Ministry of Environment
Service of Planning and Programmes

Statistical Analysis for Fires in Lebanon for the Year 2007

Source: MoE - FFC

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November 2007

Acknowledgment

The Service of Planning and Programmes would like to thank the professional work carried out by Mr. Georges Akl, forest engineer, for his assistance in classification of some variable used in this study. We would also like to thank Mrs. Patty Farah, GIS specialist, for her efforts in producing "Fire Map of Burnt Area Classified by Casa".

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Executive Summary

A catastrophic and disastrous year on forests, this is what can be said about the year 2007. Internal Security forces, ISF, recorded a total of 275 fires till 25/10/2007. These fires, 118 fires consumed 1,810 ha of "Forests", 42 fires consumed 226 ha of "Cultivated Lands" while the rest, 84 fires consumed 1995 ha of "Other Wooded Land with Trees" and "Other Land", taking into consideration that data for burnt land classification is available for 89% of the recorded fires. Total burnt area in 2007 is 4,031 ha, an increase of 360% compared to the previous year.

As usual, Mount and North Lebanon Mohafaza contained the majority of fires, 63% of total fires. Mount Lebanon contained 41.1% versus 21.8% for North Lebanon. Nabatieh, South Lebanon and Bekaa accounted for 15.6%, 14.2% and 7.3 respectively.

Most catastrophic fires occurred in the months of September and October. Plants in these two months are in a state of extreme drought; this fact helps in the rapid spread of fires and generates difficulty in surrounding, controlling and putting down fires. Average of burnt area per fire in the months of September and October is 15 ha and 33 ha respectively. While the average of burnt area for August and July is 7 ha and 6 ha respectively.

Alley, Byblos, Akkar and Shouf Caza were the most affected caza in 2007. Fires burnt an area of 674.23 ha in Alley Caza, 19% of total burnt area. As for Byblos, Akkar and Shouf Caza, they represented 28.8%, 6% and 17% of total burnt area.

"Private Property" constituted 95% of burnt properties in 2007, an increase of 30% compared to 2006. Many questions can be raised here about if the fires are accidental or incendiary.

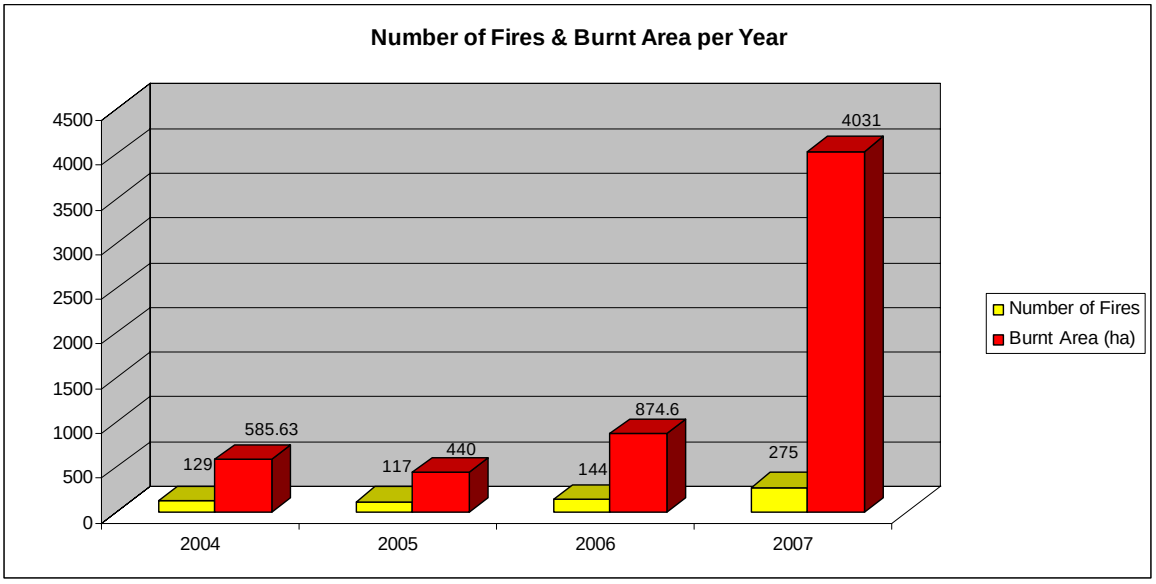
Using a Chi-square test, a significant statistical relationship was found between "Burnt Land Ownership" and "Burnt Land – Use" for fires from 2004 till 2007 with a significance level of 0.000 at 95% confidence interval. Contingency coefficient, a measure that indicates both the strength and the significance of the relationship between two variables, by giving it a value between 0 and 1, showed that the relationship between the above two variables is significant and its value is 0.451.

Civil Defense is the major partner in firefighting; it participated in firefighting 95% of fires in 2007. Lebanese Army, ISF and Civil Community participated in 13.2%, 3.1% and 2.7% respectively.

32 fires classified as "Catastrophic" forming 14% of the total number of fires burnt 84% of the total burnt area in 2007, 3400ha. Although their number is relatively small compared to "Considerable" and "Limited" fires, but they are the have a disastrous effect on the vegetation cover.

