Investigation of Different Combination of Structural Materials and Cost in Broiler House in Kahramanmaras

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Abstract

In this study, a natural ventilated broiler house with 10.000 capacity and which was suitable in terms of techniques and breeding for broilers was planned and its cost was investigated by changing the structural combinations.

By considering the selected breeding techniques and capacity of broiler house, eighteen different types of broiler houses were developed changing the structural elements, construction materials, and their compositions. Economic analysis showed that the type-17 broiler house could be built with a lowest investment costs (35.45 billion TL). Roof cost was 60 percent of total broiler house cost. The costs of covering and isolation material, and wooden truss were about 12-13% 10-11 % and 77-81% of total roof cost, respectively. Use of steal material instead of wood in truss construction decreased the cost up to 33%.

Key Words: Broiler house, structural elements and materials, materials combination, economic analysis

Kahramanmaraş'ta Broyler Kümeslerinde Farklı Malzeme Kombinasyonları ve Yapı Maliyetinin İncelenmesi

Özet

Bu çalışmada, teknik ve yetiştiricilik yönünden kasaplık piliçlerin istemlerini karşılayabilecek, doğal havalandırmalı, 10.000 kapasiteli bir barınak planlanmış ve söz konusu barınağın malzeme kombinasyonları değiştirilerek yapı maliyetleri incelenmiştir.

Seçilen yetiştirme tekniği ve barınak kapasitesi göz önüne alınarak barınağı oluşturan yapı elemanlarının malzemeleri ve kombinasyonları değiştirilerek 18 farklı alternatif barınak tipi geliştirilmiştir. Yapılan analiz sonucunda Tip-17 alternatif barınağının en düşük yatırımla (35.45 milyar) inşa edilebileceği belirlenmiştir. Barınaklarda çatı maliyeti toplam barınak maliyetinin %60'ını oluşturmaktadır. Çatı maliyetinin %12-13'ünü örtü malzemesi, %10-11'ini yalıtım malzemesi, %77-81'ini ahşap kafes kiriş giderlerinden oluşmaktadır. Çatı maliyetinin büyük bir kısmını oluşturan kafes kiriş yapımında ahşap yerine çelik profil kullanımı, %33 oranında maliyeti düşürmektedir.

Anahtar Kelimeler: Kasaplık piliç barınağı, yapı elemanları ve malzemesi, malzeme kombinasyonları, ekonomik analiz

Introduction

Broiler houses are an important structural investment for animal production and income at agricultural enterprises. To be able to get a high quality and quantity animal production, the broiler house should be planned and built providing optimal environment for broilers. Rehabilitation of broiler house is very expensive and difficult after it was built. That is why, principles of planning for animal housing should be taken into consideration at the planning stage and then the most suitable broiler house should be tried to construct in the frame of the aim.

When the built broiler houses are examined in our country, it is possible to see that there are many project mistakes on the broiler houses and they are not constructed in any planning criteria. Most of the mistakes are related to designing and selection of structural materials and elements. Structural elements have significant effects on cost and usefulness of the animal housing. So, technical features of structural elements should be known.

In this study, development of a broiler house with 10.000 capacity, litter rearing system and natural ventilation was aimed by taking into consideration general planning principle related to the structural elements, climatic data and environmental requirements of broilers, in Kahramanmaras region. An 18 different broiler houses' combinations were developed by assuming a constant inside volume and floor for the broiler house. To do so, different structural elements and materials were tested.

Material and Method

The research was carried out at three stages such as pre-survey, fieldwork and preparation of appropriate sample plans for the province of Kahramanmaras. Because there was not enough knowledge about enterprises in Kahramanmaras Province, the number of the enterprises was found out collecting pre-information from technical staff working for Agriculture Province Directorate, Minister of Agriculture and Rural Works. A survey form was prepared in order to gather systematic and adequate data. The survey form was divided into two parts. In the first part, physical aspects of the enterprise such as level of capacity use, topography and size of land, position, infrastructure etc. were recorded. In the second part, drainage property of broiler house, size and type of wall, foundation, floor, roof and isolation, and materials used in building and its properties, and location, size and feature of facilities including information on ventilation and lighting systems in enterprise were also recorded.

Long term (1980-1997) monthly average temperature, relative humidity, minimum and maximum temperature data were obtained from Kahramanmaras metrological station (Table 1).

