



DYNAMIC SOD MULCHING AND USE OF RECYCLED AMENDMENTS TO INCREASE BIODIVERSITY, RESILIENCE AND SUSTAINABILITY OF INTENSIVE ORGANIC FRUIT ORCHARDS AND VINEYARDS

Outcomes from the stakeholder surveys
(2019)



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Information about the participants

The survey was conducted in Italy, Bulgaria, Poland and Switzerland, with a total of 76, 21, 30, and 13 participants respectively. The average age of the farmers per country is around 40 to 50 years old, whereby the average is slightly higher in Italy and Switzerland compared to Bulgaria and Poland (Fig. 1, left). The farmers are exclusively men in Switzerland, almost exclusively men in Italy and Poland, and mostly men in Bulgaria with a proportion of women of around 40 % (Fig. 1, right). Producers mostly have a secondary education in Italy and Switzerland, whereas the proportion of secondary and tertiary education of the producers is about half each in Bulgaria and Poland (Fig. 2).

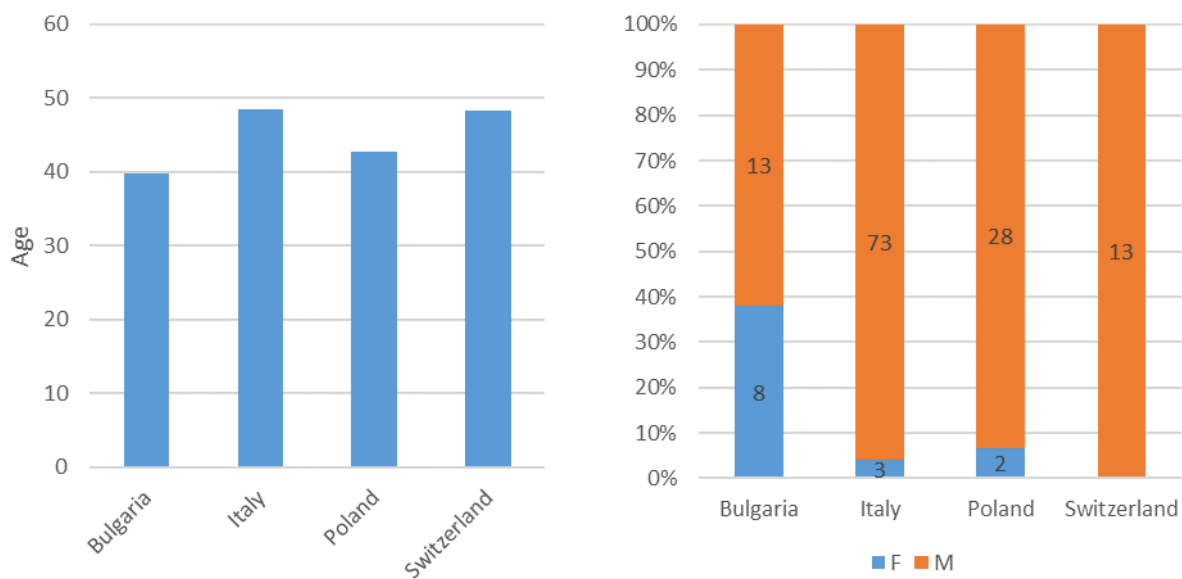


Fig. 1: Age (left) and gender (right) of the participants per country.