I- Comparison with Previous Years

Burnt area in 2007 recorded 4,031ha; an increase of 360% compared to 2006 and an increase of 816% compared to 2005. This disastrous raise in burnt area is mainly due to the fires that erupted simultaneously in different Mohafaza in the month of October.



In general, the average of burnt area in each fire in 2007 was about 18 ha. This average is the highest compared to the last three years were it was 6.2, 4.9 and 7.6 ha in 2004, 2005 and 2006 respectively.

Area burnt in each fire in 2007 can be divided into four partitions each one forming 25%:

1- 25% of area burnt was less than 0.7 ha
2- 25% of area burnt was between (0.7 – 2) ha
3- 25% of area burnt was between (2 – 10) ha
4- 25% of area burnt was more than 10ha

Burnt Area 2007 - ha

N	Valid	223
	Missing	52
Mean		18.07
Std. Deviation		83.6
Sum		4030.97
Percentiles	25	.700
	50	2.00
	75	10.00

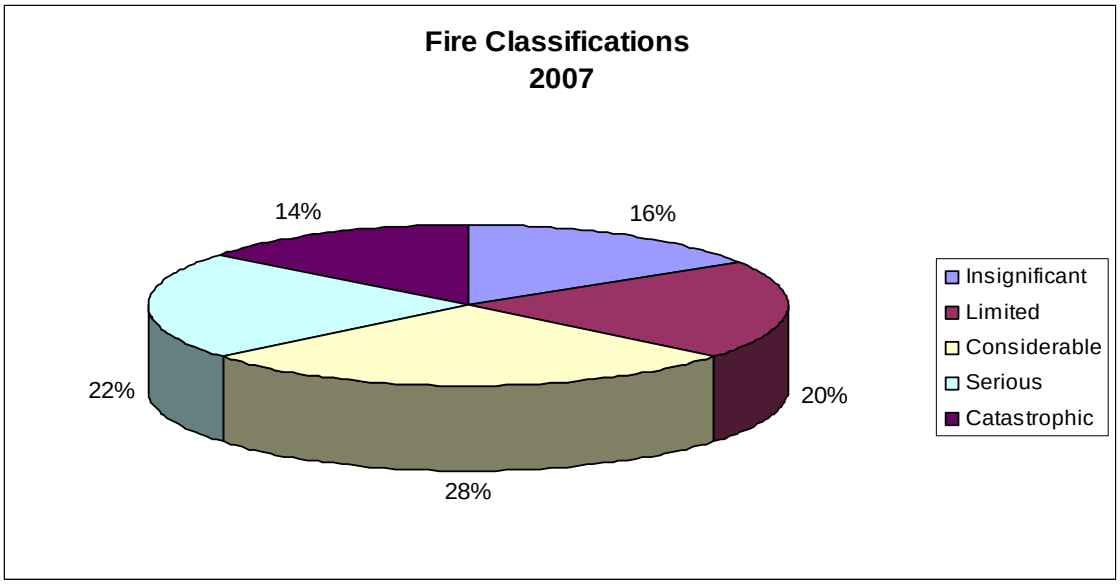
The 95% confidence interval is (7.04-29.11 ha). This means that when a fire occurred in 2007, we are 95% confident that burnt area will be between 7 and 29 ha. The 95% confidence intervals for 2004, 2005 and 2006 were (1.8-10.6 ha), (2.2-7.6 ha) and (5-10.3 ha) respectively.

II- Fire Classifications

Fires are classified into 5 categories:

1- Insignificant
2- Limited
3- Considerable
4- Serious
5- Catastrophic

36% of fires in 2007 were classified to be "Serious" or "catastrophic" fires with 22% and 14% respectively.



Although "Catastrophic" fires has the least percentage but they are most damaging when it comes to burnt area. 32 "Catastrophic" fires burnt 84% of total burnt area in 2007.

