

The Reality of Buffalo Breeding in Basra Governorate

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Abstract: Buffaloes in Iraq represent the most productive animal since its domestication in Mesopotamia about pre-historic era. Domestic water buffalo (*Babalus Babalis*) are common in the marshes of southern Iraq. On Sunday the UN cultural agency, UNESCO, added the marshlands and the ancient Sumerian cities that once flourished among them to its list of sites. The marshes today remain one of the poorest areas. Residents living on tiny floating islands fish, tend water buffalo and gather reeds. Little published research could be found into the numbers or environmental impacts of water buffalo in Basra governorate. One of the research objectives was to survey the water buffalo in this region including Al Dear, Al Hartha, Abu Alkhasib, Shat Alarab, Al Qurna, Al Mdainah, Imam Sadiq, Imam Qaim, Al Faw, Al Nshwa, Al Zubair and in Basra center. This study was conducted to evaluate all aspects of the river buffalo for the period from 2012-2016. Comprehensive knowledge of the breed characteristics, its population size and structure, taxonomy, geographical distribution and most important diseases is required to have effective management. As the marsh Arabs or Ma'adan complain of problems with some common buffalo diseases, such as those infecting the hoofs and the tongue, providing of veterinary services would be of critical value for buffalo breeding from an economical prospective.

Keywords: Marshes, distribution, ecology, diseases, vaccination.

INTRODUCTION

The buffalo is a very quiet and intelligent animal, domestic but rustic, faithful and friendly, rich in history, and can now be found in many countries worldwide [1]. Buffalo are known to live in different habitats in Iraq including marshes, villages, and even some urban regions [2]. Linnaeus in 1758 considered the domestic water buffalo (*Bubalus bubalis*) as a very important economic animal for inhabitants of marshes, the marsh Arabs or Ma'adan, in central and southern parts of Iraq, for it provides dairy products, meat, skin, dung for fuel and labor for them. It is the most prominent and common animal in marsh area due to its adaptation for a long-time scale favorable natural marsh habitat in the southern parts of Iraq [3]. Three main big Iraqi marshes (marsh means Hor in Arabic) situated in three Iraqi provinces, known as the Central Marshes, Hammar Marshes (Hor Al-Hammar), and Hawizeh Marshes (Hor Al-Hawizeh) [4]. The marshes of southern Iraq are crucial ecosystems, which influence, and also are influenced by many natural forces and human activities. These marshes are very important as incubators for fish and invertebrates, and play a vital role as habitat for the majority of wildlife in the region [5].

In Basra governorate, buffaloes are spread over many villages with varying density. North of Basra have the majority of the population (Al Dear, Al Qurna, Al Mdainah, Imam Sadiq, Imam Qaim). Water buffaloes are susceptible for many diseases. Hemorrhagic

septicemia (HS) has been identified as a secondary complication in cattle and water buffaloes following outbreaks of Foot and mouth disease (FMD) [6]. Veterinary Services in Iraq has been severely weakened over the past two decades, and its infrastructure has been devastated as a consequence of previous political conflicts, wars and international sanctions. The breakdown of Veterinary Services led to the disruption of disease control strategies, collapse of disease surveillance and monitoring, and weakening of response systems [7].

Although Iraq has an estimated 5,000-7,000 veterinarians, there is a need for quality veterinary services and for more veterinarians. In addition, there is a need for the improvement of veterinary diagnostic facilities, as zoonotic diseases are always highly probable in this region [8]. According to rare or decrease of the studies related with water buffaloes in marshes of Basra, it's important that we focus on the study of the reality of raising buffalo in order to develop and maintain this great wealth by effective management from an economical prospective.

HISTORY REVIEW

Buffalo were domesticated 3000-6000 years ago, they had economic value as dairy, meat, and draught animals, in many populated countries [9]. In areas of rich agricultural potential, notably southern Mesopotamia, settlement led to huge population growth and the concomitant development of more complex social organization [10]. In the 4th millennium BC the first literate societies emerged in Southern Mesopotamia, often referred to as the Cradle of

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Civilization, and the first cities and complex state bureaucracies were developed there during the Uruk period [11]. The Marsh Arabs are the primary inhabitants of the Mesopotamian Marshes and are the descendants of ancient Sumerians, as their civilization dates back 5000 years. They live in secluded villages of elaborate reed houses throughout the marshes, often only reached by boat. Fish, rice cultivation, water buffalo and other resources are also used in their daily life [12]. In the marshland areas of Iraq there is a long established history of economic reliance on water buffalo, which provide dairy products, meat, skins and dung for fuel. The Iraqi Museum contains artifacts depicting Gilgamesh with water buffaloes in the rivers of the Tigris and Euphrates [13].

