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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 63-66

Article available on line / Article disponible en ligne à l'adresse :

<http://om.ciheam.org/article.php?IDPDF=800337>

To cite this article / Pour citer cet article

Abdine M., Barrani A., Jafar A.M., Bourghoul A., Fulfuleh A.R., Zakaria M., Nus B.E., Cardone G.L., Dubla E. **Main integrated management techniques in olive orchards [printed version also available in Arabic]**. In : Di Terlizzi B. (ed.), Dragotta A. (ed.), Jamal M. (ed.). *Syrian national strategic plan for olive oil quality : final report*. Bari : CIHEAM, 2007. p. 63-66 (Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 73)



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Main Integrated Management Techniques in Olive Orchards

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SUMMARY - "Integrated Management" is a high-quality production technique to improve the environmental safety. This method consists in ecologically-safer cropping techniques as well as reduction of synthetic chemicals use in order to increase safety for human health and the environment. It is based on techniques (control, pest management, agronomic, phytopathological, etc.) with a particular attention to the farm balance and the enhancement of the quality of productions.

Soil erosion and loss of fertility is reduced by the application of a minimum tillage, few operation and reduction of inputs on the environmental system are also recommended at this regard.

In this case all farming system is considered like a whole natural complex system that might be destroyed if not properly protected and maintained. Soil, water, air represent the main constituents of this delicate agro-eco system and all together form an important contribution to the growth of plants.

Soil is a main constituent and represents the base for the trees life; for this reason tillage has to be done superficially (in the very first part of the soil), to preserve his structure and microflora. Besides it's important to give back to the soil a proper quantity of organic matter to restructure it, increase microflora activity and let it able to gather higher quantity of water. Irrigation and water resource are used but in order to reduce at the maximum the losses.

Key words: Integrated management, IPM, soil fertility, soil structure, irrigation, tillage

RESUME - La « gestion intégrée » est une méthode de produire et de faire agriculture tout en protégeant l'environnement. Cette méthode prévoit des techniques d'aménagement et de cultivation spécifiques qui ne compromettent pas l'environnement avec aussi la réduction au maximum possible des engrais et pesticides chimiques utilisés. Cette philosophie se base aussi sur des techniques qui considèrent la qualité final du produit et à la sauve-garde des balances entre les différentes composantes de l'agro écosystème. L'érosion du sol et la perte en fertilité est réduite grâce aux techniques de labour minimal, avec aussi la réduction des apports qui sont très importants dans ce contexte.

Dans ce cas, l'ensemble du system agricole est considéré comme un systeme complexe naturel qui pourra être détruit si on est pas près à le protéger et maintenir.

Sol, eau et air représentent les constituants principales de ce délicat agro éco-système en donnant tous ensemble une contribution et un apport important au développement et à la qualité final du produit olives/huile. Le sol est un des sujets sur lesquels il faut concentrer les attentions et il représente la base pour la vie des arbres; pour cette raison le labour du sol doit être le plus superficiel possible (dans les premiers centimètres de sol) pour protéger la structure et la microflore. En plus que cela, c'est aussi important de restituer au sol une quantité raisonnable de matière organique de façon que la structure et la microflore puissent être gardées.

Dans l'agriculture intégrée l'eau et les ressources hydriques sont utilisées mais d'une façon contrôlée en réduisant au minimum les apports et par conséquent, les pertes.

Mots-clés: Gestion intégrée, fertilité du sol, structure du sol, irrigation, labour du sol

Tillage

Actually in Syria farmers till the soil 2-6 times every year. The main periods are: November – December (after harvesting to kill a large number of pupa of *Bactrocera oleae*, especially if a high infestation on olives has been observed), April, June, July, August, September, October.

The most common machine to cultivate the soil is the tractor with a typical Arab 8 teeth plough which can cultivate the soil up to a depth of 20 – 30 cm. The average cost of one tillage is: 12 €/ha.

In some regions (e.g. Salken- Aleppo) some farmers do up to 10 cultivations/year.

Farmers in some regions behave this way since the soil is clay and deep, with the characteristic that in summer this soil cracks and ploughing is then useful to keep the humidity reduce the evaporation.

Cultivation of the soil is a normal requirement, but it's important to do in the right way and in time.

The Integrated Management suggest the most suitable way to till having a low impact on soil. For example in the spring after pruning the material could be ground and then incorporated into the soil. Other use of the cultivation is after the distribution of fertilizers in winter.

In the Syrian conditions, and in the case of cracking soils (vertisols), it's necessary to do 2-3 cultivations/year at no more than 15 cm depth. It's suitable and advisable to maintain a grass fence all around the olive field, since this allows the olive pest's parasitoids to complete their life cycle.



Photo 1: Typical Arabic plough

Use of fertilizers

Few Syrian farmers apply chemical fertilization only (15% of the surveyed), a higher quota of farmers (50%) prefer to use manure (Project survey, 2004-6), the remaining quota of farmers mix chemical and manure fertilisers or they apply them in alternate years.

