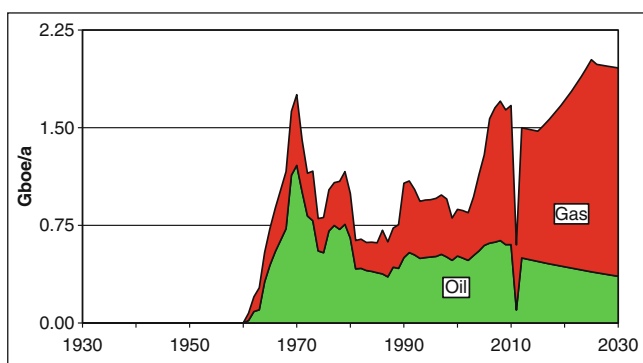
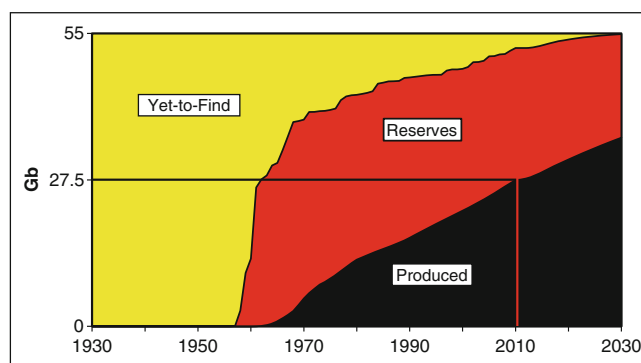


Table 11.1 Libya regional totals (data through 2010)

	Production to 2100					Peak Dates			Area	
	Amount		Rate			Oil	Gas		'000 km ²	
	Gb	Tcf	Date	Mb/a	Gcf/a	Discovery	1961	1977	Onshore	Offshore
PAST	27	21	2000	515	358	Production	1970	2030	1770	150
FUTURE	28	74	2005	596	696	Exploration	1963		Population	
Known	25	59	2010	602	1069	Consumption	Mb/a	Gcf/a	1900	0.5
Yet-to-Find	2.8	15	2020	455	1276	2010	105	242	2010	6.4
DISCOVERED	52	80	2030	376	1600		b/a	kcf/a	Growth	12.8
TOTAL	55	95	Trade	+497	+827	Per capita	16.5	38	Density	3.6

**Fig. 11.1** Libya oil and gas production 1930 to 2030**Fig. 11.2** Libya status of oil depletion

Essential Features

Libya covers an area of 1.77 million km², supporting a population of about 6 million, who live mainly along the Mediterranean seaboard. It has common frontiers with Egypt to the east, Algeria and Tunisia to the west, and Chad, Sudan and Niger to the south. A mountain range, known as the Akhdar, rises to 900 m in the northeast, but is flanked by true deserts and rocky arid plateaux over most of the rest of the country.

Oil exploration has led to the identification of an extensive fossil aquifer beneath the desert sands, which dates from before the last Ice Age.

Field	Date	Gb
Amal	1959	4.5
Beda	1959	1.0
Nasser	1959	2.0
Defa	1960	2.0
Gialo	1961	3.5
Sarir	1961	6.0
Waha	1961	1.0
A-Nafoora	1965	2.0
Intisar	1967	2.3
Bu Attifel	1968	1.5

Geology and Prime Petroleum Systems

Most of Libya's oil comes from the Sirte Basin, flanking a Gulf of the same name, but there have also been a number of isolated finds in the interior of the country, including those in the remote Ghadames Basin, which straddles the frontier with Algeria, as much as 600 km inland. The Sirte Basin covers an area of some 300,000 km², comprising a series of north-westerly trending rifts. It contains rich Upper Cretaceous and Paleocene source-rocks, which have charged reefal reservoirs, located both on the contemporaneous structural highs and in the overlying Eocene. Lower Cretaceous sandstones form additional reservoirs along the interior margin of the basin, as locally do fractured Cambro-Ordovician quartzites. High heat-flow led to early generation.

Exploration and Discovery

Exploration drilling commenced in 1957 with a minor find, and expanded rapidly in the ensuing years with as many as 144 exploration boreholes being drilled in 1963, an all-time peak. The effort was rewarded by a string of giant fields, listed in the table.

Substantial amounts of associated gas, totalling some 80 Tcf, were found in parallel.

Exploration drilling has however declined markedly since the 1980s, partly for political reasons. It will presumably cease during the present political crisis but may pick up in the future if stability returns, which is perhaps somewhat unlikely to happen soon.

Production and Consumption

Libya is a fairly mature province, although depletion has been slowed by political factors. There is a certain offshore potential awaiting evaluation, and the remote interior basins remain relatively unknown. Future discovery is here estimated at almost 2.75 Gb.