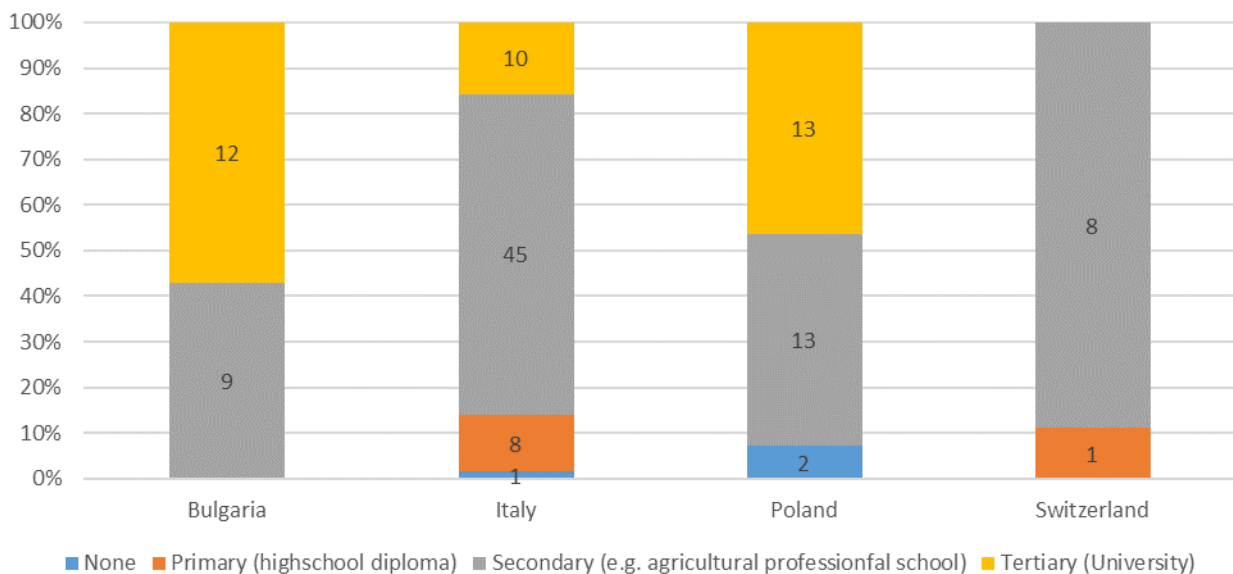


Fig. 2: Education level of the participants per country.

Information about the farm

In Italy, the fruits are almost only marketed via cooperatives, while in Bulgaria and Poland the fruits are mainly marketed via wholesalers (Fig. 3). In Switzerland, the different marketing methods including marketing via a cooperative, a wholesaler, a retailer, or direct marketing, are more balanced, with often several marketing methods per farm (Fig. 3).

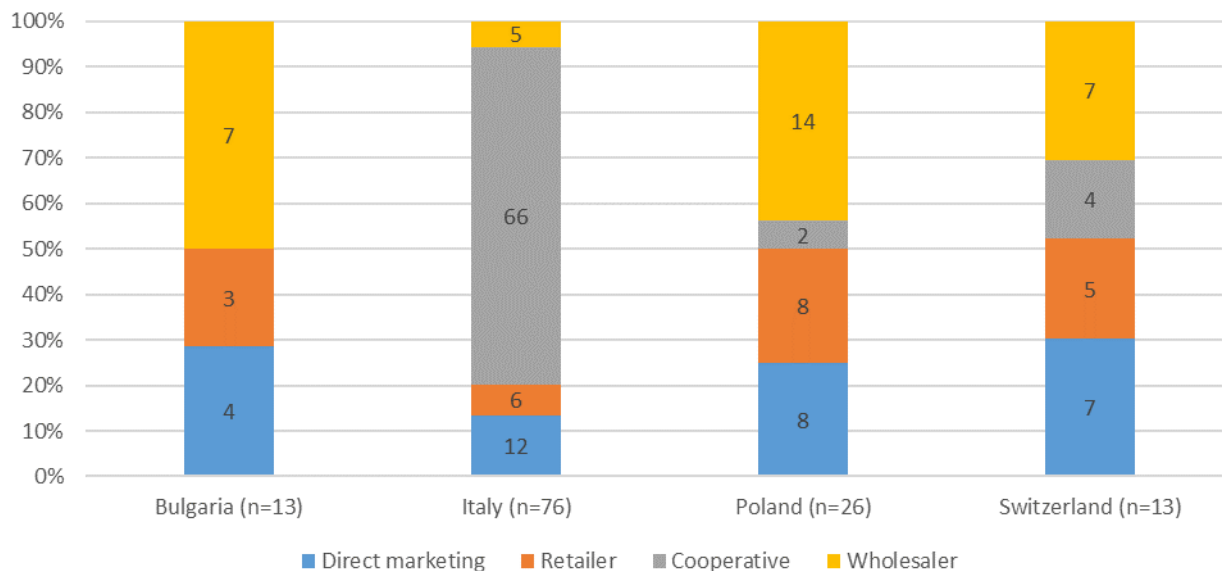


Fig. 3: Method of marketing per country.