GEOGRAPHY OF IRAQI MARSHLAND

The total area of Iraq is 435,052 sq. km. [14]. The Tigris and Euphrates Rivers form the southern Iraqi marshland, which is one of the unique aquatic landscapes in the Middle East [4], located in southern Iraq and partially in southwestern Iran and Kuwait. The marshlands constitute about 17% of the area of Iraq as the water covers about 8.3 million acres of Iraqi land of which about 3.2 million acres covered by the waters of the marshes [6]. The marshland divided into three major areas, the Central Marshes lie between the Tigris and Euphrates, while the Hammar Marshes lie south of the Euphrates and the Hawizeh Marshes are bound east of the Tigris. Before the 2003 Invasion of Iraq, about 90% of the marshes had been drained [15]. The highest population density found in Mesopotamian Marshlands between three southern governorates (Basra, Thi-qar and Missan), respectively which represented the home tract of buffalo and their typical breeders in Iraq, locally named Madan, well known by their traditional community, and characteristic accent, mainly raising buffalo for production of famous dairy thick butter cream [16].

THE EFFECTS OF DRAINING MARSH

Draining of portions of the marshes began in the 1950s and continued through the 1970s to reclaim land for agriculture and oil exploration. During the period of 1991 -2003, wide areas of reed beds and lakes of southern Iraqi marshes were ditched and drained by the previous Iraqi regime for political reasons. The destruction and drainage of the Iraqi marshes affect the wildlife of southern Iraq [17]. In the 1950s, there were an estimated 500,000 Marsh Arabs. This population shrank to about 20,000 following the draining and

Saddam's violent reprisals, and between 80,000 and 120,000 fled to neighboring Iran [18]. The marshland landscape of southern Iraq was totally drained and <10% of the area remained as functioning marshland by the year 2000. The only remaining marsh of any size was the northern portion of Hor Al- Hawizeh, which straddles the border between Iraq and Iran. The other two marshes, Central and Hor Al-Hammar, were virtually destroyed by 2000. The remaining Hor Al-Hawizeh was only 35% of its 1977 size of 3076 km² by 2000 [17].

The draining of the marshes caused a significant decline in bio productivity; following the Multi-National Force overthrow of the Saddam Hussein regime, water flow to the marshes was restored and the ecosystem has begun to recover [4]. The marshes have partially recovered but drought along with upstream dam construction and operation in Turkey, Syria and Iran have hindered the process [19]. The connection between marshes and buffaloes began to re-establish itself with re-flooding of the marshland areas after the second Gulf War of 2003. Marsh refugees, who kept cattle and sheep while in diaspora, often sell them and purchase water buffalo as soon as they resettle around the restored marshes [20]. Thousands of buffalo breeders (Madan) started a big mass moving from hot-spot area around Baghdad countryside villages nearer to conflicting sectors in Anbar and Sallah aldin provinces towards southern marshes [21]. [22] reported that Thi-qar and Missan governorates shows a steady increase in the number of water buffalo. The report puts the number at 40,008 head in those two provinces. In May 2006 Nature Iraq conducted a project to study water buffalo in the marshes of three southern Iraqi governorates: Thi Qar, Missan, and Basra. The goals of this project were to provide needed information regarding the status of buffalo following reflooding of the Mesopotamian marshlands, as well as contribute basic data for future plans and studies [2].