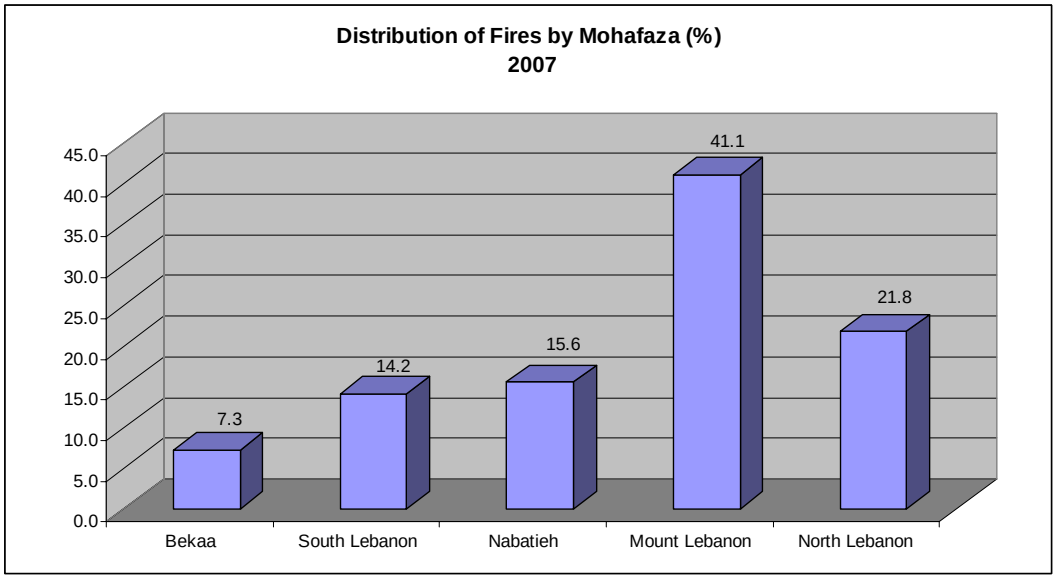
Burnt Area per Fire Classification

		Burnt Area - ha
Fire Classification	**Insignificant**	8.66
	Limited	40.70
	Considerable	148.70
	Serious	401.90

	Catastrophic	3401.00

III- Fires per Mohafaza

Like previous years, Mount and North Lebanon Mohafaza had the majority of fires in 2007. Mount Lebanon counts for 41.1% while north Lebanon for 21.8%. This is due to the fact the most of the vegetation cover in Lebanon is found in these two mohafaza. The stake of Nabatieh and South Lebanon increased from 9.9% for both of them in 2006 to reach 15.6% and 14.2% respectively in 2007. One reason for this addition in fires is due to the presence of unexploded ordnance that hampered the efforts of firefighters in controlling and putting down the fires.



Mount Lebanon was the most affected Mohafaza with respect to burnt area in 2007. Around 58% of total burnt are was in Mount Lebanon. It lost 2,372 ha, 1,182 ha in the month of October. North Lebanon also suffered a lot from fires, losing 827 ha, 415 ha in the month of October.

Burnt Area per Mohafaza (ha) - 2007

		Burnt Area - ha
Mohafaza	Bekaa	325.30
	South Lebanon	273.59
	Nabatieh	232.80
	Mount Lebanon	2372.19
	North Lebanon	827.08

Burnt Area is classified into four categories:

1- Forest Species
2- Cultivated Land
3- Other wooded Land with Trees
4- Other Land

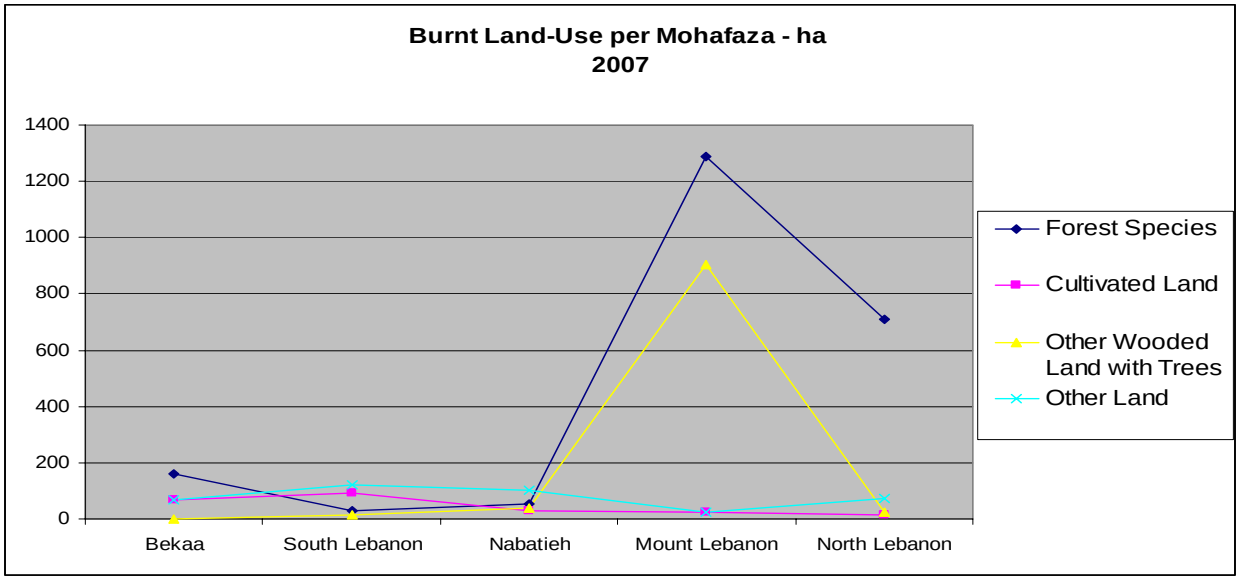
Fires consumed 2,245 ha of "Forest Species" in 2007. More than half of this area, 57% was in Mount Lebanon which lost 1,287 ha of forests. North Lebanon lost 710 ha of forests forming around 31% of the total burnt forest area.

As for "Cultivated Land", fires burnt an area of 226 ha, most of them located in the Mohafaza of South Lebanon and Bekaa with 93 ha and 67 ha respectively.