Some wind characteristics measured in the summer and winter months were presented in Table 2 and 3. Speed of wind and total winding number in the direction of north-northwest and west-northwest, north-west, north, west, north-northeast are more than other directions. More efficient natural ventilation during the summer months will be provided if these criteria are taken into consideration.

An example of broiler house with 10000 capacity and natural ventilation was planned under Kahramanmaras climatic conditions. In this plan, design criteria were taken from literature to give dimensions to the broiler house and structural elements.

An area of 0.075 m^2 per broiler was considered (Lindley and Whitaker, 1996). By accepting a wideness of 10 m net span (Ernst, 1995), the length of broiler house was calculated as 81.4 m. The followings were also assumed a minimum inside air volume per broiler was 0.29 m^3, house's height was 2.75 m, and total windows area was 15 percent of the floor area; and gable roof angle was 23°. Considering the suggestions of Tekinel et al. (1988), asbestos cement was used as covering material and wool glass as isolation material. A 40x20x20 cm dimension of briquette was used for walls.

Table 1. Climatic data of Kahramanmaras Province in the years of 1980-1997

Months	Monthly mean temp (^oC)	Monthly mean relative humidity (%)	Monthly min. ave. temp. (^oC)	Monthly min. ave. temp. (^oC)
January	4.8	69.3	1.7	9.1
February	5.8	65.6	1.8	10.5
March	9.9	61.3	5.1	15.0
April	15.2	58.4	9.7	20.8
May	20.0	55.0	13.7	26.2
June	24.7	50.4	18.5	31.2
July	27.9	51.9	21.9	34.8
August	28.1	52.3	22.0	35.2
September	25.1	49.8	18.3	32.2
October	18.6	56.0	12.7	25.3
November	10.8	67.0	6.5	16.3
December	6.5	72.9	3.2	10.7

Table 2. Winding directions, total winding number, mean wind speed during the summer months in Kahramanmaras Province in the yeas of 1929-1990

Direction of winding	Total winding number in the month				Mean wind speed (m/s)			
	V	VII	VIII	IX	VI	VII	VIII	IX
West; Northwest	539	453	460	390	4.5	5.4	5.1	4.4
North; Northwest	395	432	372	288	5.8	6.7	6.2	4.9
Northwest	200	176	160	136	4.6	5.7	5.1	3.8
West	178	244	231	157	3.8	4.7	4.7	2.9
North	166	187	263	193	5.9	7.0	5.9	4.8
North; Northeast	103	88	83	89	4.9	4.8	4.9	3.8
Northeast	70	66	75	86	5.7	7.4	4.6	2.9

Considered Broiler House Plan and Used Material

An example: A plan of broiler house and materials used in the construction. Foundation wall depth and width in the developed broiler houses were 80 cm and 50 cm, respectively. The foundation wall was constructed on 10 cm concrete thickness of with 300-doze cement. In order to spread weight on foundation uniformly,

reinforced concrete beams were suggested that its width was equal to width of foundation wall and height was 30 cm. They consisted of four vertical steel robs (ϕ14 mm) and horizontal steel (ϕ 6 mm) in every 16 cm.

Table 3. Winding directions, total winding number, mean wind speed during the winter months in Kahramanmaras Province in the yeas of 1929-1990

Direction of winding	Total winding number in the month				Mean wind speed (m/s)			
	X	I	II	III	XII	I	II	III
South	205	218	159	184	0.9	1.3	1.2	1.6
West	204	199	158	135	1.1	1.2	1.4	1.8
East	161	142	155	174	1.7	2.1	1.6	1.9
North	154	155	164	173	1.9	2.2	2.5	2.9
West; Northeast	120	133	110	216	1.8	1.8	1.9	2.8
East; Southeast	100	104	112	110	1.9	2.2	2.0	2.2
Southeast	100	90	92	101	2.0	2.2	2.7	2.3

In order to provide adequate cleaning and drainage conditions, floor coverage was consisted of a 15 cm hard core at bottom, a 10 cm concrete in the middle and 2.5 cm concrete skim at the top.

Height of the wall was 2,75 m and 20 cm briquettes were used. There was a 2 cm plaster with 350 doze on both side of the wall and whitewash was made only interior side of the wall. It was also suggested to built lintel above the doors and windows as equal to wall width and its height was 20 cm but height of the lintel on top of the wall was 30 cm. In the lintel construction, four vertical (ϕ12 mm) and horizontal steel robs (ϕ6 mm) in every 14 cm were considered. Steel robs used for making lintel and beam were IIb St1. Reinforced concrete columns were suggested to carry loads coming from roof. A four (ϕ14 mm) vertical steel robs, and a 6 mm ϕ horizontal steel robs in every 16 cm in columns were planned, assuming 25x25 cm cross section area (Anonim, 1985; Ulug and Odabası, 1990). In the suggested broiler house, both 19x19x13.5 cm and 40x20x20 cm briquettes were used as wall materials.

