Livestock in spate irrigation areas in Yemen

Spate Overview Paper
**Introduction:**

Livestock occupies an important position in the structure of agricultural production, which contributes in the provision of food for a large number of residents of the spate irrigation area and provide job opportunities for a large sector of population in these areas. So, the farmers cultivated their land as livestock fodder in order provide the needs of their animal feed, regardless what is the production of this land from grain or food for individuals. And the nature of livestock change according to the change of geographic and environmental conditions in the areas, so it notes that the goats, sheep, cows, camels, donkeys, poultry prevail in the spate irrigation areas. Although the relatively opportunities for growth and increasing livestock breeding and increasing the livestock productivity. However, the levels of productivity going at a low rate which does not agree with the available data; that is due to the inadequate attention for the productive sector in terms of investments and the establishment of specializing farms for livestock or in terms of the scope and quality of Veterinary services available and provided for the needy in the spate irrigation areas. In addition to excess slaughter of young females, as well as the development plans and small size investment in this area, which reflects the absence of adequate attention, take full benifits of Livestock and work to increase the production of important nutrients such as meat and dairy products, eggs and other production. all these shows the urgent need to provide a finite action policies for this important sector within a strategy studies which is plans can be implemented in sequenced and correlative and has the continuity character in research activity and aimed production at the development of livestock and good tapped to provide the real needs of the individual animal protein and contribute to improving the life of the individual in spate irrigation areas.

a) **Spate irrigation areas where livestock breeding in Yemen:**

**Tihama** is Located in the western part of the Republic of Yemen along the coastline of the Red Sea which is extended from the borders of the Republic in the north to Bab El-Mandeb in the south and from the Red Sea at the west to the mountains in the east, with length exceeding 450 km and width ranging between (30-60) km. The estimated area of Tihama plain is about (20,000) square kilometers, equivalent to about two million hectares.

Tihama plan consists of twenty-six directorates, twenty them trace to Al-Hodiada province, three directorates follow the province of Haja, two directorates located in Taiz governorate, and one directorate is located in Mahaweet province.
Other areas comprising three directorates is located in Abyan province, three directorates follow Lahej province, one directorate in the province of Shabwa and Hadramout, and one directorate is located in Al-Maharah province.

Figure (1) Map of Yemen showing the valleys of the Tihama.

b) Livestock numbers in spate irrigation areas:

Table (1) clarify the total number of livestock in the Tihama is about (2,103,698 head) and in the other spate irrigation areas is about (809,637 head), while the total number of livestock spate irrigation areas is about (2,913,335 head), according to the 2002 agricultural census. The contribution of Tihama region in year 2002 from camel is about (88%) and it characterized with a high proportion of twins.

Sheep numbers in spate irrigation areas:

Table (1) shows the total number of sheep in the Tihama (937 037 head) and in other parts of spate irrigation areas (350 719 head), while the total number of sheep in the spate irrigation areas (1,287,756 head), according the 2002 agricultural census. Tihama region contribution of the sheep this year range with the amount of (12.11%) from the total of the Republic, while the other spate irrigation areas contribution ranged by the amount (4.53%) from the total of the Republic, and contribution of the total spate irrigation areas ranged about (16.64%) of the total Republic.

The progress of the sheep numbers during the period from 1985 to 2012:

Table (6) shows the total number of sheep in the Tihama region which has reached (246,050 head) in the year 1985, either in 2012 it has reached the total number of sheep
(1,110,509 head), with an increase about (351.35%). The contribution of Tihama region in 1985 is about (9.83%) of the total production of the Republic, either in 2012 the Tehama contribution has reached Tehama (11.79%) of total Republic production.

The reason for this increase is due to the availability of livestock fodder in the Tihama region with the availability of irrigation water, as well as the evolution veterinary services and the farmers more attention for sheep as additional source of farmers income.

In other spate irrigation areas there is only traditional municipal goat breed, with multi-colors, body covered with hair, high fertility, the proportion of twins reach up to about (80%). In addition in Wadi Bihan area goats breed called Ataq goats.

**The number of goats in the spate irrigation areas:**

Table (1) shows the total number of goats in Tihama is about (688,460 head), while in the other spate irrigation areas is about (392,162 head), the total number of goats in spate irrigation areas in Yemen is about (1,080,622 head), according to 2002 of the agricultural census.

Tihama region contribution of goats in a year ranged by the amount (9.02%) of the total production of the Republic, while the contribution of the other spate irrigation areas ranged by the amount (5.14%) of the total production of the Republic. The contribution of the total spate irrigation areas such as Al- Serdodi, Al-Maori and Al-Sharaqi. This goat breeds located area Tehama spread primarily in Tihama plain and characterized by large size as comparison with traditional goat, the head size large, and the body covered with short hair. Also, the white color is characteristic of goat breeds in this region, there may be some of the goats, black or brown and its production of rare twins.

**2) Goats:**

The goats breeding in Yemen, one of the most common farm animals, this there are a number of goats breeds that characterizes every region of Yemen. Where it found many goat breeds in spate irrigation areas, in the Tihama plain there are several goat breed

![Photos (1,2,3) sheep breeding in Tehama.](image-url)
is ranged by the amount (14.17%) of the total production of the Republic.