In Italy, the farm size is rather small with an average size of around 6 ha, and farmers are almost exclusively growing fruits (Fig. 4). In Bulgaria, the farm size is very heterogeneous and ranging from 0.4 to 100 ha. Furthermore, 6 out of 21 farmers are only growing walnuts. The average farm size in Poland is around 20 ha, used almost exclusively fruit production. In Switzerland, the average farm size is around 30 ha with only about half of it used for fruit production. The remaining half is used as grassland or for fodder production or for production of arable crops. In Italy and Switzerland, almost three quarters of the fruit production area is used for apple production (no data available for the other countries) (Fig. 5). Switzerland is the country where organic farming is practiced for the longest amount of time (around 25 years on average), followed by Italy (around 15 years on average), and Poland and Bulgaria (3 years on average) (Fig. 6).

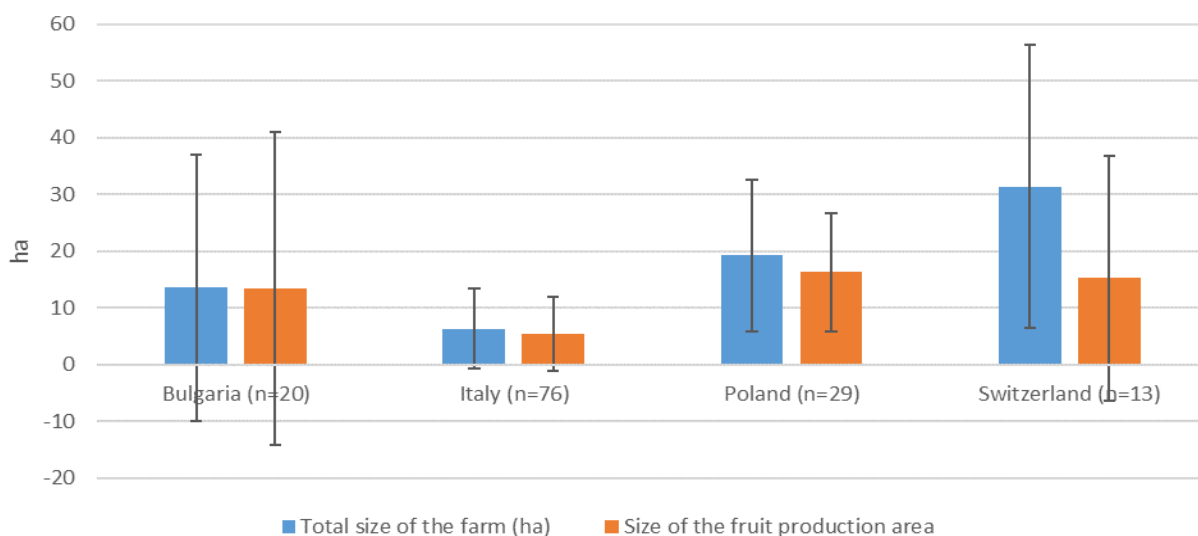


Fig. 4: Average of the total farm size (ha) and average of the fruit production area (ha) per country.

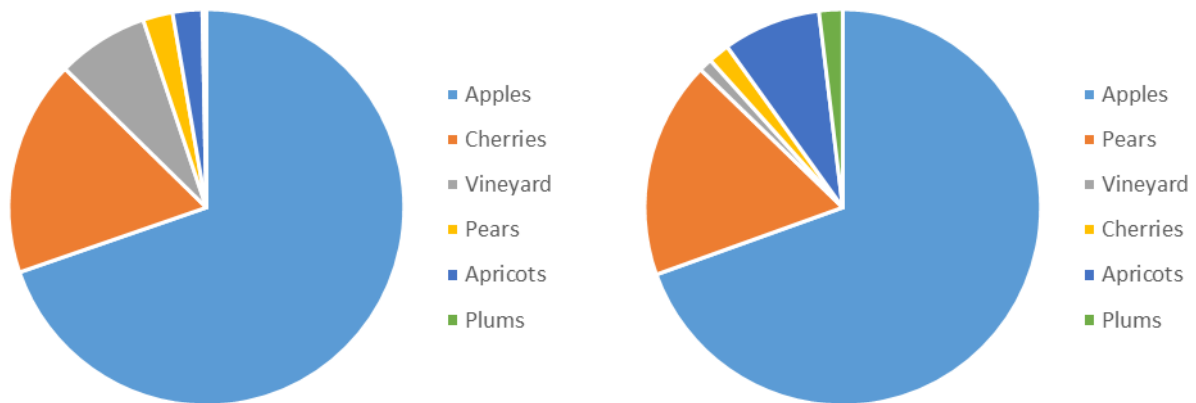


Fig. 5: Share of total area of the different fruit crops for Italy (left, n=69) and Switzerland (right, n=13).