TAXONOMY OF WATER BUFFALO

Buffalo belong to the Bovidae family and there are two main species of buffalo: the Asiatic buffalo (*Bubalus bubalis*) and the African Buffalo (*Syncerus caffer*) [23]. The Asiatic water buffalo can be divided into two subspecies: the river buffalo and the swamp buffalo. The exact phylogenetic relationship between swamp and river buffalo is still in question [9]. The division into swamp and river buffalo based on morphological, behavioral, geographical criteria and number of chromosomes. River buffaloes (*B. bubalis*

bubalis) are generally large in size, mostly with curled horns, prefer to enter clear water, have 50 chromosomes. They are primarily used for milk production and, mainly found in India, Pakistan and some of the west Asian countries. Swamp buffaloes (*B. bubalis carabanesis*) are mostly stocky animals with marshy land habitats and have 48 chromosomes [24]. Cross-breeds are generally successful and have 49 chromosomes [1]. Water Buffalo are believed to originate in South Asia. There is evidence to suggest that these animals were first introduced into Mesopotamia in about 3500 BC, but archaeological evidence exists that suggests that buffalo were formerly wild in the marshes and then domesticated [20]. Two opposing theories exist regarding the origin of buffalo in Iraq. The first theory hypothesizes that wild buffalo already existed in Mesopotamia and spread from there to other countries. Others believe that the buffalo were introduced to the marshes of southern Iraq from India thirteen centuries ago [2]. According to archeological remains referring to buffalo raising in Mesopotamia before Christ confirming by recent Iraqi molecular studies, these updated data should leading us to register our buffalo as dependent breed in riverine group under the name of (Mesopotamian Buffalo). The most updated Microsatellites markers Iraqi study showed that our buffaloes were originated in Iraq, not imported from India [16].

CHARACTERISTICS OF RIVER BUFFALOS

Buffaloes are large in size reaching to 800 kg. The horns are curved and the animal's age can be determined from the size of the horn [25]. The body length is about 115.2-128 cm and the chest girth is 207.2- 223.8 cm. Furthermore, water buffalo are black or gray in color, with white irregularly shaped spots that are sometimes present on the chest, legs or tail. Buffalo's dung is very important as a main source of fuel, however the primary uses are for milk production, meat, and skins [2]. Gestation lasts from 281–334 days, but most reports give a range between 300 and 320 days [26]. River buffalo distinguish from the swamp buffalo in many morphological points, grossly the river buffalo has big mass body with long legs, the skin is dark black massive hairy located only in face and along the vertebrate column and the eyes brown to black color almost. Swamp buffalo less weight and shorter than river buffalo, generally hairy body, and the eyes appear in grayish to light bluish [27].

According to [14], buffaloes can be divided into two distinct varieties according to habitat: 1- Marsh

Buffaloes: characterized by long deep body and limbs. It constitute more than 50% of the population of buffaloes in Iraq. 2- City Buffaloes: characterized by its large size and high milk yield. Usually raised round main cities specially Baghdad. It constitutes more than 30% of the population according to the 1978 census. They are more tamed and easy to handle than Marsh buffalo. There are two main seasons for buffalo activity summer and winter. Buffaloes go to the marshes in the summer to cool their body temperature [13]. Buffalo have a relatively low number of sweat glands per unit area of skin and are highly susceptible to overheating [28]. In temperatures above 34°C buffalo suffer lower rates of growth and milk production and higher calf mortality [29]. The buffalo stay in the marshes approximately 10-12 hours and return home each night. Milk production varies depending on the type of nutrition. Milk yield is about 4 - 5 liters when nutrition is only reed, but reaches up to 15 liters if the nutrition is of reed and concentrated foods (Corn, wheat, bran, and other grains). Reed is cut by farmers in winter using an instrument called a "Minjel" and given to buffaloes in the stable, because buffalo rarely leave to the marsh in the winter [13]. Clarified butter is made by heating the butter, but the white froth that forms on top (gamer) thickness and it scraped off to be eaten on bread. Both butter and cheese are sold by Mi'dan women in the villages and in the market towns. Water buffalo exist almost entirely on grasses, sedges, and young reeds from within or on the edge of the marsh [30]. Male buffaloes are very hazardous, strong and difficult to handle and always aggressive to humans. In a few cases, for tilling operations, they are castrated. Females are very sensitive to non-familiar persons and reduce milk yield with non-familiar milkers [1]. The buffalo is a highly social animal with strong instincts. Consequently, mother and young are closely bonded, and the buffalo calf usually becomes more stressed when separated from the dam than the calves of cattle [31].