**The progress of goat's number in spate irrigation areas from 1985 to 2012:**

Table (2) shows the total number of goats in the Tihama has reached (220,180 head) in 1985, either in 2012 the number of goats has reached to a total (576,394 head), with an increase by (261.78%), and the contribution of the Tihama in 1985 ranged about (13.52%) of the total Republic production, while in 2012 the Tihama percentage contribution has reached (6.29%) of the total Republic production.

This decline in the contribution percentage is due to lack of pasture and fodder and the weakness of veterinary services, as well as some young shepherds migration to the cities or out of the country to search about work.

Photos (4,5) shows Al-Mowri goats breeds

Photos (6,7) shows Al-serdudi goats breeds

Photos (8, 9, 10) tradition (Baladi) goats breeds (Yemeni).

**3) Cows:**

There are two cows breeds in the spate irrigation areas strains in Yemen, which is characterized the Yemeni environmental. These cows breeds are Yemeni Zibo which has a high hump and the second one is a costal Yemeni cows. Zibo cows originally from India have a high hump, which distinguishes it from other Europe cows, and it has a small size and short horns. These
cows have a single color - graded between white and gray and dark brown, and its production varies from one area to another as it produce between 2-3 liters per day at an average annual production rate of 585 liters , and adult cow weighing about 228 kg and an adult male weighing about 320 kg.

While costal cows have a large size and medium horns, and its colors are different, and produced high compared to the Zibo and spread in the wadi Mwar and some other areas in the Tihama plain. Also, in some areas of spate irrigation the hybrid cows between Zibo and Friesian and Jersey is found , as in the case of Tehama plain and Delta Tuban.

Table (1) shows the contribution and total livestock in different spate irrigation areas

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of Cows</th>
<th>Contribution to Total Production (% of Republic)</th>
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<tbody>
<tr>
<td>Tihama</td>
<td>339,021</td>
<td>24.14%</td>
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<tr>
<td>Other Regions</td>
<td>36,6593</td>
<td>1.96%</td>
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<tr>
<td>Total</td>
<td>366,593</td>
<td>26.11%</td>
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Source: Agricultural census in 2002

The number of cows in the spate irrigation areas:

Table shows (1) that the total number of cows in the Tihama (339,021 head), and in the rest of the spate irrigation areas is (275,72 head), while the total number of cows in all spate irrigation areas (366,593 head), according to the agricultural census of 2002.

The contribution of Tihama region of cows is ranged by the amount (24.14%) of the total of the Republic production, while the rest spate irrigation areas contribution is ranged by the amount (1.96%) of the total Republic production. The total contribution rate of spate irrigation areas is ranged by the amount (26.11%) of the total production of the Republic.
The Cows number progress during the period from 1985 to 2012:

Table (2) shows that the total number of cows in the Tihama region has reached about (154,207 head) in 1985, while in 2012 the total number of cows have reached (331,919 head), in terms of increased numbers rose by (115.24%).

The contribution of Tihama region in 1985 by the amount (15.66%) of the total production of the Republic, either in 2012 the total contribution Tehama region has reached the proportion (19.71%) of Republic.

4) Camels

There are many Camels veins in the spate irrigation areas in Yemen, that belong to the camels that originated from the Arabian Peninsula, and has not been familial identified, and has not known its breeds.

Numbers of Camels in spate irrigation areas:

Table (1) shows the total number of camels in the Tihama region about (15006 head), and in the rest of the spate irrigation areas about (13798head), while the total number of camels spate irrigation areas (28804 head), according to the Census of Agriculture in 2002.

The contribution of Tihama region of camels is ranged by the amount (4.33%) of the total production of the Republic, while the contribution of the rest of the spate irrigation
areas is ranged by the amount (3.98%) of the total production of the Republic. The total contribution rates of spate irrigation areas ranged by the amount (8.32%) of the total production of the Republic of Yemen.

**The Camels number progress during the period from 1985 to 2012:**

Table (6) shows the total number of camels in the Tihama region has reached (14440 head) in 1985; while in 2012 has reached the total number of camels (13516 head), the contribution of Tihama region in 1985 ranged by the amount (24.23%) of the total production of the Republic, while it decrease in 2012 by (6.4%). The proportion of the total contribution of Tehama region in the production of the Republic is (3.05%).

![Camels in spate irrigation areas in Yemen.](image)

**5) Donkeys**

In the spate irrigation areas there are several veins of donkeys in some areas which is called Al-Soreky donkeys and Al-Sbany donkeys but even to this day there is no genetic characterization to identify the breeds of donkeys in Yemen as well as in the spate irrigation areas.

**Numbers of donkeys in spate irrigation areas:**

![Donkeys in spate irrigation areas in Yemen.](image)

**6) Livestock**

Table (1) shows the total number of donkeys in the Tihama region (124 174 head), and in the rest areas of the spate irrigation (25386 head) while the total number of donkeys areas spate irrigation (149,560 head), according to 2002 agricultural census.