Window area of broiler house in Kahramanmaras was 10-15 percent of floor area. Size of the windows varied from 2.00x0.75 m to 2.25x1.00 m. Height of windows from ground was 1.00 m and windows were placed on north and south sides of the broiler house. Window frames were made from wooden and covering material was 3 mm glass.

Interior doors of the broiler house had single wing. Height and width of them were 2.00 m and 1.10 m, respectively. The dimensions of outside doors were planned as 2.0x3.0 m. Double wings and inward opening type was selected for out side doors.

Howe type-wooden truss was selected and distance between them was 3 m. A 4 mm asbestos as a roof covering material and 6 cm wool glass as isolation material and a 50 cm eaves were accepted in the design of roof. For alternative broiler house, 3 cm tile and 0.5 mm galvanised sheet for roof covering material and wool glass as

well as double layer polystyrene foam in 2.5 cm thickness for isolation material were chosen. Heat-humidity balance was also calculated.

The loads might be due to covering material; aluminium foil pasted corrugated cardboard, isolation material, rafter, beam, individuals, wind and snow. Assuming that truss would carry 8 kg per square metres of feed tank and water tanks, and a second-class pine timber structural analysis and design were made. As a result, Size of the top cord and purlins of the truss were 15x7 cm, 10x14 cm. respectively. Both cross section size of AM and HG were 9x10 cm. ML, IH, LK and KI were calculated 9x9 cm, and other member of truss were 9x7 cm according to connection principle of wooden material of cage truss struts (Figure 1).

If it is made from steel instead of wooden, ⌝⌜50.50.8 angle iron struts are selected for AM, ML, LK, KI, IH, HG and ⌝⌜50.50.5 angle iron for all other trusts and I_{80} profiles for struts were used.

In the project, it was approved that the transom adjustable windows which could be opened from upper and lower side would be used. It was also assumed that entrance of air was from windows and outlet of air was from roof. A 0.80x0.80 m size of outlet, 0.50 m height of outlet from roof and 0.30 m height of hat were accepted.

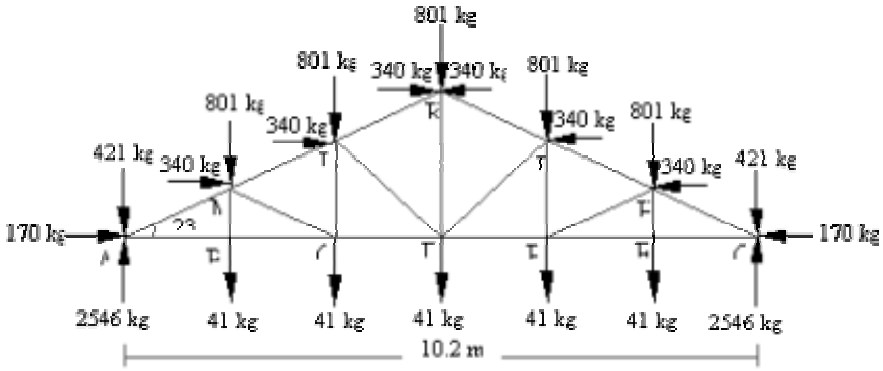

Figure 1. The burden to the truss of the planned broiler house.

Alternative broiler house plans were developed by changing the structural elements (roof covering materials, roof angle, height of wall, and window area). However, the capacity and floor area of planned broiler house were not changed in the alternative project.

Eighteen broiler house types were developed by changing briquette as perforated brick in walls; wooden truss as steel materials of truss; angle of roof as19□, 20□ and 23□; covering material as asbestos cement profiled sheet, tile and galvanised profiled sheet; 6 cm wool glass as polystyrene foam with 2.5 cm for isolation material, and window area as 10% and 15%.

In the selection of the structural elements, design and project of the broiler house, criteria mentioned by Tekinel at el. 1991 were considered.

Amount of required material for alternative projects was determined according to structural elements and materials. Economic analysis of project was also calculated according to Anonim (1999a).