"Other Wooded Land with Trees" lost 985 ha, 92% of them were lost in Mount Lebanon. "Other Land" lost 383 ha, 32% of them in the Mohafaza of South Lebanon.

Burnt Land-Use per Mohafaza - 2007

		Burnt Area - ha			
		Burnt Land-Use			
		Forest Species	**Cultivated Land**	**Other Wooded Land with Trees**	**Other Land**
Mohafaza	**Bekaa**	162.30	67.00	.	66.00
	South Lebanon	30.99	93.00	14.70	119.91
	Nabatieh	54.50	28.30	39.00	99.70
	Mount Lebanon	1287.69	22.30	905.90	22.80
	North Lebanon	710.30	15.85	25.23	75.00

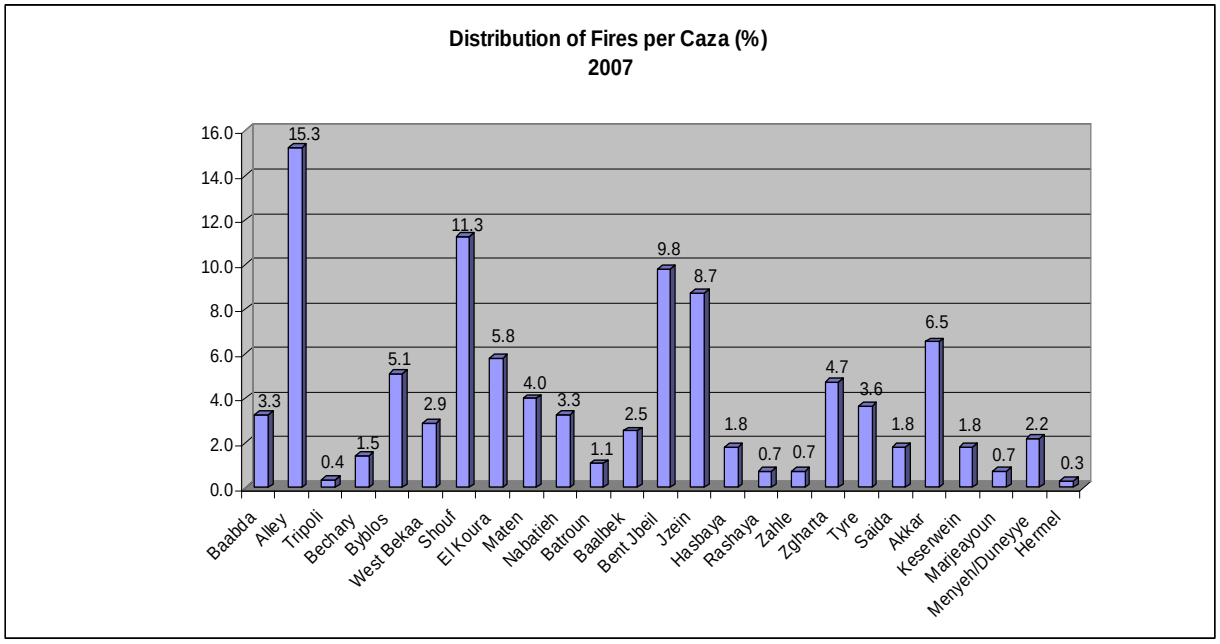


IV- Fires per Caza

Five Caza contained 51% of the total number of fires in 2007, they are:

1- Alley, 15.3%
2- Shouf, 11.3%
3- Bent Jbeil, 9.8%
4- Jezin, 8.7%
5- Akkar, 6.5%

Compared to 2006, Bent Jbeil and Jezin had a significant increase in the number of fires. For Bent Jbeil, its share in the number of fire doubled, from 4.4% in 2006 to 9.8% in 2007. As for Jezin, its share in 2006 was 2.2%, but in 2007 it boosted to reach 8.7%. One reason for this rise in their share is due to the presence of unexploded ordnance after the July War which forms a major obstacle in putting down fires by the Civil Defense.



On the hand, since the number of fires in each Caza may not reflect the real damage on the vegetation cover, the following table represents the area burnt in each Caza and its percentage from the total burnt area.

Five Caza were mostly affected by fires in 2007, combined they form 76% of total burnt area:

1- Alley, 674.6 ha
2- Byblos, 1,028.1 ha
3- Shouf, 612.6 ha
4- Zgharta, 546.3 ha
5- Akkar, 214 ha

These five Caza are characterized by their vegetation cover so they are greatly affected by fires every year.