The contribution the Tihama region of donkeys ranged by the amount (17.57%) of the total production of the Republic, while the rest areas of spate irrigation contribution ranged by the amount (3.59%) of the total production of the Republic, and the total contribution rate of spate irrigation areas ranged by the amount (21.16%) of the total production of the Republic.
the total number of livestock spate irrigation areas is about irrigation areas (1,077,493 head), according to the Census of Agriculture in 2002.

The contribution of Tihama region is about 11.80% from the production of the republic, while the contribution of the rest of the spate irrigation areas ranged by the amount (4.54%) of the total Republic production, and the contribution of the of the total spate irrigation areas is ranged by the amount (16.34%) of the total Republic production.

7) Poultry (chicken)

Numbers of poultry in spate irrigation areas:

Table (1) shows that the total number of poultry in the Tihama (910 187 head), and in the rest of the spate irrigation other (167 306 head), while the total number of camels in spate irrigation areas was (1077493 head) according to the Census of Agriculture in 2002.

The contribution of Tihama region from Poultry (chicken) for year 2002 is about 9.34% from total republic production, while the contribution of rest spate irrigation areas is about 1.72% from total republic production, and the total spate irrigation contribution is about 11.06% from total republic production.

d) Usage (practices) livestock in spate irrigation areas:

The livestock is an integral part of the livelihood strategies of most families in the spate irrigation areas, and this livestock is used in the following:

1) Food production:

Cattle, goats, sheep, camels and chickens were breed as a source of food, such as milk and milk products, eggs, meat, wool, and leather. The livestock is considered as the main source for these products and is mainly used for domestic consumption, but it also sold to collect money.

There are some practices carried out by families in the irrigation spate areas, who product milk, where it is used for the manufacture of cheese municipality, which uses part of it for self-consumption and the rest is sold in local markets, as well as extracted from fat (ghee), which is used by families in those areas for cooking. And the milk can be used in viverrine production for self uses. Sometimes the municipal cheese and ghee is sold in some local markets to give money as additional income for the farmers to improve their livelihood.

Despite the prevalence of certain modern dairy farming and some fattening farms in the last decade of this century, but the small-scale producer in the villages are responsible for the majority of livestock except poultry sector which is dominated by mostly private companies and mixed. producer in the villages are responsible for the majority of livestock except poultry sector which is dominated by mostly private companies and mixed.
2) Tilling the soil (the plowing):

Using the bulls as well as donkeys, camels less than bulls in the preparation of fields for growing crops and rebuild facilities manufacturing system of traditional irrigation and cleaning of irrigation canals, the establishment and maintenance and furrows field and maintenance of dams.

Photos (26 to29): Show the uses of bulls in the preparation of the fields for the cultivation of crops and rebuilding Channels traditional irrigation system.

3) Biogas (energy production):

Cows and calves, goats, sheep, donkeys and beauty (camels) provide organic waste used by farm families as fuel so that it works dung as cakes shapes, and also dung poultry glaucoma can be used to produce biogas for several purposes, including cooking, lighting and other household uses. Also the dung can be used in construction after mixing it with mud and straw.
Table (2) clarify the Tihama region contribution and other spate areas from number of livestock during years 2000 to 2012, according to the Census of Agriculture book for 2000 to 2012.

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source: the Census of Agriculture book for 2000 to 2012
4) Transportation and transport:

Beauty (camels) and donkeys are used to transport agricultural products and crops, drinking water for families' in spate irrigation areas in Yemen and the pictures below clarify these.

Photos (30 to 35) show Beauty (camels) and donkeys used in transport the agricultural crops and drinking water for families in spate irrigation areas in Yemen.

e) Savings:

The income level in spate irrigation areas is usually low. The income per capita in Shabwa province is about (412 U.S/year) dollars in 2000. In wadi Tuban about (28 %) of the population, and in Wadi Zabid about (35%) of the population live and their incomes under the poverty line of (203 U.S. dollars per year), but these figures are average values, and reflect the income levels of families where the income levels folliculated by the size of holdings land or area cultivated by the family, in the spate irrigation areas in Yemen.

In spate irrigation areas there is a limited number of major land owners and own large areas of land and sometimes enjoy the sites featured in the upper parts of the spate irrigation systems which has access to the first flood water. In addition to that, there are destitute families who do not have land and work as day laborers. So, in Wadi Zabid there is about (55%) of households living in spate irrigation areas, and in wadi Tuban about (25%).

It is common in a number of spate irrigation areas there is a large proportion of the land is cultivated by tenant farmers or the so-called partnership, in Wadi Zabid (82%) from land is rented, and in wadi Tuban about (51%) of the cultivated land leased or participation.

The ownership of livestock in spate irrigation areas in Yemen is as follows: in Shabwa average family owned between 10 -20 small ruminants (goat, sheep, chicken) and 5-10 camels and some poultry. While family in Wadi Zabid owns average 2 calves, 2 cows, 5 goat and 4 sheep, while a minority of households owns 2 bulls. Also, the family in Wadi Rema owns average household has 1.5 cows, 7.2 sheep, 1.5 donkeys and 6.4 chicken, while around a quarter of households have 2.1 bulls and about 40 percent have 3.4 goats.
The flood waters diversion from intermittent rivers (wadi) in most times are a major intervention in a series of investment programs in spate irrigation systems. This is a way forward for improving the productivity of water which lies in many cases to be at the expense of support for multi-purpose uses and not enough focus on the spate irrigation only, but must be considered on the local economy as a whole, including that many of the poor families livelihoods in irrigation spate areas is not depend only on the income from agriculture, of the improvement in irrigation projects spate, which aims to reduce poverty in an effective and sustainable. But, it must develop and implement activities that will create a basis for the development of sustainable communities.