Results and Discussion

Enterprises growing broiler in Kahramanmaras were investigated and surveyed. As a result of this survey, there were two types of enterprises having 3 broiler houses. Observations and measurements showed that capacity of broilers house varied from 2000 to 5000 birds. Furthermore, list of the some materials used in the surveyed broiler house was given in Table 4. Three broiler houses investigated were constructed according to plan obtained from Agricultural Bank, and the other three ones were constructed without plan and project.

Table 4. The materials used in structural elements of the surveyed broiler house

Broiler house location	Ww	Wall	Plaster		Roof type	Roof material	Covering materials	Frame and covering of windows	Door material
			I	O					
Sır1	Ww	Br	x	x	G	W	GPS	Wg	Dww
Sır2	Ww	Br	x	x	G	W	GPS	Wg	Sww
Sır3	----	Br	x	x	G	W	GPS	Wg	Sww
Esenkent	Ww	Br	x	x	G	W	GPS	Mg	Sww
Bertiz-1	----	Br +B	-	-	G+Lt	W	GPS	Wn	Sww
Bertiz-2	----	Br	x	-	G	W	GPS	Wn	Rm

Ww: Whitewash; x: plustered; -: unplustered; Br: briquette; B: Brick; I:inside; O: Outside; G: Gable; lean to:Lt; Galvanised Profiled Sheet:GPS; Wood-glass:Wg; Metal-glass:Mg; Wood-nylon:Wn; Single and double wing wood:Sww, Dww; Rail-metal:Rm

As a result of this study, the lowest and highest cost of broiler house were for Type-17 and Type-2, respectively (Table 5). Cost of Type-17 broiler house was less about 2.447.256.735 TL compared to Type-2. Cost of the other alternative broiler houses varied between these two broiler houses cost. Furthermore, Type-17 broiler houses cost were close to Type-3 house. Because all structure combination was same except only isolation material, and there was no big differences between the isolation materials cost including labour cost.

As shown in Table 5, if Type-17 was chosen instead of the Type-2, expenses of the broiler house would become 6.45 percent lower. If the floor of the broiler house was covered with concrete, cost would decrease as much as 2.120.179.000 TL in the total cost. It means that rate of reduction would be 5.59%. Consequently, it was determined that investment cost would be 12.04 % lower in the condition that the alternative broiler house with the lowest cost and compacted soil for floor instead of concrete were selected.

Table 5. Developed broiler house using alternative materials and its costs

Used alternative materials in the broiler house						Total cost of the broiler house having 814 m^2 floor area (TL)
Type of house	Roof covering	Roof angle	Isolation	Area of window (%)	Wall materials	
Type-1	Asbestos	23°	Wool glass	15	20 cm Briquette	37.352.206.021
Type -2	Asbestos	23°	Wool glass	15	19 cm Brick	37.906.321.289
Type -3	Asbestos	23°	Wool glass	10	20 cm Briquette	36.416.971.163
Type -4	Asbestos	23°	Wool glass	10	19 cm Brick	37.037.360.890
Type -5	Asbestos	19°	Wool glass	15	20 cm Briquette	37.151.889.749
Type -6	Asbestos	19°	Wool glass	15	19 cm Brick	37.780.380.542
Type -7	Asbestos	19°	Wool glass	10	20 cm Briquette	36.622.684.065
Type -8	Asbestos	19°	Wool glass	10	19 cm Brick	37.317.453.134
Type -9	Asbestos	20°	Wool glass	15	20 cm Briquette	37.217.572.134
Type-10	Asbestos	20°	Wool glass	15	19 cm Brick	37.824.690.371
Type-11	Tile	19°	Wool glass	15	20 cm Briquette	35.989.366.373
Type-12	Tile	19°	Wool glass	15	19 cm Brick	36.617.857.166
Type-13	Tile	19°	Wool glass	10	20 cm Briquette	35.460.160.689
Type-14	Tile	19°	Wool glass	10	19 cm Brick	36.154.929.758
Type-15	Galvanised Sheet	19°	Wool glass	10	20 cm Briquette	36.360.812.109
Type-16	Galvanised Sheet	19°	Wool glass	10	19 cm Brick	37.055.581.178
Type-17	Tile	19°	Polystyrene foam	10	20 cm Briquette	35.459.064.554
Type-18	Tile	19°	Polystyrene foam	10	19 cm Brick	36.153.833.622

Survey result also showed that three-broiler house of six were used hard core instead of concrete as a floor materials. The concrete was used on the floor of only in one broiler house. In rest of the two houses, compacted soil was used as a floor material.