ECOLOGY

Buffaloes are considered as one of the most important sources of milk and meat production [32]. One cannot discuss the Madan without talking about their use of water buffalo. They are livelihood of people in the marshes. In fact, water buffalo are considered indicators of the quality of marsh life and restoration of the Iraqi marshes. I expect that the absence of water buffalo will lead to the disappearance of people in the marshes [33]. Historically the marshlands, mainly composed of the separate but adjacent marshes, used

to be the largest wetland ecosystem of Western Eurasia. It is a rare aquatic landscape in the desert, providing habitat for the Marsh Arabs and important populations of wildlife [17]. Buffaloes are well adapted to the hot and humid climates of many parts of Iraq and play a distinct role in improving the rural economy, which is primarily based on agriculture and animal husbandry. Buffalo feed on plants in the marshes and also on protein-rich concentrated food when available [2]. The water buffalo feeds on common reeds by grazing as well as on reeds cut by their owners, which is also cut and sold as fodder to buffalo and cattle/sheep owners in cities [25]. Buffaloes having high capacity to face adverse environmental conditions and a remarkable longevity (up to 10 years production period) [34]. The ideal habitats for water buffalo are floodplain environments with a mixture of abundant grasses and available water bodies. Access to water is critical for thermoregulation and often limits the ability of buffalo to seek fresher pastures [35].

THE POPULATION, DISTRIBUTION AND SEXING OF BUFFALOES

The world buffalo population is estimated to be 170 million heads [36], 172.7 million [37], and approximately 177.247 million dispersed in 42 countries, out of which 97 percent (171 million) are found only in Asia [38] and was estimated to be more than 194 million in 2010 as reported by FAO [39]. According to [1], the buffalo population in the world is actually about 168 million head: 161 million can be found in Asia (95.83 percent); 3 717 million are in Africa, almost entirely in Egypt (2.24 percent); 3.3 million (1.96 percent) in South America, 40 000 in Australia (0.02 percent); 500 000 in Europe (0.30 percent).

Buffaloes in Iraq has been neglected for along times and affected by many factors that lead to severe decline in population and production [37]. According to

1986 statistics the number of Iraqi buffaloes reached more than 233,000 buffalo [6]. A counts of all buffaloes in Iraq, showing a decline in numbers between 1986 and 1993 to 98,700 [25]. According to data provided by [1], there were 98 000 total River Khuzestani or Iraqi buffaloes. Buffalo population increased after re-flooding, reaching numbers higher than after desiccation and potentially close to those numbers recorded before desiccation. This is an indicator of good marsh recovery at least in terms of livestock [2]. No adequate or accurate information existed about the buffalo population in the marshes after the reflooding [40]. According to [21], the population of buffaloes in Basra governorate between 1981, 2001 and 2006 is approximately 19.1%, 12% and 11.9 respectively of buffaloes in Iraq. The population, distribution and sexing of buffalo among the districts of Basra were clearly uneven as shown in Tables 1 and 2 which shows the names of the villages where the buffalo are raised in Basra province and determine their locations using the GPS.

The rural people reared the buffaloes mostly for milk purposes and to get immediate monetary benefits to fulfill their needs. Most farmers sold calves and those animals that become non-productive or diseased for beef purposes [41]. In Egypt, the number of buffalo bulls reached about 6 percent, 32 percent heifers less than two years old and 20 percent male calves less than two years old [1]. Also In Iraq, people sell the males only and keep the females. Therefore, the approximate percentage of male to female from the total number is up to 20% as shown in Table 3.

DISEASES OF BUFFALOES

The water buffalo is susceptible to most diseases and parasites that afflict cattle, although the effects of disease on the buffalo and its productivity are sometimes less evident. Generally *Bubalus bubalis* is a healthy animal, in spite of a natural habitat consisting of

Table 1: The Number of Buffaloes According to the Geographical Area of each Veterinary Clinic in Basra Governorate from 2012 to 2016

The year	Basra center	Al Dear	Al Hartha	Abu Alkhasib	Shat Alarab	Al Qurna	Al Mdainah	Imam Sadiq	Imam Qaim	Al Zubair	Al Faw	Al Nshwa
2012	825	6401	5754	1339	3296	4511	6009	6971	5970	1144	1805	-
2013	239	4769	5429	1000	2609	3905	8795	5480	5315	518	135	-
2014	433	5881	7989	1908	4371	6319	7079	1072	5347	988	170	-
2015	-	4960	4057	1550	2705	6663	5885	1123	4409	937	250	-
2016	1177	5854	6857	2070	4265	10219	6514	1521	6918	979	465	52