There are several ways to improve the spate irrigation, which is contrary to focus only on diversion facilities. They can choose the form of wider improve the standard of living and local food security especially for the most vulnerable segment of the population. The most promising interventions include:

- Enhance the productivity of livestock, including improved access to animal feed (fodder crops and pastures irrigated spate irrigation, watering points and veterinary services as well as manufacturing and marketing of animal products).
- Development of employment and non-farm income, especially for impoverished families (subsist by women).

Therefore, small ruminants such as goats, sheep and poultry, has fertility rates and high reproduction, and a high degree of ability to adapt to drought conditions, so it is important and constitute case saving to save money for their needed time, and can be sold calves and bulls also as a mechanism deal with crop failure or in case of other crises.

The great majority of small farmers and the poor class in spate irrigation areas have some resources from livestock, and many of them are considered livestock they hold as savings and saving balances, which could be sold when they need money. In addition to increasing income through the sale of ancillary products, there are promising opportunities to provide additional income for families in rural areas of spate irrigation if there is a development in market resources for others exploited such as leather, wool, and the expansion in the production of secondary products such as cheese, ghee, eggs, and develop new sources of income, as production municipal compost of manure, can all contribute to improving the income of farmers and the rural population in spate irrigation areas, and it is considered as the commercial production of livestock which are an important resource in Yemen, and it has the ability to grow and develop.
There are some practices executed by livestock breeders in spate irrigation areas to increase their savings:

1. Making the municipal fertilizer from the animals waste.
2. Fattening lambs
3. Breeding bees and product honey

**f) Economic production of animal products in the republic and in the spate irrigation areas:**

The agricultural sector contributes with greatest percentage from national income. Where the animal production contributes ranged by about (28%) of the total return of productivity agriculture in Yemen. However, the economic performance of the agricultural sector in the past few decades is going in the retreat, so the contribution of the agricultural sector is dropped from the GDP to 75% in 1975/1976 and to (23%) in 1988, then to (18%) only in 1998.

Probably part of this decline is due to the increased production of oil and thus causes the modification of the composition of the contribution of other sectors, including the agricultural sector, but there are other reasons for the deterioration of agricultural production linked to the problems of different environmental. All these due inefficiency of the agricultural sector production which caused by the misuse of water resources, and the degradation of the basic environmental, and poor economic policy, as well as poor agricultural services, especially marketing.

That the total production of red meat, according to the statistics of the Central Agency of Statistics of the Republic is about (23100 tons) of red meat in 1985, while in 2012 it reached the total production of red meat to (152 061 tons), with an increase about (558.27%).

The total production of white meat in the Republic is about (48698 tons) in 1985 while in 2012 it reached the total production of white meat to (156 329 tons), with an increase about (221.02%). While the total production of milk in the Republic is about (105000 tons) in 1985, while in 2012 has reached the total production of milk to (335 185 tons), with an increase of (219.22%).

In addition, the total production of leather in the Republic is about (4437 tons) in 1985, while in 2012 it reached the total production of leather to (13390 tons) with an increase of (201.78%). And the total production of wool in the Republic is about (2071 tons) of wool in 1985, while in 2012 reached the total production of wool about (4,423 tons), with an increase of (113.57%).

The contribution of the Tihama from the animal products in 1985 is grown by (12.27%) of the total production of the republic in 1985, while contribution of Tihama in percentage
ranged about (9.82 %) of the total production of the republic in 2012.

Table (A1) shows the amount of livestock products domestically produced and imported and their value during the period from 1990 to 2012 for the Republic of Yemen. Where the amount of red meat consumed in 1990 is about (37,953 tons) and its the value (1,800YR) billion and eight hundred million riyals, while in 2012 the amount consumed red meat reached to (52,061 tons) and the value (234.126 YR) two hundred and thirty-four billion and one sixty million riyals, where the increase in the amount of red meat consumed amount (37.17%), with an increase in the value of (232,326 YR) two hundred and two and thirty billion three hundred and twenty-six million riyals. While amount of white meat consumed in 1990 is (58,935 tons) and the value (2,063YR) Two billion and sixty-three million riyals, while in 2012 the amount consumed white meat reached about (156,329 tons) and the value (111.072YR) one hundred and eleven billion and two seventy million riyals, where the increase in the amount of white meat consumed amount is (165.26 %), with an increase in the value of (109 009 YR) one hundred and nine billion and nine million riyals.

The amount of wool consumed in 1990 (2,249 tons) and the value about (2,800,000 YR) Two million eight hundred riyals, while in 2012 it reached the amount consumed from leather to (4,423 tons) and the value (3,441,200,000 YR) three billion, four hundred and one and forty million, two hundred thousand riyals, where the increase in the amount of leather consumed is (96.67%), and an increase in the value (3,438.40 M YR) three billion, four hundred and thirty-eight million forty thousand riyals.

