Pruning in the olive orchard [printed version also available in Arabic]

Abdine M., Famiani F., Cardone G.L.

in

Di Terlizzi B. (ed.), Dragotta A. (ed.), Jamal M. (ed.).
Syrian national strategic plan for olive oil quality : final report

Bari : CIHEAM
Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 73

2007
pages 67-73

Pruning in the Olive Orchard

M. Abdine[1], F. Famiani[2], G.L. Cardone[3@]
[1]GCSAR, Idleb, Syria
[2]Dept. of Agricultural and Environmental Sciences, University of Studies of Perugia, Italy
[3]Consortium of Defense and Exploitation of the Intensive Productions, of the Environment and Rural Territory of the Province, Bari, Italy
[@]Corresponding authors: gianluigicardone@virgilio.it

SUMMARY – The Italian cooperation project "Technical Assistance for the Improvement of Olive Oil Quality in Syria", carried out in 2004-06 period, included the improvement of the agronomic techniques and the transfer of technological innovation to Syrian olive growers. In this context, a specific activity was dedicated to olive pruning, also considering the use of machines to execute such a practice.
In general, the development of mechanization can improve the competitiveness of Syrian olive growing in comparison to that of other countries and make Syria a country in the vanguard of the use of technologies. Technological innovation is not only aimed to increase the production, but also to reduce the costs and improve the quality of the product and of the working conditions of operators.
The exchange of knowledge and experiences between the Italian and Syrian experts and the local farmers on pruning techniques was fruitful and mainly focused on the improvement of the production (quantity, quality and regularity) and phytosanitary state of the trees and the reduction of the occurrence of burns on branches (caused by intense solar rays in some regions) and cost for the execution of such a practice.
In order to promote the technological modernization of the Syrian olive growing, demonstrations of mechanical pruning with pneumatic scissors and saws were performed. An evaluation to appraise the convenience of the use of machines for pruning and harvesting in the Syria conditions was also carried out.

Key words: Manual pruning, Mechanical pruning, Improvement of oil quality, Economic convenience of mechanical pruning and harvesting

RESUME - *Un plan de amélioration de la qualité de l'huile d'olive en Syrie passe à travers l'amélioration et l'innovation des opérations des téchniques de cultivation et le transfer dans les oliveraies syriens. Dans ce cadre, la taille et sa méchanization recouvrent un role fondamental dans l'optique de la réduction des couts de production et l'amélioration de la qualitè.*
L'exchange des connaissances et d'expériences entre les experts italiens et syriens et aussi les agriculteurs sur la technique de taille, a étè fondamentale pour rechercher des nouvelles solutions pour am -éliorer aussi l' état phytosanitaire des arbres, pour équilibrer les phases végéto-productives et pour la réduction de l'alternance de production en protégeant le bois de l'exces de radiation solaire.
Avec la modernization technologique des oliveraies syriens il faudra considérer aussi une action finalisèe à introduire aux oliviculteurs les machines pour la récolte méchanisèe, à côtè de cela une étude économique a étè réalisè pour évaluer la convenience et la rentabilitè de l'achat de ces machines pour la taille et la récolte avec des accessoires supplementaires.

Mots-clès: *Taille, mechanization, amélioration de qualitè, rentabilitè économique*

Introduction

In Syria olive is generally trained according to the globe system (Photo 1).

On adult trees, pruning is executed every 2 years in about 60% of farms, every 1 year in about 30% and every 3 years on about 10% (*Source: Project Survey 2004-6*).

Generally, olive growers prune at different times in relation to the area considered:

- in coastal areas the pruning starts in October, after harvesting, and continues up to April;
- in inland areas pruning is executed in two periods: November-December and March-April.

Pruning is executed manually, using mainly scissors. Mechanical pruning in Syria is not widespread, probably because of affordable cost of labour (6-7 €/day) and the ready availability of workers; however, finding specialised pruners is more and more difficult also because young people are not continuing this activity preferring emigration or work in other sectors.