Table 2: Names and GPS of the Villages where Buffalo are Raised in Basra Governorate

Basra center	Al Dear	Al Hartha	Abu Alkhasib	Shat Alarab	Al Qurna	Al Mdainah	Imam Sadiq	Imam Qaim	Al Zubair	Al Faw
Sket Alaon E 47.84927 N 30.48984	Al Athbeh E47.46167 N30.89256	Bny Sken E47.78412 N30.55845	JekorE47.013 60N30.45436	Alkbasi alsaghir E47.80319 N30.59897	Shiht akab E4739247 N30.99507	Umshwech E47.26243 N31.00129	AboGareb E47.33375 N30.93691	Alkhesat E47.42724 N31.26917	Jsrzubair E47.45351 N30.26652	Kutbander E48.36414 N30.20942
ALmufqia E 47.79726 N 30.51750	Bet Wafi E47.48836 N30.91645	Aboskhair E47.71602 N30.56534	KutAlzaen E48.09258N3 0.42341	Alsaltheah E47.94064 N30.47896	Nhrbasha E47.41170 N31.00010	Albadran E47.26243 N30.94095	Rahmania E47.29717 N30.92503	Al hdama E47.43079 N31.25704	Aldwagen E47.69199 N30.3552	Fadaghiah E48.3963 N30.1867
Alqiadeh E 47.80011 N 30.54922	Al Nhran E47.63033 N30.76294	Alkhorah E47.66303 N30.58599	Al Sebah E 48.25184N30. 32550	Nhr Jasim E47.94064 N30.47896	Alshresh E47.45892 N30.96377	Alsoreh E47.23238 N30.96665	Alboktaeb E47.29251 N30.90378	Al kbebh E47.40484 N31.14766		
HayAlhsen E 47.78552 N 30.49469	Alshrebh E47.58680 N30.77252	Al khet E47.68598 N30.58504	Sbeleat E47.95020N3 0.46163	Aljazera 3 E47.77327 N30.60059	Mzeraa E47.45142 N31.01534	Aljebot E47.25947 N30.92831	AlMzraah E47.40453 N30.98467	Alshghafia E47.35850 N31.14296		
Hayasdk E 47.77544 N 30.50971	Abowawi E47.52658 N30.84048	Hareer E47.68935 N30.61859	MhejranE47.8 8677N30.471 58	Kut aljoa E47.87472 N30.51285	Alsweb 47.48622 N30.98681	Nhr saba E47.15920 N30.96840	Bahleh E47.29251 N30.90378	Al alwa E47.42686 N31.57660		
Al Muteha E47.83607 N30.48522	Alzergan E47.51589 N30.88559	Alshkhata E47.73963 N30.61986	Al nzaelehE47.9 8120N30.439	Al Sahel E47.84976 N30.52694	Alhwedy E47.44613 N31.05903	Nhr Saleh E47.18662 N30.94656	Al Mhyat E47.26858 N30.84757	Bet awfi E47.35644 N31.17689		
Al Qebilah E47.80375 N30.46340	Al Salam E47.55927 N30.82125	Alshlegia E47.66303 N30.65267	Abogorah E 47.95902N30. 44100	Kteban E47.76696 N30.68609	Nhr Aliz E47.37540 N30.99495	Al Smaed E47.29169 N30.99061	AlJasim E47.38847 N30.96447	Sghanbeh E47.35850 N31.14296		
UmAlnaag E47.84262 N30.47315	Alchabeen E47.53538 N30.85701	Al senkh E47.75822 N30.58898	AlAsmd E 48.02568N30. 44134	Aljazera 1 E47.81791 N30.55680	Alghmaig E47.46835 N30.93956	Al Hyader E47.21883 N30.89723				
		Al kzazeh E47.73931 N30.55855	HamdanE47.8 9848N30.466 30	Al Zregy E47.76696 N30.68609		Al Sbeteah E47.23238 N30.96665				

Table 3: Approximate Total of Buffalos in Basra governorate 2012-2016 Classified According to Sex.