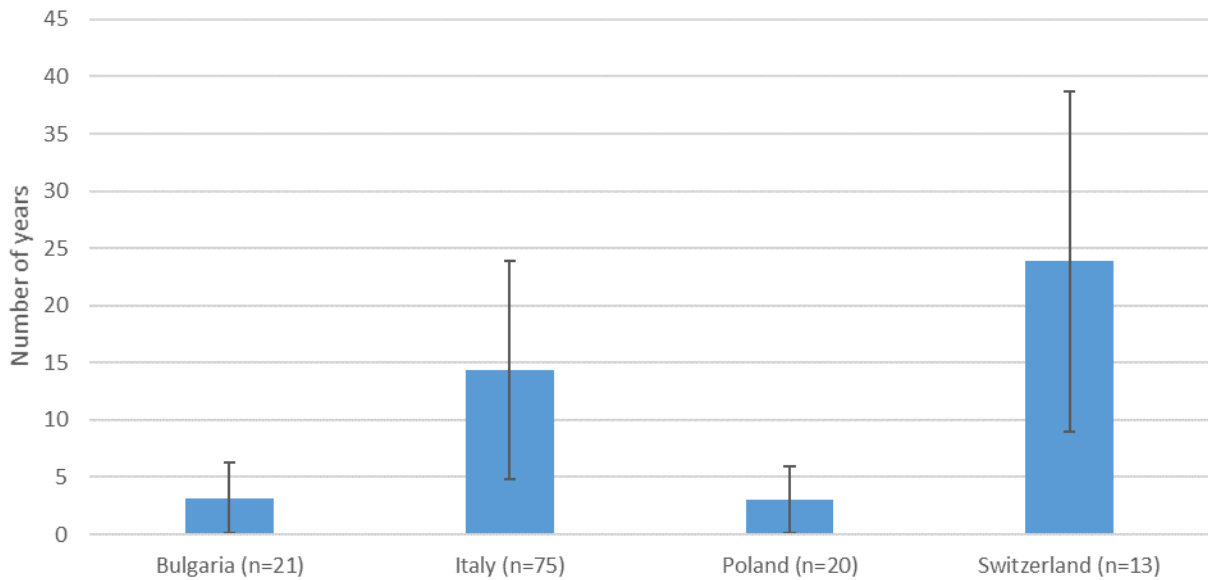


Fig. 6: Number of years since which organic production is practiced.

General Information about the orchard (focus on the important variety in terms of area)

The age of the orchard is around 10 years for all the countries. The farmland has been used for fruit production the longest time in Italy (around 70 years on average), followed by Poland (around 40 years on average), Switzerland (around 30 years on average), and Bulgaria (around 10 years on average) (Fig. 7). Crop rotation is usually not applied, except for Poland, where it is applied in 45 % of the cases (Fig. 8). In Italy and Poland, the same species has been replanted more than twice on the same area in most of the cases (Fig. 9). On the other hand, trees have never been replanted in Bulgaria. In Switzerland, the proportion of farmers having replanted never, once, twice and more than twice is about equal.