The first application is normally done after harvesting and the added amount per tree (at an average age higher than 20 years) might be 1 kg of super phosphate (50 %), 1 kg of potassium sulphate (50%). In very arid environments with low rainfall in spring might be advisable to distribute during winter 2 kg of N (48%).

As general reference, the maximum amounts of nutrients that could be given to a healthy olive orchard (trees older than 20 years) in good cultural conditions and in full production are the following:

N	14 kg/dnum	P ₂ O ₅	5 kg/dnum	K ₂ O	14 kg/dnum
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It is self understood that fertilization techniques have to be evaluated by a professional also taking into consideration average rainfall distribution and intensity and soil type; for this reason we suggest that the above cited amounts are not increased for Syrian conditions, on the contrary, they might even be reduced in case of more arid environments and/or if by-products are spread (olive mill waste water, as reported in the related chapter of this report).

A second application can be done in spring after dormant period 1kg N (33%) or 2.5 kg Nitrogen if

no fertiliser was added after harvesting.

Those doses are determined considering that only chemical fertilization is applied. If organic fertilization is also applied then the doses have to be reduced. If nitrogen chemical application is not done both in the end of winter, then it could be done only at once by distributing 10-12 kg of nitrogen/dnum. If trees cover with their crown more than 50% of the field surface, distribute the fertilisers uniformly and till the soil immediately after spreading. Otherwise, distribute the fertilizers near the trees (at the border of the crown).

In case of occurrence of nitrogen deficiency, in spring it is possible to spray the leaves with nitrogen fertilisers; it avoids spraying during flowering.

Another solution is to use organic fertilisers. Normally Syrian farmers apply 7-10 kg of manure/tree, but most of soil is poor of organic matter due to several reasons. So it's better to give more than 10 kg of mature manure for each tree. A good advice can also be to apply a mix composed by 2/3 sheep or cow manure and 1/3 of chicken manure. Chicken manure is very rich of Nitrogen and this element is very important for vegetative growth and new shoots and branches. At this regard, the following average contents of nutrients in organic fertilisers have to be considered: in a ton of ovine manure there are 5-7 kg of nitrogen, 2-5 kg of phosphorous, 5-15 kg of potassium and 3-4 kg of magnesium, in a ton of cow manure there are 3-6 kg of nitrogen, 1-4 kg of phosphorous, 4-10 kg of potassium and 1-3 kg of magnesium. Manure is normally added every 2-3 years, but it's better to spread it every year one time in all the season.

One important operation to do just after spreading the manure is to plough the soil to avoid loss in Nitrogen due to gasification.



Photo 2: Chemical fertilization

Cover crops

Actually in Syria most farmers don't use cover crops. They normally till the soil to get rid of the spontaneous grass. In fact cover crops represent a good agronomic technique to maintain equilibrium in soil and furnish some nutrients as well. Green manure for example can give up to 10 kg/dnum of nitrogen (about 50% of which is available in the same season of the cutting) especially if composed of legumes (the amount of organic nitrogen provided by a mix of cereals and legumes is reduced to about half).

During the project activities green manure has been accepted with enthusiasm by olive growers, the composition of the mix (8 Kg/dnum) has been: 20% of barley and 80% of mixed local legumes (*Vicia* spp. and *Lathirus* spp.)

Soil cultivation to keep clean the surface and cut cover crops must be done in first blooming period (only when 5% of legumes' flowers start to open).



Photo 3: Green manure



Photo 4: Detail of the used legumes

Irrigation

Actually in Syria just 5% of the olive orchards are irrigated with old system of emergency by water tank and PE pipes. Many Syrian varieties of olive tree are resistant to water stress, but production can be increased in quantity and quality if a water support is given.

So one is better advised to do irrigation, if possible, in case of water shortage when necessary.

As an indication, seasonal irrigation volumes in areas with rainfalls of 450-600 mm/year are range from 150 to 250 m³/dnum. Higher volumes are required in more arid environments.

The season to give support is the summer, from June to September.



Photo 5: drip irrigation in a new orchard (Hama)

Conclusion

The IPM method, based on techniques (control, pest management, agronomic, phytopathological, etc.) with a particular attention to the environmental system, has the function to reduce the exploitation of the soil. So it is important to do a minimum of tillage, few operations and reduction of inputs.

All farming systems must be considered a natural reserve that can be destroyed. So the farmers must not forget that soil, water and air are important parts of this system and all together give an important contribution to the growth of the plants. For this reason, a network of Syrian technicians has to be organized to give the right information to the farmers about the parasites of the plant and the management of the soil system. In the same way, demo plots must be organized to give demonstration of management and create an occasion to share experiences among farmers and technicians. The government should support these activities, ensuring also regular training of the technical staff.