The contribution of the Tihama region ranged from the locally animal products produced in 1990 is grown by (8.19 %) of the total production of the republic in 1990, while the contribution of the Tihama region in 2012 grew ranged by (9.82 %) of the total production of the republic in 2012.

g) The role of livestock in the spate irrigation areas in food security:

Due to population growth and the increasing demand for livestock products, especially meat, it is known that the population growth in the range of 2-4 %, while the demand for
livestock products is more than 5% annually. So it must be developed plans to ensure the development of livestock and increased productivity in various ways and to increase the benefit of the animal secondary products for secure food.

The animal is consumed the waste of field crops and residues of food industry after making simple transactions on it, and these residues are often a burden and a source of environmental pollution in the case of non-accumulation and disposal. In addition, the animal converts these sources to abnormal food products useful to human.

The ruminants has high ability for transform the fodder material to useful products for human as milk and meat. So, cows consumed about 30-60 kg green substance (10-20 kg dry matter) per day and its calves grow at a rate of 700-1200 mg/day or produce milk at a rate of 15-25 liters per day. The sheep eat up to 3-7 kg green substance (1-2 kg dry matter) per day and is growing at a rate of 1.2 kg/week. This is done with favor of the microbial digestion which is enjoyed by it.

The results of the survey of food security in 2010 carried out by the FAO in the province of Hodeidah is (59.7%) of households have one animal, according to animal species, the proportion owning families for cows and bulls and calves represent is 1.5% and the proportion owning families of goats, sheep, representing is (14.5%). While the donkeys owned is (32.7%) of the households and the rest of the households own beauty and bees, horses and mules, and the majority of rural households own animals more than families vegetative, and for the average size of herds ranges in the countryside about (7.3%) for cows and 12% for goats and sheep.

It should be noted that the number of animals reported in the surveys doubtful usually for several reasons, for example, fear of taxes and local beliefs, but it is noted that the bulk of the herds is for livestock in the stands and the mountains low (10.3 head per family) in the coast and coastal area (9 capital per family). As for the cattle and sheep have family living in the stands low in the mountains and in the plains and sandy valleys very large herds as the family head 13.0 and 12.2 per household head, respectively. The survey also found in other types of animals, where the average number per household 1.6 camels, and 1.3 donkeys, 2.9 mules, and 20.1 bees apiaries.

Livestock in areas spate irrigation contribute securing food for the families and the surplus it is marketed in local markets, where the contribution amounted of animals in the spate irrigation zones amount from livestock products produced amounted (14.47%) in 2002 (Table (1)), from total production of red meat, according statistics Central Bureau of Statistics in the Republic is (68 173 tons) of red meat, and the total production of meat.
white stood Republic is (106,624 tons), while the total production of milk in the Republic is (205,158 tons).

Table (A2) shows sufficiency ratio of products of livestock and per capita during the period from 1990 to 2012 for the Republic of Yemen, where the percentage of sufficiency of red meat in 1990 is (89%), while in 2012 it reached sufficiency ratio of red meat about (96.2%). Where the increase in the proportion of sufficiency red meat is (7.20%), and the average per capita red meat in 1990 about (7kg/year), while the average per capita red meat in 2012 is (5.1kg/years), with the amount of decrease about (1.90kg/year).

The percentage of sufficiency white meat in 1990 ranged (81%), while in 2012 the sufficiency ratio of white meat reached to (57.6%), where the amount of the decline in the proportion of sufficiency white meat about (23.40%), and the average per capita red meat in 1990 (4 kg/year), while the average per capita of white meat in 2012 (10.7 kg/year), and the increase was an average per capita white meat of (6.70Kg/year), while the percentage of sufficiency of dairy products in 1990 is (41%), while in 2012 the sufficiency of ratio dairy products of milk reached to (95.1%), where the increase in the proportion of the sufficiency of milk and milk products is (54.10%), and the average per capita of milk and dairy products in 1990 about (41kg/year), while the average per capita of milk and dairy products in 2012 is (16.7kg/year), where the amount of decreasing is about (24.30 kg/year).

The contribution of Tihama region of sufficiency ratio of livestock products in 1990 growing is ranged by (8.19%) from total production of the republic in 1990, while the growing of the contribution of the Tihama region ranged in 2012 by (9.82%) of the total production of the republic in 2012.

Although the statistical data indicate that self-sufficiency ratio of meat and dairy products continues to increase but the per capita Yemeni animal protein is still low given the level of low-income. The numbers and statistical data indicate that the average per capita animal protein ranging from (81-100 kg/year) in developed countries. While a per capita animal protein in developing countries between (30-40 kg), but this has to be the exploitation of opportunities for livestock development and the alleviation of poverty through the promotion of the production of meat, milk and derivatives and marketed to raise the per capita animal protein in the areas of spate irrigation and Yemen in general.

h) Animal Production Systems in spate irrigation areas:

Animal production systems vary according to the quality and number of animals, and the availability of pasture, and the amount of capital used by breeders. This included the
existing production systems in spate irrigation areas are four main systems:

1) **Pastoral system:** which represents about 85% of the applicable systems breeding small ruminants. This system is spread in the Tihama areas, Wadi Tuban and Delta Abyan or on the outskirts of cities, and is characterized by instability where herds move in search of pasture and dependent education within the framework of this system on the experiences gained by the shepherds. And some shepherds caring for the animals for others in exchange for a percentage of the crop.