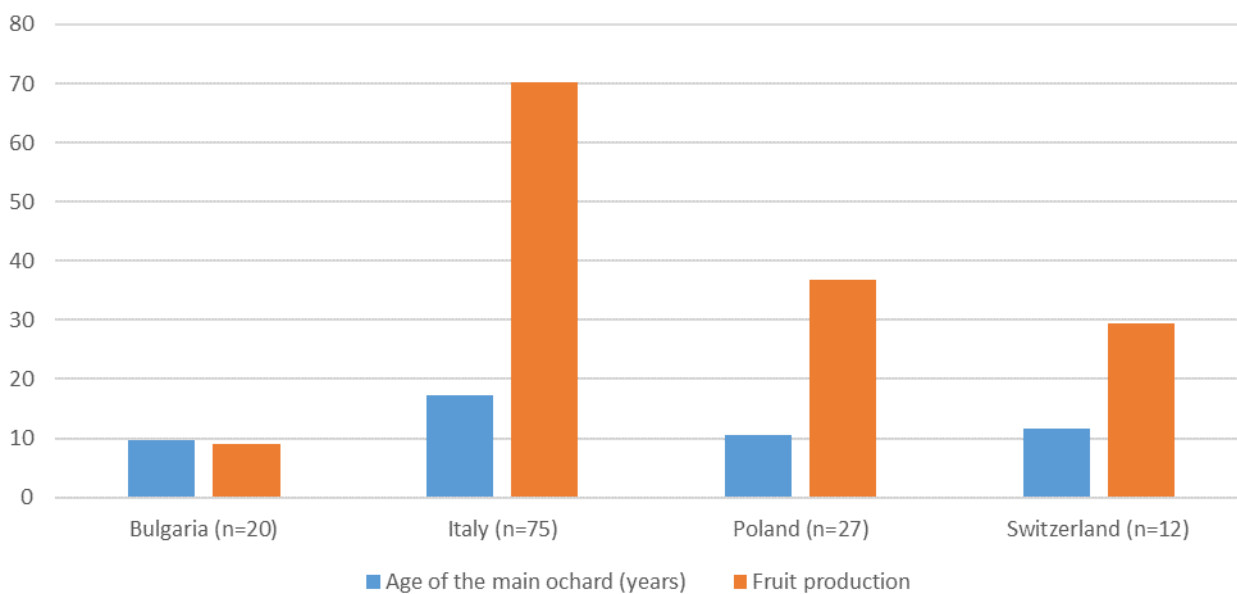


Fig. 7: Age of the main orchard and number of years since which the area is used for fruit production.

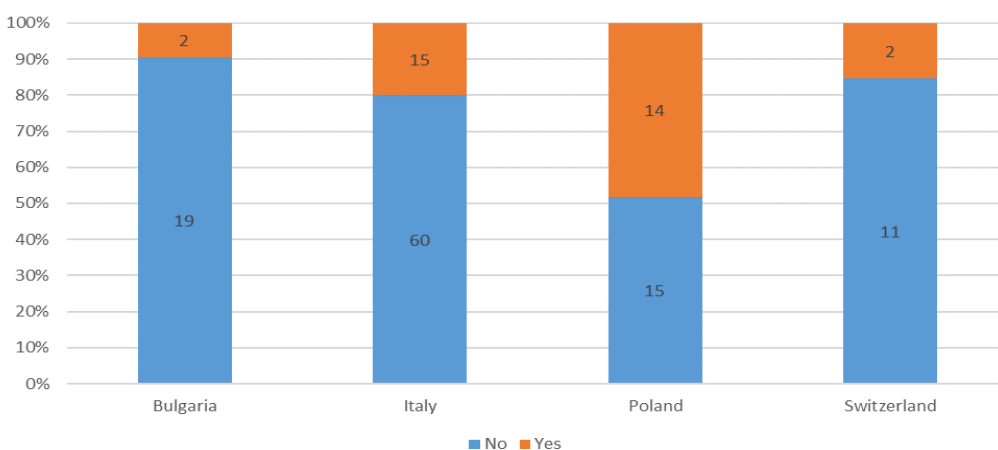


Fig. 8: Is crop rotation applied?