Ratio of costs of wall, roof, windows, foundation and floor of 18 different broiler house types to total cost varied between 5.3 and 8.9%, 58.5 and 63.5%, 5.8 and 9.1%, 3.8 and 4.1%, 5.6 and 6.0%, respectively (Table 6). However, although foundation and floor had the same construction materials in the whole broiler houses, their cost share in the total cost were different because of different cost of structure combination.

As shown in Table 6, the cost of the roof had great amount as much as 58.5-63.5 % of total house cost. The cost of the roof varied depending on covering material, roof angle, and variety of the isolation material and its width. Cost share of truss, isolation, and covering materials and their span, in the cost of roof, varied between 45.7- 48.8 %, 5.0-8.1%, 6.2-6.6 %, respectively.

When cost of roof was examined according to roof angle's alteration but all other features were the same, cost of the type-5 broiler house with 19° had lowest cost.

Cost of the type-9 with 20°and type-1 with 23° were 0.6% and 2.5% higher than cost of the type-5, respectively (Gencoglan, 2000). As angle of the roof increased, cost of roof also increased too.

Result showed that angle of broiler houses' roof was changed between 23.9 and 29.74 . If we compare the angles found in this study with ones recommended by Ones and Olgun (1989), they mere not resemble to each other. Our survey study showed that there was not any economic consideration in constructing of broiler house's truss.

Table 6. Total cost of the structure elements in developed broiler house

Broiler House Types	Foun-dation (%)	Floor (%)	Wall (%)	Total Cost (%)			Roof (%)	Window (%)	Colon+ Lento (%)
				Cage Beam	Isolation	Covering			
Type-1	3.9	5.7	5.3	47.6	6.4	7.9	61.9	8.8	14.4
Type-2	3.8	5.6	6.9	46.9	6.3	7.8	61.0	8.6	14.1
Type-3	4.0	5.8	6.2	48.8	6.6	8.1	63.5	6.0	14.5
Type-4	3.9	5.7	7.8	48.0	6.4	8.0	62.4	5.9	14.3
Type-5	3.9	5.7	6.2	46.5	6.3	8.0	60.8	8.8	14.6
Type-6	3.8	5.6	7.8	45.7	6.1	7.9	59.7	8.7	14.4
Type-7	4.0	5.8	6.9	47.1	6.4	8.1	61.6	5.9	15.8
Type-8	3.9	5.7	8.6	46.3	6.2	8.0	60.5	5.8	15.5
Type-9	3.9	5.7	6.1	46.7	6.3	8.0	61.0	8.8	14.5
Type-10	3.8	5.6	7.6	46.0	6.2	7.8	60.0	8.7	14.3
Type-11	4.0	5.9	6.4	48.0	6.5	5.0	59.5	9.1	15.1
Type-12	4.0	5.8	8.0	47.2	6.4	4.9	58.5	8.9	14.8
Type-13	4.1	6.0	7.1	48.7	6.6	5.1	60.4	6.1	16.3
Type-14	4.0	5.9	8.9	47.8	6.4	5.0	59.2	6.0	16.0
Type-15	4.0	5.8	7.0	47.5	6.4	7.4	61.3	6.0	15.9
Type-16	3.9	5.7	8.7	46.6	6.3	7.3	60.2	5.9	15.6
Type-17	4.1	6.0	7.1	48.7	6.6	5.1	60.4	6.1	16.3
Type-18	4.0	5.9	8.9	47.8	6.4	5.0	59.2	6.0	16.0

If roof angles and isolation materials of broiler houses were the same, only by changing roof covering material, the least cost would be found for Type-13 broiler house with tiles. If galvanised sheet (Type-15) and asbestos were used instead of tile (Type-13) as roof covering material, total cost would be increased 2.5% and 3.2%, respectively. Results also showed that Gutter galvanised sheet would be used as the roof covering materials in Kahramanmaras. It is a common covering materials used by farmers in Kahramanmaras.

Of the total roof cost, the share cost of wooden truss, isolation material and roof covering materials were 77-81%, 10-11% and 8-13%.

When isolation materials of Type-17 and 13, Type-18 and 14 were compared, it was observed that usage of wool glass or Polystyrene foam on roof did not affect the total cost.