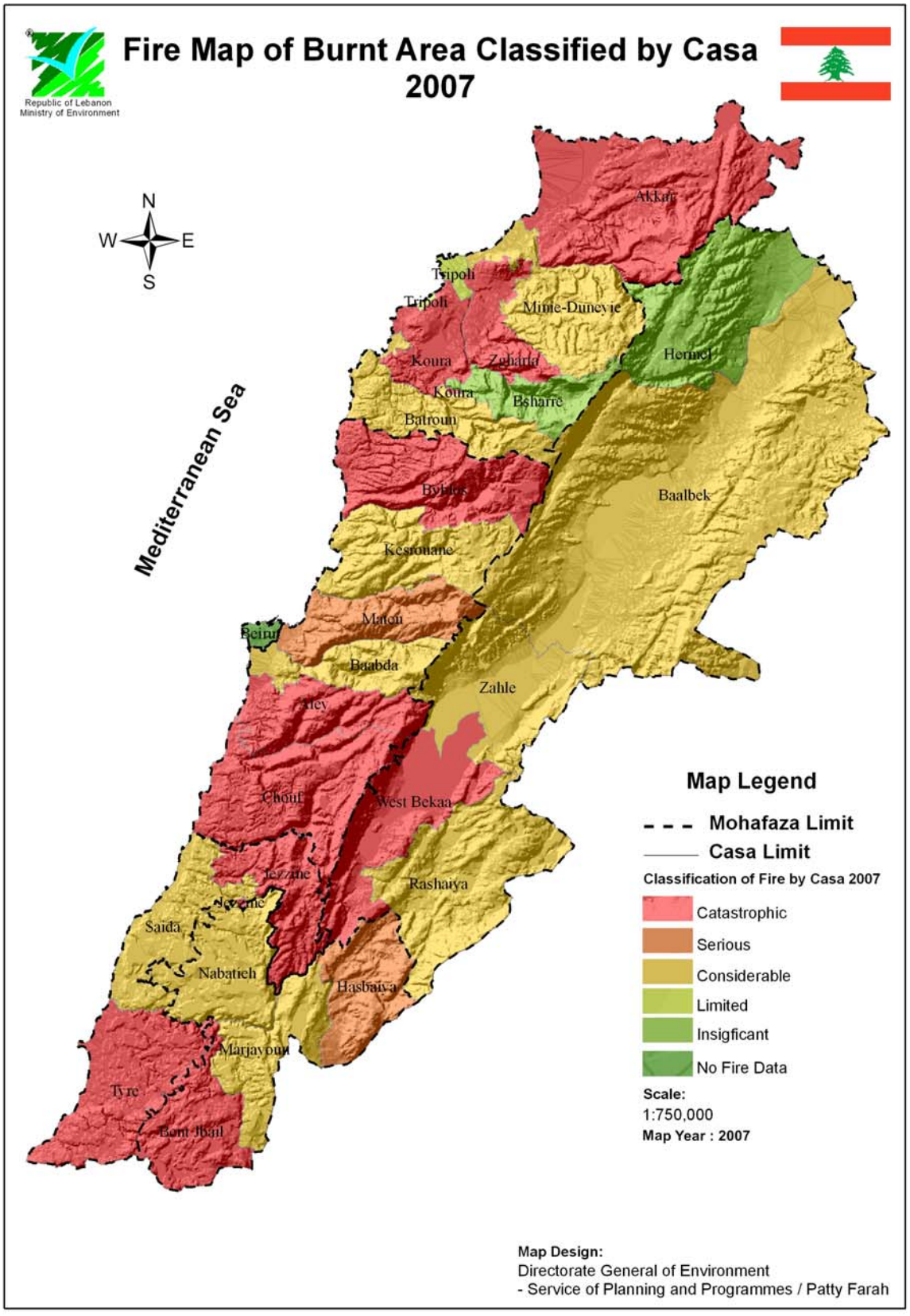
Bent Jbeil and Jezin although they had many fires, but their percentage of burnt area is relatively small with 3.7% and 3.4% respectively.

We can conclude from this that the average area burnt in each fire in Bent Jbeil and Jezin was relatively small compared with the average

Burnt Area per Caza - 2007

Caza	Burnt Area - ha	%
Baabda	23.90	.6%
Alley	674.63	16.7%
Tripoli	.50	.0%
Bechary	.75	.0%
Byblos	1028.10	25.5%
West Bekaa	162.00	4.0%
Shouf	612.60	15.2%
El Koura	39.90	1.0%
Maten	30.46	.8%
Nabatieh	28.70	.7%
Batroun	11.03	.3%
Baalbek	103.30	2.6%
Bent Jbeil	148.60	3.7%
Jzein	135.60	3.4%