Photo 1: Typical traditional pruning of a tree trained to globe

Project related activities

Within the Italian Cooperation project “Technical Assistance for the Improvement of Olive Oil Quality in Syria”, some lessons, demonstrations and simulations were carried out in order to give useful indications for the improvement of olive tree pruning in Syria.

In particular, during short missions in Syria, some theoretical-practical lessons were delivered, in the class and in the field, on olive tree pruning techniques, giving particular emphasis to the vase training system. Discussions focussed on technique of cutting, disinfection of wounds and how to use pruning in order to improve production, to avoid or reduce phytosanitary problems, to reduce alternate bearing, to avoid the break-up of branches, to predispose the tree to mechanical harvesting.

Some field demonstrations regarding the use of pruning machines in the olive areas of Aleppo-Afrine, Idleb, Homs and Lattakia were carried out. The machines considered were pneumatic scissors and saws operated by a compact air compressor powered by a diesel engine transported by a pick-up car.

An economic study on the convenience of mechanical pruning, also considering equipment integrated with pneumatic combs for olive harvesting, was carried out.

Results

The observations on pruning techniques in Syria, especially in the olive areas of Lattakia, Idleb and Homs, showed that trees are generally trained according to the globe system in order to avoid the solar rays entering inside the canopy causing burns on branches. However, in some cases (Lattakia and Tartous areas characterised by relatively cooler temperatures and higher rainfall), the globe system caused bad canopy aeration with stagnation of damp that favours some diseases, such as *Spilocaea oleagina* and *Mycocentrospora cladosporioides*. In several cases, trees presented an excess of primary branches and secondary branches that often overlapped. Primary branches, sometimes, run horizontally for a long part and this can favour the occurrence of breaking-ups. Secondary branches, in some cases, had an anomalous “U” shape. With pruning often too many vertical headed secondary branches were left. Lesions and superficial dried wood on the branches were sometimes noticed together with the presence of lichens and saprofitarian fungi (Photo2). This damage might be attributable to burns caused

by the direct exposure to the solar rays. However, this phenomenon was not observed in Afrine-Aleppo area where olive trees are trained according to a shape similar to a vase, with direct entrance of the sun radiation inside the canopy. This could be explained considering the cooler conditions of this area and, according to the opinion of Syrian technicians, the different susceptibility of different varieties.

Photo 2: Damaged branch

The practical pruning demonstration on some olive trees according to the vase system had a scarce attention, above all from the farmers. However, it was considered interesting to prune some olive trees according to the vase training system, in order to evaluate the differences with the globe system in terms of production and burn damage over the next years.

Demonstrations of pruning with pneumatic pruning machines (scissors and saws) had a good involvement of the operators. During the discussions with farmers some general observations emerged:

- the effectiveness of the pruning equipment is good in terms of quality of cuttings and working capacity;
- the cost of the pruning equipment looks excessive for the Syrian financial availability; generally, the low cost of manpower makes not convenient the purchase of such equipment, especially for small size olive farms.

This situation pushed the experts to evaluate the technical-economical convenience of the mechanization of pruning and, as the same equipment with the addition of some accessories can be also used to detach olives from trees, harvesting. Three situations were considered (Table 1):

1) mechanization only of pruning;
2) mechanization only of harvesting;
3) mechanization of both pruning and harvesting.

Comparison between Annual Manual Pruning and Mechanized Pruning (*)						
hectares	trees**	workers pruning	hours / day / worker	minutes / tree / worker	trees / day / worker	days / farm
1	110	3	6.5	40	9.8	11.3
1	110	3	6.5	27	14.4	7.6
						18.9
hectares	trees**	workers pruning	hours / day / worker	minutes / tree / worker	trees / day / worker	days / farm
59	6490	3	6.5	40	9.8	665.6
59	6490	3	6.5	27	14.4	449.3
hectares	trees**	workers pruning	hours / day / worker	minutes / tree / worker	trees / day / worker	days / farm
58	6380	4	6.5	40	9.8	654.4
58	6380	4	6.5	27	14.4	441.7