The year	Total of buffalos	Male	Female
2012	44025	8805	35220
2013	38194	7639	30555
2014	41557	8311	33246
2015	32554	6510	26044
2016	46891	9378	37513

hot and humid regions that are very favorable to microorganism and parasite proliferation [42]. Although Iraq has been successful in eradicating of some diseases, buffaloes in Iraq has been neglected for long times and effected by many factors that lead to sever decline in population and production.

The most important diseases recorded in Basra governorate that affect buffalo are shown in Table 4.

One of the important diseases affecting buffaloes is Foot and mouth disease. FMD is an infection caused by the Aphtovirus, an RNA virus occurs in seven main serotypes: O, A, C, SAT 1, SAT 2, SAT 3 and Asia 1. The susceptibility of buffaloes to FMD has shown to vary according to the country and the various strains of virus [42]. The first official cases of FMD were recorded in 1937, while the first record of a specific FMD serotype in Iraq was serotype A in 1952A severe epidemic of FMD occurred in Iraq in 1998, affecting 2.5 million ruminants and causing heavy losses in newly born animals. It is estimated to have killed about 550,000 animals. The outbreak was due to the serotype O1 Middle East strain which has affected large and small ruminants. In 2009, Iraq was severely affected by new serotype A (subtype A Iran 05) [7]. Infection of Lumpy skin disease LSD was reported for the first time in Turkey and Iraq in 2013, indicating that the disease has a potential for further spread to the European Union and Caucasus Region, as well as to Asia [43].

Hemorrhagic septicemia (HS) is an acute and often fatal disease primarily occurring in water buffaloes which is more susceptible to HS than cattle and cattle [44]. The disease caused by the gram-negative bacterium *Pasteurella multocida* [45]. So far, various serotypes (A, B, C, D and E) of *P. multocida* have been detected among the livestock population [46]. A satisfactory investigation of buffaloes hemorrhagic septicemia was obtained in the marshes of Dhi Qar governorate in southern Iraq. The research described the clinical and pathological symptoms, exterior morphology of bacterial colonies, biochemical behavior of *Pasteurella multocida*, gross and histopathological changes were also recorded in 13 samples collected from infected and dead animals [47]. Blackleg, is an infectious bacterial disease most commonly caused by *Clostridium chauvoei*, a Gram-positive bacterial species. It is seen in livestock all over the world, usually affecting cattle, sheep, and goats. It has been seen occasionally in farmed bison and deer [48].

Brucellosis is one of the major endemic zoonotic diseases worldwide, and it has history dating back to 1937 in Iraq. The Brucellosis Control Program was established in 1995. A serological surveillance was conducted and revealed the apparent prevalence of the disease in sheep and goats, cattle, buffalo, and camels was 6.51%, 1%, 1.48%, and 0.02%, respectively, in which buffaloes of Basra recorded 5.35% [49]. Tuberculosis is a chronic disease manifested by progressive development of tubercles in any organ of

Table 4: The Most Important Diseases of Buffalos in Basra Governorate from 2012 to 2016

The disease	2011	2012	2013	2014	2015	2016
Foot and Mouth Disease	134	52	1	0	0	0
Brucellosis	0	0	0	0	5	0
Hemorrhagic Septicemia	10	9	1	0	0	0
Theileriosis	0	33	29	22	20	86
3 day sickness	0	45	39	0	1	23

the body. The causative bacterium is *Mycobacterium bovis*, the disease was widely reported among buffaloes at meat inspection in Eastern Europe and Mediterranean countries [44]. Three-day fever is a viral disease caused by an Ephemerovirus of the family *Rhabdoviridae*, transmitted by arthropod vectors. It is common in tropical and subtropical regions, where it affects mainly domestic cattle and buffaloes, especially in intensive dairy or fattening production systems. Subsequently, the disease has been reported in the Near and Middle East (Israel, Syria, Iran, Iraq), [50].

Theileriosis are those tick-borne protozoan diseases associated with *Theileria spp* in cattle, sheep, goats, buffaloes, camels as well as in some wild animals [51]. [52] studied 55 local newborn calves (male and female), 1-9 days old infected with *Theileria annulata*. The study was carried out in Mosul, Iraq It have been concluded that *Theileria annulata* infection in newborn calves resulting in serious effects and health deterioration, leading to substantial significant economic losses.