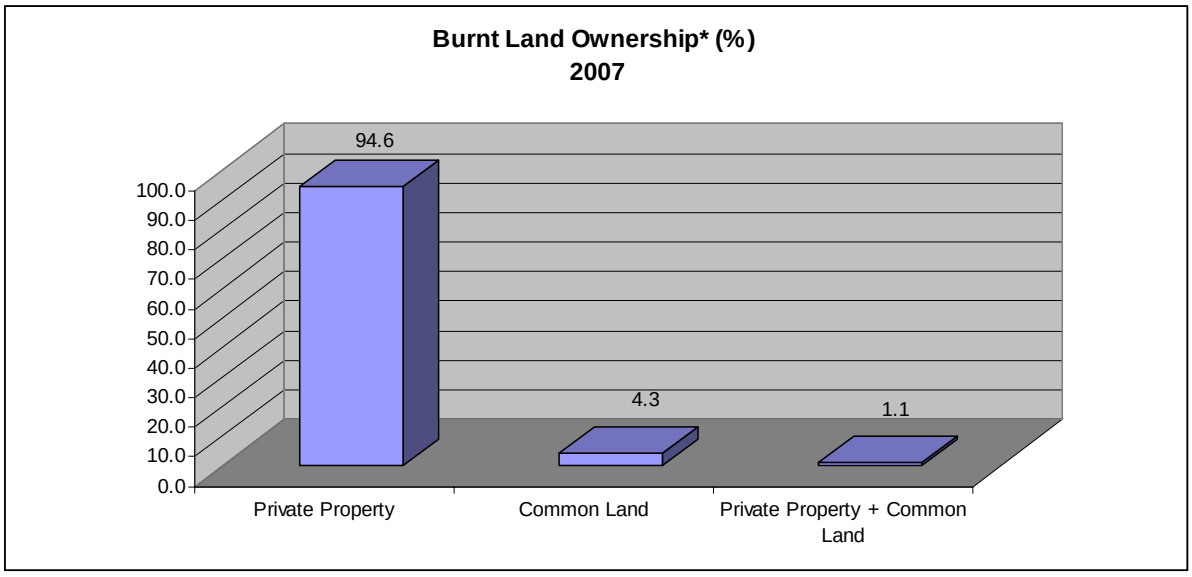
Hasbaya	45.50	1.1%
Rashaya	40.00	1.0%
Zahle	20.00	.5%
Zgharta	546.30	13.6%
Tyre	134.00	3.3%
Saida	4.00	.1%
Akkar	214.00	5.3%
Keserwein	1.50	.0%
Marjeayoun	10.00	.2%
Menyeh/Dun eyye	15.60	.4%
Hermel	.	.


Fire Map of Burnt Area Classified by Casa 2007
Republic of Lebanon
Ministry of Environment
N
W
E
S
Mediterranean Sea
Akkar
Tripoli
Tripoli
Minie-Dunieyie
Hermel
Koura
Zgharta
Koura
Bsharre
Batroun
Byblos
Baalbek
Kesrouane
Matn
Beirut
Baabda
Zahle
Aley
Chouf
West Bekaa
Jezzine
Rashaiya
Saida
Nabatieh
Hasbaiya
Marjayoun
Tyre
Bent Jbail
Map Legend
Mohafaza Limit
Casa Limit
Classification of Fire by Casa 2007
Catastrophic
Serious
Considerable
Limited
Insigficant
No Fire Data
Scale:
1:750,000
Map Year : 2007
Map Design:
Directorate General of Environment
- Service of Planning and Programmes / Patty Farah

V- Burnt Land Ownership

"Private Property" constituted the vast majority of burnt areas in 2007, around 95%. There can be many explanations for this fact:

1- The owners of agricultural lands tend to practice some agricultural activities such as grubbing and burning dried weeds in order to replant their lands and sometimes they can not control the burning weeds and fire spreads to other private and common properties.
2- Some land owners tend to burn their lands in order to change their lands' classification to get permits to use their lands in different ways that were prohibited according to the previous classification.
3- Some people living in mountain areas tend to use the burnt trees instead of gasoline in winter in order to save money.



*Data is available for 33.5% of fires.

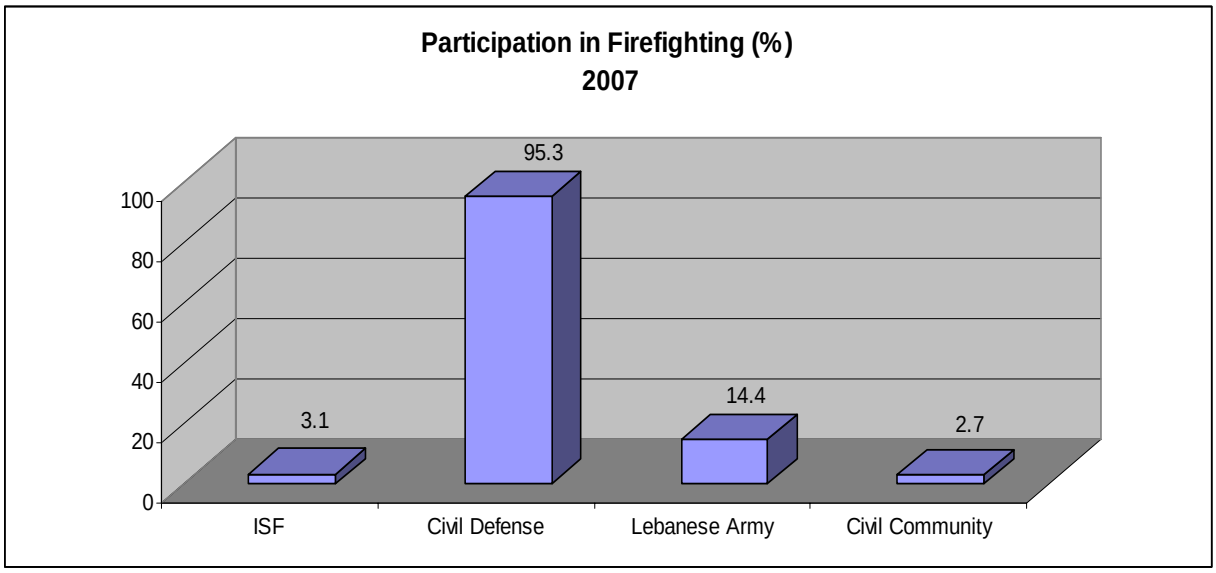
To see if there is a relationship between burnt area and burnt area ownership, we performed a Chi-square test for the fires from 2004 till 2007. The results were significant at the 95% confidence level; this means that the mentioned variables are related. To measure the magnitude of this relation we used the contingency coefficient, a measure that indicates both the strength and the significance of the relationship between two variables, by giving it a value between 0 and 1, showed that the relationship between the above two variables is significant and its value is 0.451.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	**Contingency Coefficient**	.451	.000
N of Valid Cases		214	