Gas has been produced from the deeper parts of the Sirte Basin, at the rate of 1,000 Gcf/a in 2010, prior to the political crisis, from reported reserves of almost 59 Tcf. There is evidently scope for exports to populous Egypt, if and when new pipelines are constructed and political circumstances permit.

The Oil Age in Perspective

The coastal strip of Libya, previously known as Cyrenaica, was settled by Phoenicians and Greeks, and became an important source of grain for the Roman Empire. It later fell under the control of Egyptian dynasties, which in turn led to its nominal incorporation in the Ottoman Empire, but for much of the last millennium it was a sparsely populated and inhospitable backwater of no great interest to anyone.

The country's modern history opened in 1911, when it was invaded by Italy. Initial resistance was soon subdued, and the country was settled by Italian peasants, being fully incorporated into the Italian State in 1939. In the Second World War, a German army under General Rommel advanced through Libya in 1942, only to be defeated at the Battle of El-Alamein. The Italian population was evacuated during the retreat, leaving the country to its Arab indigenous people, mainly belonging to the Senussi tribe. It became effectively a British Protectorate during and after the Second World War, before being granted full independence in 1951 under King Idris, a well-disposed ageing Senussi leader. The principal export of the country at the time was scrap-iron left over from the battlefields. Visitors remarked on the high incidence of one-legged inhabitants: the victims of the many minefields left over from the war.

The fortunes of Libya changed quite literally with the discovery of oil in 1957, which ushered in a period of economic expansion and even prosperity. A Petroleum Law had been passed in 1955 to pave the way for the entry of British and American oil companies, including Exxon, which made the first major strike at Zelten in the Sirte Basin, 150 km in from the Mediterranean coast. It found light crude, which compared favourably with Middle East supplies, especially as Libya was closer to the European markets. As is so often the case, discovery followed discovery as a new prolific trend was opened up, so that by the end of the 1960s, the country's production briefly passed 3 Mb/d, exceeding even that of Saudi Arabia. Most of the major companies concentrated on the heart of the Sirte Basin, while BP headed into the interior to bring in the remote Serir Field, a giant with almost 5 Gb of oil, which was found in 1961. It contains oil with a high wax content that may block pipelines if they are shut down by political tensions, as has recently been the case. The opening of Libya gave a particular opportunity to the smaller oil companies, such as Occidental and Oasis (a consortium of Marathon, Amerada and Conoco), which had been largely excluded from the Middle East.

But the new production drowned Europe in a flood of cheap oil, which depressed world prices, being one of the factors prompting the creation of OPEC, which Libya joined in 1962. Libyan oil took on even more strategic value following the Six-Day War in 1967, although that further inflamed Arab nationalist passions reacting to Israel's occupation of Palestine. The scene was set for a coup d'état to replace the ageing, pro-Western, King Idris, and on 1 September 1969, a group of officers, led by Colonel Muammar al-Qaddafi, declared a Republic.

The new regime at first sought unions with neighbouring countries, including Egypt, the Sudan, Tunisia and later Morocco, resurrecting the notion of a greater Arab nation, but the efforts ended in failure even triggering a brief war with Egypt in 1977. Col. Qaddafi changed the Constitution to create what was termed the Popular Islamic Socialist State to represent the mass of people, although he remained firmly in control. In fact, this formula did not differ greatly from the Communist regimes in several countries, or the Ba'athist Party of Iraq.

In 1971, Libya nationalised the holdings of BP as a gesture in its support of Islamic and pan-Arab power, establishing a national oil company, which now controls some 60% of the country's production.

The US support for Israel led to deteriorating relations during the 1980s, which culminated in the US aerial attack in 1986. It aimed to assassinate Qaddafi, but killed his daughter instead. This may have prompted a retaliatory act of planting a bomb on an American airliner in 1988, which exploded over the Scottish town of Lockerbie with tragic loss of life, although a similar outcry did not accompany the death of Qaddafi's daughter. (Various alternative explanations for the bombing have been advanced, some seeing it as a contrived incident to strengthen anti-Arab feeling in relation to the Israeli conflict.) Libya too is said to have encouraged revolutionary movements in many countries, including the Irish Republican Army. It was as a consequence made subject to the US trade

sanctions which have been in force since 1996. They exclude the US companies from operating, but several European companies continued to work there satisfactorily. In 2003, Libya negotiated an end of sanctions with the payment of three billion dollars to the relatives of the Lockerbie victims.