2) **Breeding of livestock around the cities:** with the aim of producing and marketing of milk where this system is considered as endangered systems for livestock wealth due to the stop of publishing the genotypes, inbreeding, and over-fed females to get the highest productivity of milk. As an example of these farm livestock breeders is the Association in kilo 9 in AL-Hodeidah.

Photos (37 -41) Show pastoral system in spate irrigation areas.

Photos (42 to 49) shows livestock puter areas
Photos (50 to 57): Clarify animal husbandry system about the cities in areas spate irrigation.

3) **The traditional semi-intensive system of the livestock**: This system is the main system of livestock breeding in spate irrigation areas where the percentage of cows breeding is about 80% under this system in smaller educators. This system characterized by a small animal occupancy which does not exceed about 30 head. Breeder relies on traditional methods and his expertise in breeding.

Photos (58 to 65): Show animal production of semi-intensive traditional systems, in spate irrigation areas.

4) **Livestock intensive system production**: This system be done in breeding about 20 per cent of the livestock. An example of that Brothers Thabit farm in Wadi Surdud, in addition to another farms in wadi Surdud which are mixed farms where cattle and sheep, as example Munif farm, Siham Association farm, also Al homaigani farm. Also, there are sheep breeder farms including farm of Hail Saeed, Alkheer farm and Alnahdah Association farm in wadi Surdud. In addition
to a farm which is belong to the Ministry of Agriculture in Surdud.

This system is characterized in the application of the scientific base for breeding and care, and the existence of an institutional system for the marketing of animal products, and the application of modern technologies in breeding and the production of meat and milk. And this involves in the framework of the first three systems where several determinants is the difficulty of monitoring guidelines and providing veterinary healthcare, and the application of modern biotechnology or providing technological packages required to develop production quality and quantity, and the lack of an institutionalized system for the marketing of products, and ease of transmission of sexually transmitted diseases among animals in the case of natural insemination.

h) The importance of fodder for livestock in spate irrigation areas:

Livestock is an important integral part of the living conditions of families living in most spate irrigation areas, which makes getting enough fodder inevitable, the main source of food for animals is usually from the remaining parts of crops.

The second source is the cultivation of fodder in spate irrigation areas, such as corn and green clover, cut herbs from the fields and spate irrigation channels, also used the leaves of trees in and around the spate irrigation fields as food for animals.

During cultivation the crop is fed animals on the grass cut from the fields so as to prevent the animals from damaging crops planted. Grazing is practiced in certain periods in spate irrigation areas after harvesting crops. Also enhances spate irrigation in providing a large percentage of feed and this led to the provision of feed which leads to improved household income from animal products in spate irrigation areas.

In this time grazing land in spate irrigation areas is the least common grazing, although it is an important source of feed. In flood plains which is covering large areas with grasses and shrubs due seasonal flooding from the excess floodwaters. According to the conventional practices in the management of water is converted first flood of the river to the external surrounding field areas in order to provide and storage of drinking water for livestock and irrigation of pastoral land so that keep animals away from crops.

In Pakistan, the flood waters are converted at times other than agriculture to pasture land in order to get the maximum benefit from pastures such as herbs, shrubs and trees for timber fuel and other.

Usually small ruminants graze on pasture, while large ruminants are feed on green fodder
and crop residues (straw and stalks) collected from agricultural fields.

Pastures consider as natural source which is an important to be used in the field of livestock development and pastures land plants that grow natural or semi-natural. The grasslands and natural forests on the western coastal plains and South, and vary in the density of vegetation of these pastures according to the average annual rainfall and distance from populated areas.

Pasture lands are used as source of fodder for livestock, and source of timber for fuel, also utilized for rainwater harvesting and directed it to agricultural land. However the indiscriminate overgrazing and cutting trees for fuel has led to logging in recent years to a serious deterioration of pasture lands and natural forests.

The irrational use of pastoral land is the main reason for the deterioration of agricultural land, and this is reflected in the weakness of vegetation and soil degradation. This may result in damage and soil erosion and degradation which is impossible to be restored the situation to its natural status, where soil erosion damage the land and reduces the nutrients and moisture. The soil become unable to bear vegetation, thus weaken vegetation. There are a lot of factors, led to the deterioration of pastures and forests, such as natural factors and environmental, social and economic, which makes it imperative need for the competent authorities develop a clear policy for the use of land and regulate grazing, to contribute positively to the achievement of sustainable agricultural development, through the development of long-term strategy for the development of pastures. With taking into account the circumstances environmental, social and economic factors, as well as encouraging alternatives to firewood and fuel at reasonable prices up to the various regions, including the establishment of biogas units, and the establishment of nature reserves.