The results showed that cost of wooden truss had the largest amount of the roof cost. If the steal truss was made instead of wooden truss, it would be expected that the cost of the roof reduced one-third. In Kahramanmaras, steel truss was used only one broiler house out of six broiler houses constructed. As a result of this, economic cost did not take into consideration.

The costs of developed 18 different broiler houses using various structural elements were between 43.561.504 TL and 46.567.962 TL for per square meter (Table 1), except transport expenses. Anonim (1999b) reported that the broiler house would be built with a cost of 60.546.100 TLm^{-2}, except constructor benefits. However, this study put forward that per square meter of a broiler house would be built with 43.561.504 TL. In other word, a broiler house would be constructed with a cost 25% cheaper. Because producers invest a good deal of money for their broiler house they have financial problems for broiler production. For this reason, it is very important to try to reduce the cost for the broiler house.

Ozturk (1998) carried out a study related to reduction of dairy house roof cost in Konya and found that a cheap dairy house roof was realised by using wood and steel truss with 30° and 45° roof angle, covering material with 2 cm tile, 0.35 cm galvanised sheet, 1.25 cm asbestos, isolation materials with 3 cm wool glass and ruberoit and 5 cm compacted straw. Our results were similar to the results of Ozturk.

Consequently, more convenient construction combination, named Type-17 for Kahramanmaras were developed. This combination included; 19° roof angle, tile as covering materials, Polystyrene foam as isolation material, wood for truss, 10% of floor area for window area and briquette for wall. Besides, if steel truss is used instead of wooden truss, roof and total cost is to be less. For that reason, steel for truss and wool glass (wool glass and polystyrene foam did not significantly change the cost for isolation) was suggested.

Most of the broiler houses surveyed were not planned technical aspect and economical criteria. Before a broiler house was built, present conditions of enterprise and climate of region should be examined. On the condition applying of general planning principles, some modification can be realised inside of the broiler house according to enterprise special condition and desire.

References

Anonim, 1985. Betonarme Yapıların Hesap ve Yapım Kuralları. TS 500. Türk Standartları Enstitüsü Necati Bey Cad. 112, Bakanlıklar-Ankara.

Anonim, 1999a. 1999 Yılı İnşaat ve Tesisat Birim Fiyatları. Bayındırlık ve İskan Bakanlığı. Ankara.

Anonim, 1999b. Mimarlık ve Mühendislik Hizmet Bedellerinin Hesabında Kullanılacak 1999 Yılı Yapı Yaklaşık Birim Maliyetleri Hakkında Tebliğ. Resmi Gazete. 20 Nisan 1999. Sayı: 23672, 48 s.

Ernst, R.A., 1995. Housing for Improved Performance in Hot Climates. Poultry Production in Hot Climates. (Edited by N.J. Daghir). Cab Internatıonal, UK, pp. 72-82.

Gençoğlan, S., 2000. Kahramanmaraş Yöresinde Kasaplık Piliç Barınaklarının Yapısal Yönden Durumlarının İncelenmesi ve Uygun Barınak Tiplerinin Geliştirilmesi. Ç.Ü. Zir. Fak. Tarımsal Yapılar ve Sulama Bölümü (Doktora Tezi) Adana.

Lindley, J.A., Whitaker, J.H., 1996. Agricultural Building and Structures. ASAE, USA.

Öneş, A., Olgun, M., 1989. Tarımsal Yapılarda Planlama ve Projelendirme Kriterleri. Bayındırlık ve İskan Bakanlığı Bülteni, Yıl: 21, Sayı: 104, Ankara, 27-35 s.

Öztürk, M., 1998. Hayvan Barınaklarında Çatı Yapım Giderlerinin Azaltılmasına İlişkin Analizler ve Uygulamalar. Ç.Ü. Zir. Fak. Tarımsal Yapılar ve Sulama Bölümü (Yüksek Lisans Tezi) Adana.

Tekinel, O., Kumova, Y., Alagöz, T., Demir, Y., 1988. Hayvan Barınaklarının Planlanması. Ç.Ü. Zir. Fak. Yardımcı Ders Kitabı. No:10. Adana.

Tekinel, O., Çevik, B., Tekinsoy, M.A., 1991. İnşaat Malzemesi Bilgisi. Ç.Ü. Ziraat Fakültesi Ders Kitabı, No. 103, Adana, 71-90 s.

Uluğ, T.N., Odabaşı, Y., 1990. Betonarme İnşaat Hesapları. 11. Baskı. Beta Yayınları, İstanbul.