Buffaloes can become infested with different types of parasites. The animal helminthes are of great public health and economic importance, as hydatidosis is a source of infection to final host (carnivores) and transmitted to human beings [53]. [54] showed that livers of buffalo was more frequently infected with hydatid cysts and *Fasciola spp* as 4.98% of In the slaughter house of Babil province, [55] examined 1228 Buffaloes, the study showed that the highest rate of infection with Echinococcosis was in Buffalo, (3.56%). The disease is endemic in all provinces of Iraq and particularly in Basra governorate. A total of 220 surgically confirmed cases of human hydatidosis recorded in Basra province during the period (2006-2007). The investigation of 41 homeless dogs in Basra city revealed that the infestation rate of *Echinococcus granulosus* adult worm was 14.7% and the intensity of infestation was 30.9% [56].

The other main parasitic infection is Sarcocystosis which caused by species of Sarcocystosis, an intracellular protozoan parasite in the phylum

Apicomplexa [57] tested Two hundred buffalo carcasses in the abattoir of Ashar-Basra city. The results of the study showed that the incidence of macroscopic and microscopic was 16% and 84.6% respectively, where it was noted that the incidence examine by capillaries telescope was of 77.5% and by squeezing method was 72.2%. It also recorded the high incidence of the disease 95.8% was in the esophagus and the low value in the heart 30.9%, on the other hand the result showed that the highest proportion of macroscopic incidence in an area where the esophagus was 90.4% and the least in the heart, reaching 14.8%. the microscopic examination was 95.6 and 57.3% in ages under two years. The macroscopic examination infection rate also increased with age and it was 60% in the ages of four years or more, while 1.8% at ages younger than two year. Table 5 showed the mortality rate of buffalos with most important diseases in Basra governorate from 2012 to 2015.

SLAUGHTERED BUFFALOES

Buffalo are the source of milk and future herd expansion, their slaughter is often associated with a reduced reproductive efficiency [58]. Up to 10% of the total population of buffalo were being culled annually by humans with little appreciable impact on population increase [35]. The average slaughter weight is 400 kg, at the age of 12 months. Carcass yield is 50 percent. Overall growth rate is 580 g/day [1]. Previous conditions that prevailed in Iraq according to [59] resulted in heavy wave of buffalo slaughter due to high cost of buffalo raising and expensive meat price in the market therefore buffalo breeders switching partially or totally to dairy cattle husbandry and started work on easy jobs with better income and forced to move with their stock to big cities and villages around Baghdad countryside. For the same reasons that mentioned before, the slaughtered buffalo includes male buffalo and calves, buffaloes that suffer from productive or reproductive problems, aged animals, or with chronic symptoms, or because of the owner need, thus he will sell the animal for the purpose of slaughter as shown in Table 6 of slaughtered buffalos.

Table 5: The Mortality Rate of Buffalos with Most Important Diseases in Basra Governorate from 2012 to 2015

The disease	2011	2012	2013	2014	2015
FMD	1	0	2	0	0
Brucellosis	0	0	0	0	0
HS	0	1	0	0	0

Table 6: Number of Slaughtered Buffalos in Basra Governorate (2012-2016)

The year	slaughtered buffalo
2012	5700
2013	4692
2014	4256
2015	3840
2016	3032

VACCINATION

Animal health information systems are one of the most crucial requirements for successful implementation of any program. Vaccination is a vital component of both control and prevention, and the use of proper vaccines is always recommended for potential control of disease [49].

The veterinary service plan offer through the annual plan by the Department of Planning and Follow-up at the veterinary directorate in Baghdad and implemented through veterinary hospitals and veterinary clinics scattered in the Provinces districts and towns in Iraq, whether in urban, rural or remote areas, which include (15) veterinary hospital, (228) vet clinic (except for the Kurdistan region). A Part of the vaccination program performed during the year and the other section is implemented through preventive vaccination campaigns as showed in Table 7. Regardless of the difficulties and derailed steps encountered during the vaccination phase, there were several remarkable

achievements attributed to the vaccination campaigns. The most important output was the apparent decrease in the level of buffalos affected with the high risk diseases. The most recent update of 2009 revealed the incidence of brucellosis to be 16.99 cases/100,000 people in the middle and south of Iraq [49].

