: The regulations date September 4, 1988 and published in the Official Gazette No. 19919 and aim to protect the country's underground and the potential surface ground water resources. Public drinking water supplies should be at least 50 m from where any structure in which solid and liquid waste drains pass. To comply with this requirement, around 50 m of water source is bordered with barbed wire.

Solid Waste Control : The regulations date March 14, 1991 and published in the Official Gazette No. 20814thaim to regulate entry of different types of wastes into the environment, either directly or indirectly; taking into consideration air, water and soil health, natural wealth and ecological balance,. Instruction 25

provides guidance on storage facilities to prevent polluting underground water.

The quality criteria of compost used in agriculture

- Compost should be hygienic aspect, health of humans and all should not be threatened,
- C / N ratio larger than 35
- To be used for soil improvement the dry matter content of compost or organic matter should be at least 35%,
- If it is to be marketed the water content of the compost should not exceed 50%.
- Produced compost should be classification according to the grain size,
- In marketed compost; glass, metal, plastic, leather should not exceed 2% by weight.

Limits of heavy metal content in compost:

- The heavy metal content of the produced compost to be assessed at least at quarterly intervals, and to check for lead, cadmium, chromium, copper, nickel, mercury and zinc

b) If land on which compost is to be used is greater than one hectare, soil pH value the heavy metal content of soil should not exceed lead 100 mg / kg, cadmium 3 mg / kg, chromium 100 mg / kg, copper 100 mg / kg, nickel 50 mg / kg, mercury, 2 mg / kg and 300 mg of zinc / kg.

e) If compost is repeatedly used in the land, the heavy metals should not exceed lead 2000 gr / ha / year, cadmium 33 gr / ha / year, chrome 2000 gr / ha / year,

Copper 2000 gr / ha / year, nickel 330 gr / ha / year, mercury 42 gr / ha / year, zinc 5000 gr / ha / year.

Hazardous Waste Control: The regulations date August 27, 1995 and published in the Official Gazette No. 22387th. According to the instruction, livestock waste is included in the list of hazardous waste and its storage and handling is regulated.

ENVIRONMENTAL IMPACT ASSESSMENT:

Instruction in the Official Gazette dated June 23, 1997 and No. 23028 regulate planning of enterprises and determine the potential environmental impact through assessment. These include in part animal production enterprises.

In Turkey, in intensive cattle fattening enterprises and products processing industry, the emerging major environmental issues can be summarized as follows;

- Cattle manure is not stored in the appropriate manner.

SUGGESTED SOLUTIONS

- More frequent inspections and auditing to ensure compliance with regulatory requirements.
- Manure to be produced and managed without harming the environment, e.g biogas, fertilization of agricultural land to be based on the results of soil analysis.
- In Turkey, a large amount of manure is used as turd, which damages the environment. Suggested to produce biogas from manure instead of turd, as biogas is more environmental friendly.

- Cattle manure application to soil, not based on soil analysis.
- Making of animal-feed without complying with environmental regulations.
- A large amount of cattle manure used in fuel.
- Processing industry of cattle products polluting water, soil, air and noise generation.
- Location of industry in an inappropriate location/area.
- Legally complex and poorly coordination and controlled regulatory framework.

- Forage production should be done without damaging the environment and storage should be improved.
- Control of business licensing to ensure all enterprises have the necessary facilities and capacity to minimize risk of environment pollution. Removal of industries located within public settlements.
- Consolidate the number of laws regulating environment management and improve coordination of implementation of existing laws.

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