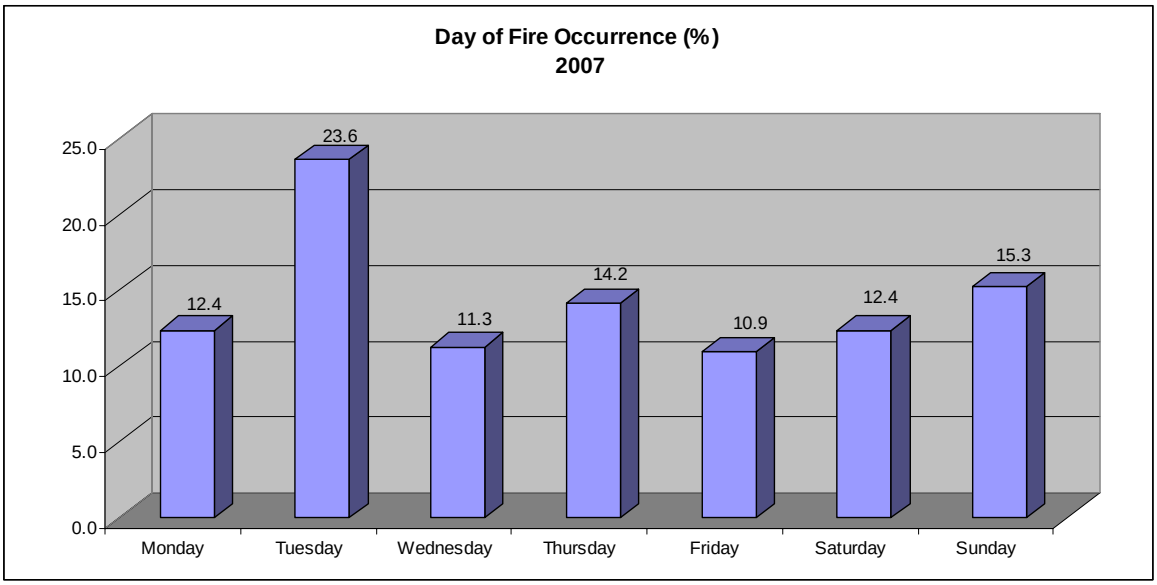
VI- Firefighting

Civil Defense is the most effective stakeholder in firefighting; its firefighters participated in putting down 95% of fires in 2007. The Lebanese Army helped in firefighting 37 fires. Those fires are characterized to be large fire that couldn't be controlled by the Civil Defense alone. The average burnt area that the Lebanese Army had to intervene is 35 ha. Internal Security Forces, ISF, shared in firefighting 8 fires while the Civil Community in 7 fires.