The veterinary hospital in Basra included 12 vet clinics: Al Dear, Al Hartha, Abu Alkhasib, Shat Alarab, Safwan, Al Qurna, Al Mdainah, Imam Sadiq, Imam Qaim, Al Faw, Al Zubair and outpatient clinic at the hospital headquarter. The veterinary hospital in Basra through a combination of vaccination teams vaccinate buffaloes in Basra governorate twice a year against foot and mouth disease, hemorrhagic septicemia and black leg as shown in Table 8, 9 and 10. Prophylaxis-Strategies for the control of foot and mouth disease can be based on different measures depending on the objectives and on the existing sanitary situation. Eradication implies a policy in which the presence or possible incursion of the virus is not tolerated, while control implies that the presence of the virus might be tolerated but the effects of the disease are minimized by vaccination and other zoo sanitary measures [60].

The major efforts of Veterinary Services in Iraq have been directed towards control of FMD by vaccination strategies. Two types of vaccine have been used, trivalent vaccine (O, A 22, and Asia 1) for cattle and buffalo and monovalent vaccine (O Manisa) for sheep and goats. Vaccination has been implemented once yearly on a voluntary basis. Sometimes other limited control measures have accompanied vaccination,

Table 7: Buffalo Vaccination Campaigns in Basra Governorate (2013-2016)

Type of vaccine	The period		Vaccinated buffalos
	from	to	
FMD	5 May. 2013	4 Jul. 2013	64631 (buffalo & cattle)
FMD	29 Sep. 2013	7 Nov. 2013	64631 (buffalo & cattle)
FMD	20 Apr. 2014	20 Jun. 2014	47073
FMD	21 Sep. 2014	4 Dec. 2014	35232
FMD	18 Jan. 2015	12 Mar. 2015	31074
HS	26 Apr. 2015	18 Jun. 2015	31672
BL	26 Apr. 2015	18 Jun. 2015	31537
HS & BL	3 Apr. 2016	17 Apr. 2016	29685
FMD	14 Apr. 2016	9 Jun. 2016	44732
LSD	21 Aug. 2016	31 Oct. 2016	80613 (buffalo & cattle)
FMD	1 Nov. 2016	29 Dec. 2016	48599
Brucellosis	During 2016		12142

Table 8: Planned and Implemented Numbers of Buffalos Vaccinated against FMD in Basra Governorate from 2012 to 2016

The year	Planned	Implemented	The percentage %
2012	90000	74819	83.13
2013	103000	68322	66.33
2014	72852	83114	114.08
2015	72852	32554	44.68
2016	72852	93731	128.65

Table 9: Planned and Implemented Numbers of Buffalos Vaccinated against Hemorrhagic Septicemia (HS) in Basra Governorate from 2012 to 2016

The year	Planned	Implemented	The percentage %
2012	90000	104112	115.68
2013	82100	52799	64.31
2014	72852	44278	60.77
2015	72852	66922	91.86
2016	72852	37180	51.03

Table 10: Planned and Implemented numbers of Buffalos Vaccinated against Black Leg (BL) in Basra Governorate from 2012 to 2016

The year	Planned	Implemented	The percentage %
2012	90000	98614	109.57
2013	82100	55605	67.72
2014	72852	43465	59.66
2015	72852	66502	91.28
2016	72852	37180	51.03

which include quarantine, movement control, focused vaccination, disinfection, and public awareness programs. The FMD control program in Iraq has been confronted by many challenges: deficits in FMD surveillance and emergency preparedness, limited diagnostic capabilities, difficulties in restricting animal movement, and lack and irregular supply of appropriate vaccines [7].

In any disease control program there should be relevant rules and regulations which facilitate and support implementation of the control and eradication programs of selected diseases. Major factors having a negative impact on the vaccination program in Iraq were the rules affecting importation processes of the required amounts of vaccine during the vaccination

program. In addition, politics, improper personnel techniques and decisions by non-professionals in choosing the vaccine source contributed to a difficult and unstable situation in Iraq [49].

CONCLUSION

Water Buffalo in the Iraqi marshlands are an important resource potential that has not been emphasized or examined properly. The potential for developing new economic opportunities based on Water Buffalo husbandry could have a great impact on marshland communities. The local population needs assistance in developing this potential in a variety of ways. A cooperative, multi-disciplinary approach is needed to achieve such a goal and additional studies will be required to support better planning.

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