Spate irrigation systems have significant benefits through improved management of natural resources, first and foremost, which provides the Cultivation crops to provide food or feed or fiber, enjoying the families who live in spate irrigation areas with the following advantages:

- Easy access to animal feed.
- Access to drinking water for animals.
- get jobs.

So the ponds or drilling for water storage should be done to take advantage of them for watering animals and to improve livelihoods in the areas of spate irrigation. The family’s livelihood in spate irrigation areas exposed to threaten especially that families depend on spate for crops cultivation. In addition to the extra income from grazing animals and
activities sub-Ire Agricultural such as wage labor or immigration as a result of the deterioration of the surrounding pastures, which reduces the yield of animals, which should be reduce poverty in the spate irrigation areas through integrated land use such as feed production, as well as to the pastures, forests or water storage on a small scale in the ponds.

j) Animals housing in the current status in spate irrigation areas in Yemen:

Most of the farmers in rural Yemeni and in spate irrigation areas puts their cows in ground floor of the house, and rarely puts sheep and goats with cows in one barn or corral. The animals corral should be out of the house in some areas and in others at the bottom of the house. It is often the bottom of the barn is inappropriate, and the area of the barn are not commensurate with the number of animals, and there is no pot is placed for the feed or pot for watering, in addition to the lack in lighting and the ventilation is very bad. Moreover, animal waste remains underneath, causing escalation gases ammonia and methane, presence of holes and cracks in the walls, the emergence of some sharp stones and thorns and nails, sometimes have be narrow door and sometimes there is no door all this hurts animals.

Photos (66 to 69): Show current status for housing for animals in spate irrigation areas.

The most important conditions that must be met in livestock housing (barns):

1 – Should be wide and can accommodate the number of animals.
2 – Should be built from local materials available in the region
3 – The sun’s rays should be enter to it.
4 - Provide tendency tilted for easy cleaning.
5 - Provide lighting and good ventilation
6 – Feed and drinking pots should be available and be installed.
7 - Must be split rooms for sick animals and new births.

Photos (69 to 72): Show good houses for the animals.

The importance of animal barns:
✓ Protect the animals from predators and thieves and place where animals feel safe.
✓ Protect animals from climate change and weather such as rain, sun and other.
✓ Animal Shelter where it is back to sleep and rest.
✓ Provide comfort and warmth for the animals sick and pregnant animals.
✓ Isolate sick animals from all right animals.
✓ In order to fatten the animals.

L) Types of livestock barns (houses) in spate irrigation areas:

Animal barns in spate irrigation areas divided to:

1) Modern barns:
These barns are existed in intensive production systems. This system is mainly based on breeding livestock in closed place, fed it on coarse fodder and concentrates fodders only, without allowing it to get out of the pasture. The goal of such a system is to increase the level and efficiency of production of both productive and reproductive this is system from the most expensive breeding patterns because they need a high level care as they need special equipment and adequate housing to house and provide feed and serve.

The quality of housing construction depends the availability of share capital for the project, concrete buildings can also use any old building house suitable the cattle. In the spring summer can work suitable umbrella.

Theater should be attached to each dwelling secure for cattle sport and take it out when you distribute the bush in pots. The theater space usually equal to the living space and prefers not to inflict large theaters housing so the cattle is not lose part of the energy in wasted effort during the run. Therefore, the head of sheep must provide space of (0.5 - 0.7) square meters from barn area, and must be good ventilation, in addition to have enough light, and direct sunlight, and to be far from moisture areas. In addition to provide night lighting if possible, so the animals can eating it diet and with the provision of clean drinking water as permanently in the dwelling.

The head of cows must provide space (5.1 to 5.2) square meters, and often divides the dwelling or followed by several sections and one for milk and other for baby boomers young and a third stock of feed grains and hay, while in the sheep farms it divided to the same divisions in addition to feeding machine for small sheep.

These barns are found in the Tihama constant brother’s farm for cows and sheep a Jerabh farm owned by the Ministry of Agriculture as well as the Hal Saeed farm for sheep in Wadi surdud and other model farms in spate irrigation areas.
Photos (72to 76): Show modern barns in spate irrigation areas in Yemen.

2) Traditional barns (conventional housing):

These barns are found in the semi-intensive systems production, and this system is mainly based on housing next to the house or on the ground floor of the house in warm areas such as Tehama and Delta Tuban and Abyan, where straw and wood is used to build barns or uses zinc and tin in the construction of the barn. This leads to expose the animals to stress and thus mortality or reduced production. Also the mud has been used to build barns in spate irrigation areas.

Traditional barn is divided in spate irrigation areas into two place shelter and theater or (shadow). The importance of providing shadow in summer for animals is protect it, where the shade is very important for animals, especially at high temperatures and can take advantage of the shade of trees and shrubs, especially in spate irrigation areas or making temporary or permanent umbrellas.

Either importance lies in the provision of shelter to protect the animals, or especially the birth of the coldest winter winds and cold.
Photos (74 to 92) Some traditional barns in spate irrigation areas in Yemen.