Comparison between Annual Manual Harvesting and Mechanized Harvesting (*)						
hectares	trees**	workers harvesting	hours / day / worker	kg / tree	kg / farm	kg / worker
1	110	3	6.5	27	2970.0	100.0
1	110	3	6.5	27	2970.0	250.0
hectares	trees**	workers harvesting	hours / day / worker	kg/ tree	kg / farm	kg / worker
5	550	3	6.5	27	14850.0	100.0
5	550	3	6.5	27	14850.0	250.0
hectares	trees**	workers harvesting	hours / day / worker	kg / tree	kg / farm	kg / worker
7.5	825	3	6.5	27	22275.0	100.0
7.5	825	3	6.5	27	22275.0	250.0

Comparison between Annual Pruning and Harvesting, Manual and Mechanized (*)						
hectares	trees**	workers pruning	hours / day / worker	minutes / tree	trees / day / worker	days x farm
ha	n	n	n	minutes	n	n
9.3	1023	3	6.5	40	9.8	104.9
9.3	1023	3	6.5	27	14.4	70.8
hectares	trees**	workers harvest-ing	hours / day / worker	kg / tree	kg x hectar	kg x worker
ha	n	n	n	kg	kg	kg
9.3	1023	3	6.5	27	27621.0	100.0
9.3	1023	3	6.5	27	27621.0	250.0
			total days machine for mechanized harvesting and pruning			

Note: (*) with air presser, 3+3 scissors, 2 saws at chain for pole, 2 poles 2mt, 1 pole 3mt, 1 scissor with pole 2 mt, 1 scissor with pole 3mt, 20 faucet with spring, 10 grafts with spring, 1 saws at chain, skein 150mt, 2 comb shaker (total cost euro 5.500)
(**) Type of tree cv sorani or kaisi 25-30 years of age.
Unit of measure used for costs is euro (1 euro ≈ 65 Sy P)

Comparison between Annual Manual Pruning and Mechanized Pruning (*) (cont'd)						
days / worker	daily cost / worker	total work cost	difference	rate annual amortization machine	fuel cost	differ. between manual and mechanized pruning cost
3.80	6	67.69				
2.50	6	45.69		1000.00		
			22		5.08	-983.08
days / worker	daily cost / worker	Total work cost	difference	rate annual amortization machine	fuel cost	differ. between manual and mechanized pruning cost
221.90	6	3993.85				
149.80	6	2695.85		1000.00		
			1298		299.54	-1.54
days / worker	daily cost / worker	Total work cost	difference	rate annual amortization machine	fuel cost	differ. between manual and mechanized pruning cost
163.60	6	3926.15				
110.40	6	2650.15		1060.00		
			1276		220.85	-4.80

Comparison between Annual Manual Harvesting and Mechanized Harvesting (*) (cont'd)							
days harvesting	days / worker	daily cost / worker	cost work total	difference	rate annual amortization machine	fuel cost	differ. between manual and mechanized harvesting cost
29.70	9.90	6	178.20				
11.88	3.96	6	71.28		760.00		
41.58				106.92		5.23	-658.31
days harvesting	days / worker	daily cost /worker	cost work total	difference	rate annual amortization machine	fuel cost	differ. between manual and mechanized harvesting cost
148.50	49.50	6	891.00				
59.40	19.80	6	356.40		760.00		
				534.6		26.14	-251.54
days harvesting	days / worker	daily cost /worker	cost work total	difference	rate annual amortization machine	fuel cost	differ. between manual and mechanized harvesting cost
222.75	74.25	6	1336.50				
89.10	29.70	6	534.60		760.00		
				801.9		39.20	2.70

Comparison between Annual Pruning and Harvesting, Manual and Mechanized (*) (cont'd)							
days / worker	daily cost / worker	work cost total	difference	rate annual amortization machine	fuel cost	differ. between manual and mechanized pruning cost	
	euro	euro	euro	euro	euro	euro	
35.00	6	629.54					
23.60	6	424.94		429.69			
			204.60		47.22	-272.30	
days harvesting	days / worker	daily cost / worker	cost work total	difference	rate annual amortization machine	fuel cost	differ. between manual and mechanized harvesting cost
n	n	euro	euro	euro	euro	euro	euro
276.21	92.07	6	1657.26				
110.48	36.83	6	662.90		670.31		
	36.83			994.36		44.19	279.85
	60.40						7.50

	manual operation		mechanized operation
	critical date		
	If it is a positive value, the minimum area to have economic benefit to use machine is 9.3 hectares		