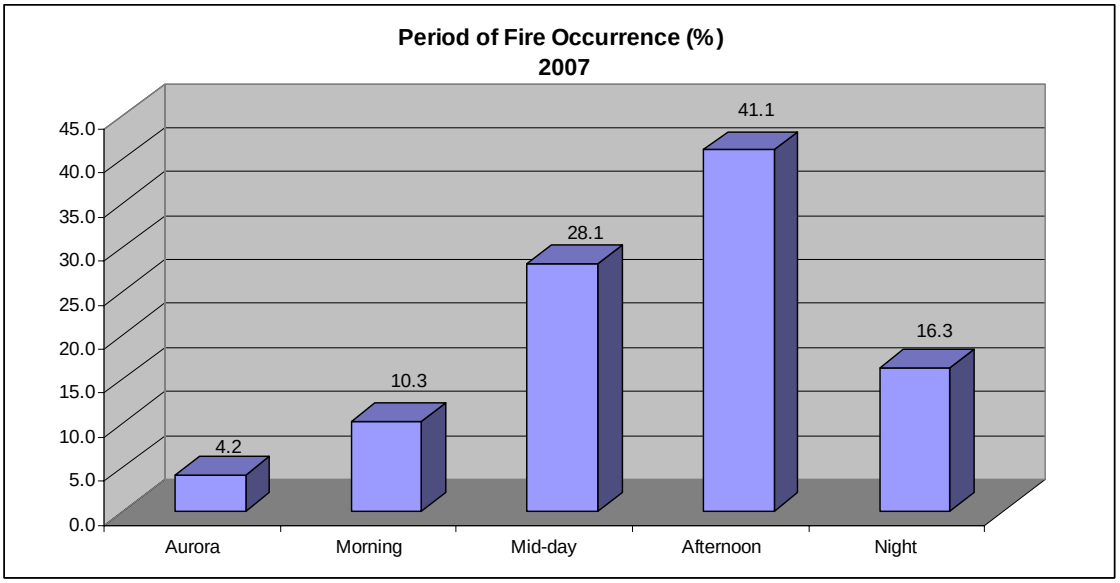


VII- Fires and Week Days

Tuesday was the most frequent day in fire occurring, unlike previous years where fires were somehow equally distributed on week days. This year, 65 fires happened on Tuesday, 23% of the total number of fires. Of these 65 fires, 29 occurred on October, the month that witnessed the catastrophic fires.



It should be mentioned that in 2007, it was recorded by the Internal Security Forces that 11 fires began in the aurora period; 6 of these 11 fires happened on Tuesday and in the same month which is October. These five fires are from the fires that happened between 2-3 and 23 October.

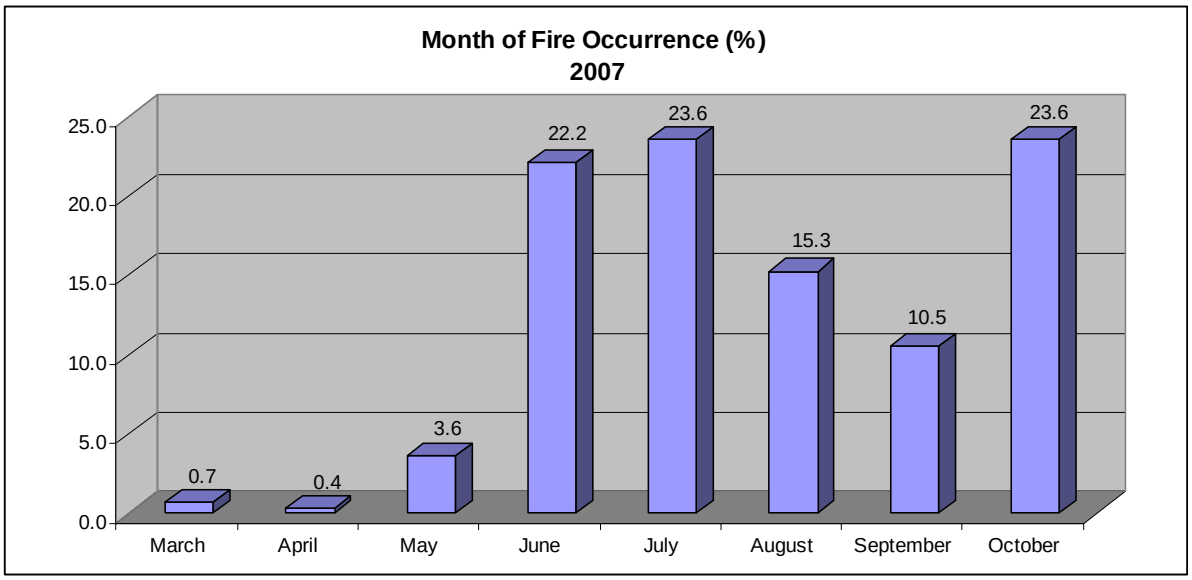


It's not known till now if these fires are incendiary or accidental. Many related variables should be studied and analyzed like air temperatures, humidity, existence of waste dumps, existence of unexploded ordnance, etc….

Mid-day and Afternoon had around 70% of the fires with 28.1% and 41.1% respectively. This result is very logical because air temperature and human activity reach their peak in these two periods. As for the fires that happen in the Aurora period, they a lot of examination and analysis to know if they were incendiary.

VIII- Fires and Months

Fire season began in June in 2007 with 61 fires that burnt an area of 1345.6 ha. On average, each fire that happened in June burnt an area of 22 ha. September, which was in previous years known for its fires, had a decrease in its share of fires reaching 10.5% and recording burnt area of 347.2 ha.



The most catastrophic month in 2007 was the month of October. Burnt area reached 1720.9 ha, around twice the area which was burnt in the year 2006. October had more fires in the "Aurora", "Morning" and "Night" periods compared to other months. As stated earlier in 2007, 11 fires occurred in the "Aurora" period were recorded by the Internal Security Forces. 10 out of these 11 happened in October.

Burnt Area per Month

		Burnt Area - ha		
		Number of fires	Area burnt - ha	Average of burnt area per fire
Month of Fire Occurrence	January	0	.	.
	February	0	.	.
	March	2	2.20	1.10
	April	1	1.00	1.00
	May	10	16.70	1.67
	June	61	1345.60	22.05
	July	65	353.78	5.44
	August	42	243.56	5.79
	September	29	347.23	11.97
	October	65	1720.90	26.47
	November	0	.	.
	December	0	.	.

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