K) Some programs supporting livestock in spate irrigation areas:

1. Veterinary care for animals in spate irrigation areas:

Veterinary care is important for maintaining the health of livestock in spate irrigation areas for the development of the livestock sector and development and the provision of a healthy diet and appropriate for the population and reduce the import of those products. The should work on improving productivity through breeding, care and genetic improvement, as it should for Veterinary Services be passed on to the work of Research and Economic Studies the impact, and control of diseases and control them on the basis of the economic feasibility of the fight, be abreast of modern economic trends of the state, especially in the field of investment and development. In addition, to that the studies on the effects of nutrition and care and genetic resources on the production should be improved.

Linked to the importance of the development of livestock and the importance of veterinary services, where the importance of livestock in the food security of Yemen and the social significance of livestock are considered more important than their economic contribution. Where approximately 13% of Yemenis live in rural communities and the majority of rural households has livestock, which constitute a large part of the agricultural production and a major source of income for families with small holdings or that do not have land.

Yemen is in a delicate, particularly with regard to the possible entry of epidemics and animal diseases, due to its geographical location at the crossroads of Africa, which provide most of the imported animals and the Arabian Peninsula. As well as with respect to wild birds migrating from north to south and back, and many of these diseases have the ability to influence and indeed affect on human beings, whether in the form of epidemics sharp (Rift Valley fever and avian influenza) or recurrent attacks of chronic (
brucellosis, tuberculosis ...), in addition to diseases transmitted through food and transmitted through the consumption of animal products contaminated, all this causes many human deaths and high rates of morbidity in different regions of the country, including the areas spate irrigation.

The most import of animals from the Horn of Africa, where Africa is home to most of the animal diseases that pose a significant threat to the local livestock spate irrigation areas and on public health in the event of leakage into the territory of the Republic. The Rift Valley fever pose a significant risk to livestock, although the disease under control after entering the first time in Yemen in 2002 and the emergence of the disease remains a risk. The regular foot- and-mouth attacks in Yemen familiar. After the emergence of SAT-2 in the neighboring countries in the Arabian Peninsula, foot and mouth disease has become big business problems in the region, and that PPR is widespread in Yemen widely.

In 1972 was the opening of the first center veterinarian in wadi Rmaa, and has been training and graduation of a large number of veterinary staff (doctors - guides veterinarians) in all disciplines related to animal production and animal health laboratories and nutrition and improve production and established the General Authority for the development of Tehama number of veterinary centers in many of the valleys of the Valley of Rmaa - Zabid - Mawr – and Surdud. It has a modern veterinary laboratory in Hodeidah serves all parties and citizens. And carried out over the past years several special campaigns to combat and vaccinate livestock against pests and diseases, including cattle plague - sheep pox - and parasite control and was most recently the campaign, which included these areas end of last year and targeted vaccination of goats and sheep against PPR have been vaccinated more than a million head of this livestock and arrived coverage ratios for the campaign to 75-80% of the target animals in spate irrigation areas.

In spite of this there is a shortfall in the provision of veterinary services for the animals in those areas and the images below are illustrative.
2) Priority programs to promote growth livestock in spate irrigation areas:

1) In the field of genetic improvement and animal health care:

- Improve breeds through conducting research in the field of genetic improvement and mixed mating between certain breeds of livestock to improve local breeds, which will increase the production of milk and meat, in addition to the introduction of artificial insemination techniques.

- The expansion of extension services and communicate veterinarian: should be expanded counseling programs to include training of technicians and workers in this field of males and females, and the implementation of outreach programs and awareness in the field of animal production and animal health as well as the dissemination of techniques and the use of diets balanced by small farmers and the introduction of techniques help reduce wastage of feed the water and the establishment of centers and demonstration projects in the field of breeding and care of the animals and also in the area of improved breeds and different techniques relevant, including livestock development programs related to food Order and improve productivity drought resistant fodder.

- Combating animal diseases and to provide veterinary services: the promotion and development of a network of early warning for diseases endemic animal) epidemiological surveillance and laboratory and the possibility of interaction rapidly through the implementation of a range of health measures to control diseases and epidemics settlement, as well as protecting the country from pathogenic workers, As well as work to be veterinary services field accessible to farmers on demand, especially in remote areas and areas with animal density.

2) In the area of pasture and forage:

- Study and characterization of and natural pasture improvement.

- Establish / maintain facilities to provide new and appropriate fodder to feed the livestock, poultry and beekeeping.

- Study ways to increase the nutritional value of the feed with low nutritional value.

- The study and application of modern methods and technology to improve the palatability of feed.

Livestock’s in spate Irrigation areas in Yemen
- Supporting associations and producers of improved seeds to produce plants Pasture, and fodder production.

- The establishment of units for cutting feed and by-products of crops, food additives mixing, pressing and packaging to be sold to livestock producers.

- Working with farmers to improve pasture and rangeland rehabilitation and the introduction of green fodder conservation techniques (silage) and the use of feed additives as well as assistance through the introduction of appropriate agricultural mechanization to harvest feed and the use of modern irrigation systems.

- The introduction of modern technologies to reduce waste of green fodder and dry.

- Special attention to the introduction of feed and chooses which combine high productivity and nutritional value and low water needs.

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For more information about spate irrigation is found in the following site: www.spate-irrigation.org.

Reviewed and published by:
Dr. Sharafaddin A. A. Saleh (WEC - Sana'a University – Yemen)