In each situation, the mechanical execution of pruning and/or harvesting was compared to the manual one/s. It can be observed that for the three situations, the cost of the equipment changes according to the used accessories, while the economical duration of the machine was always considered of five years (economical/technical life).

A lot of techno-economical information was given by Syrian technician to make this simulation as near as possible to the reality.

The obtained results showed that around 58 ha are necessary to pay back the cost of the machines in five years if used for pruning only (situation 1). According to a project survey carried out on 444 farms in the main olive regions of Syria no farms were surveyed with such a high area. Very few farms in Syria have an area greater than 58 ha.

Contrarily, if the equipment is used only for mechanical harvesting (situation 2), only 7.5 ha (75 dnum) are enough to pay back the machine cost in five years.

Finally, if machines are used for both pruning and harvesting (situation 3), 9.3 ha (93 dnum) are required to pay back the cost of the whole equipment in five years.

Conclusions

Taking into account the modalities with which olive pruning is currently carried out in Syria and the results of demonstration and simulation activities that were performed some suggestions can be given in order to improve the impact of such practice on olive cultivation and revenue.

Pruning in internal areas where there are frost risks should be done not too early, because pruning increases the susceptibility of trees to frosting temperatures. Therefore, in these areas it is advisable to concentrate pruning in March. In all the areas where olive is cultivated, pruning should not be executed too late, that is when trees have started they vegetative growth. Therefore, pruning in April in most areas should be reduced at minimum and, however, should be concentrated in the first part of the month.

Annual pruning allows regulating at best the balance between vegetative and reproductive activities and so contributes to reduce alternate bearing. The execution of pruning every 2 or more years allows reducing the cost for such practice but favours the occurrence of alternate bearing. When possible, it is advisable to execute pruning annually. In intensive olive growing it must be done annually, while in extensive ones it could also be done biennially.

In the coming years, it will be important to evaluate the behaviour of the trees that within the demonstration activities were pruned according to the vase training system, because this training system could be interesting in areas characterised by a relatively lower solar ray intensity and/or a relatively high air humidity (northern and coastal areas of Syria).

The execution of pruning should avoid the accumulation of too much wood caused by an excess of primary branches and an excessive overlapping of secondary branches.

The demonstration and simulation activities carried out within the project showed that in farms that have an area cultivated with olives larger than 9.3 ha (93 dnum) it is possible and economical to use machines for the pruning and harvesting of olive trees. The use of machines just for pruning is convenient only in very large farms (> 58 ha), of which there are very few in Syria.

Considering that in Syria most of the farms have a small size, it may be advisable to stimulate a collective use of the equipment (especially among neighbours and relatives), that allows a decrease of the maintenance and amortization costs.

In case of olive growers associations these machines find their ideal working environment.

The use of machines for pruning and harvesting, particularly in large farms, provides also advantages that are very important for the olive growing of Syria that in the future will be more and more oriented to quality and improved operative conditions for workers:

- reduction of the time required by pruning and, therefore, considering that when pruning is per-

formed it is often cold and rainy, it becomes easier to execute such cultural practice in the most favourable periods;

- reduction of the time required to harvest olives; this makes it easier to concentrate the harvesting in the period that allows to maximise the quantity and the quality of the oil and to reduce the risk of an excessive olive drop and of late attacks of *Bactrocera oleae* (olive fly);
- increase of the quantity of olives harvested daily and so the reduction of the risk of an excessive olive storage since, at farm level, the amount of olives needed for processing can be reached in a shorter time.

Finally, it has to be considered that there are predictions that manpower costs will increase in the next years and this will make more convenient the use of machines for the executions of pruning and harvesting.