Born in 1942, Col. Qaddafi became a mellowing dictator showing some signs of rapprochement with the Western powers, which may however have suffered a setback with the invasion of Iraq that has understandably inflamed Arab passions everywhere. A revolution in Tunisia in early 2011 sparked unrest throughout North Africa and parts of the Middle East. The people of eastern Libya, who largely belong to the Senussi tribe, to which the previous leader, King Idris, belonged, rose in rebellion, to be brutally suppressed by Qaddafi forces. Later, the United States, Britain and France led NATO military forces under a UN resolution to support the rebels and oust Col. Qaddafi from power. It may be supposed that the country's oil endowment prompted this intervention, as other humanitarian crises as in Syria or Rwanda did not trigger a response. Col. Qaddafi was finally killed but at the time of writing has yet to be replaced by an effective government. Western contractors and oil companies are now lining up to try to make money from Libya's oil, repairing the damage caused by the attack.

The flush oil production from the early giant fields is coming to an end as is the easy wealth that flowed from it. It is too soon to evaluate the consequences of the current political tensions and foreign intervention, but looking ahead it may be time for the country to think of replanting and tending the olive groves introduced by the Italian colonists during the early years of the last century because there is not much else to do in the barren deserts. The country also probably faces increasing pressure from Egypt whose vastly greater population will desperately need access to its remaining oil and gas. That threat apart, the modest size of its population augers well for the future of the country.

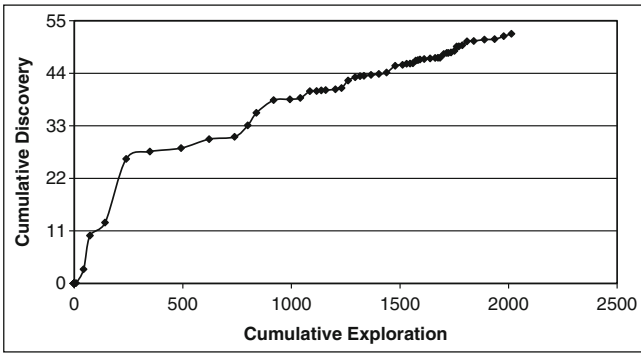


Fig. 11.3 Libya discovery trend

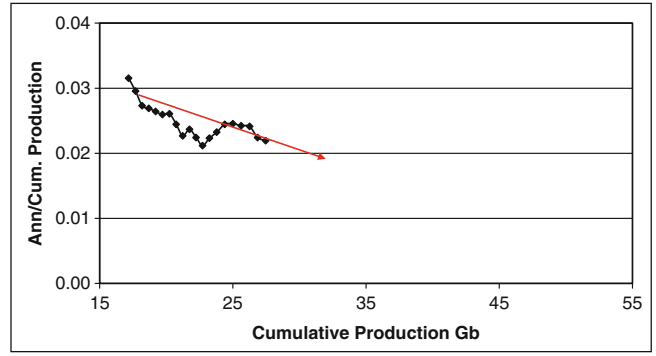


Fig. 11.4 Libya derivative logistic

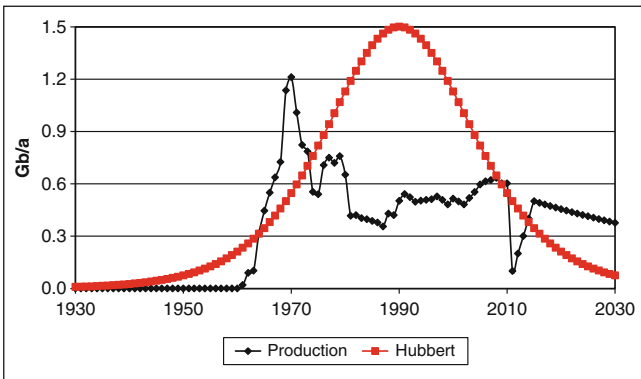


Fig. 11.5 Libya production: actual and theoretical

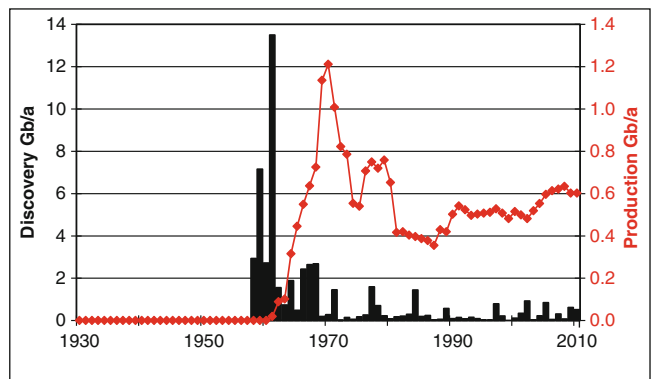


Fig. 11.6 Libya discovery and production