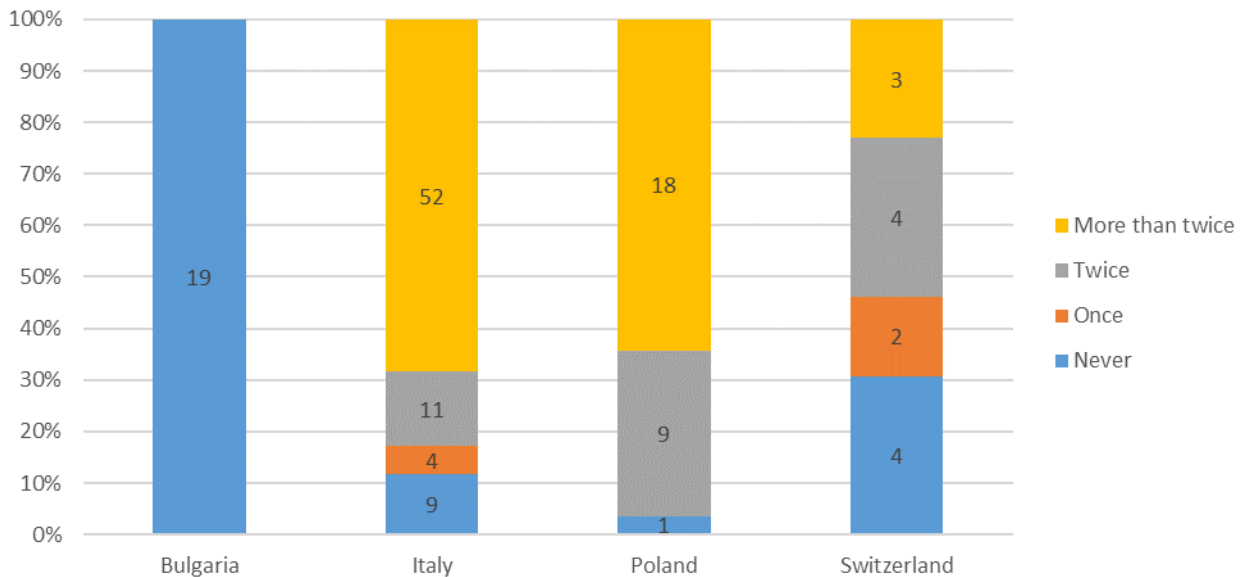


Fig. 9: How many times has the same species been replanted?

The leading apple variety in Italy, Poland and Switzerland is ‘Gala’, followed by ‘Golden’ in Italy and Poland, and ‘Topaz’ in Switzerland (Fig. 10). The rootstock type M9 is mainly used in all the three countries (Fig. 11). Additionally, in Poland, the rootstock type M26 is used in 40 % of the cases. The (tall-)spindle training system is the most common training system in all three countries (Fig. 11). Bulgaria has the highest average planting distance (4.6 x 3.4 m) followed by Switzerland (3.9 x 1.4 m), Poland (3.4 x 1.2 m), and Italy (3.0 x 0.9 m). The average yield is the highest in Italy (around 50 t/ha) followed by Poland (30 t/ha), Switzerland (25 t/ha), and Bulgaria (4 t/ha) (Fig. 12).

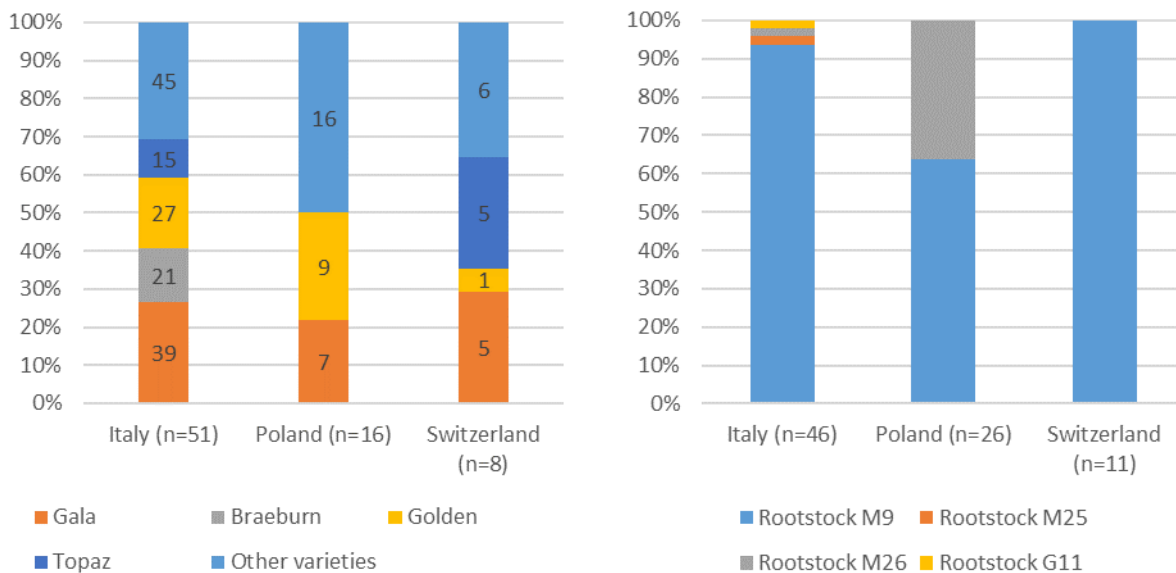


Fig. 10: Apple varieties (left) and rootstocks (right) used.

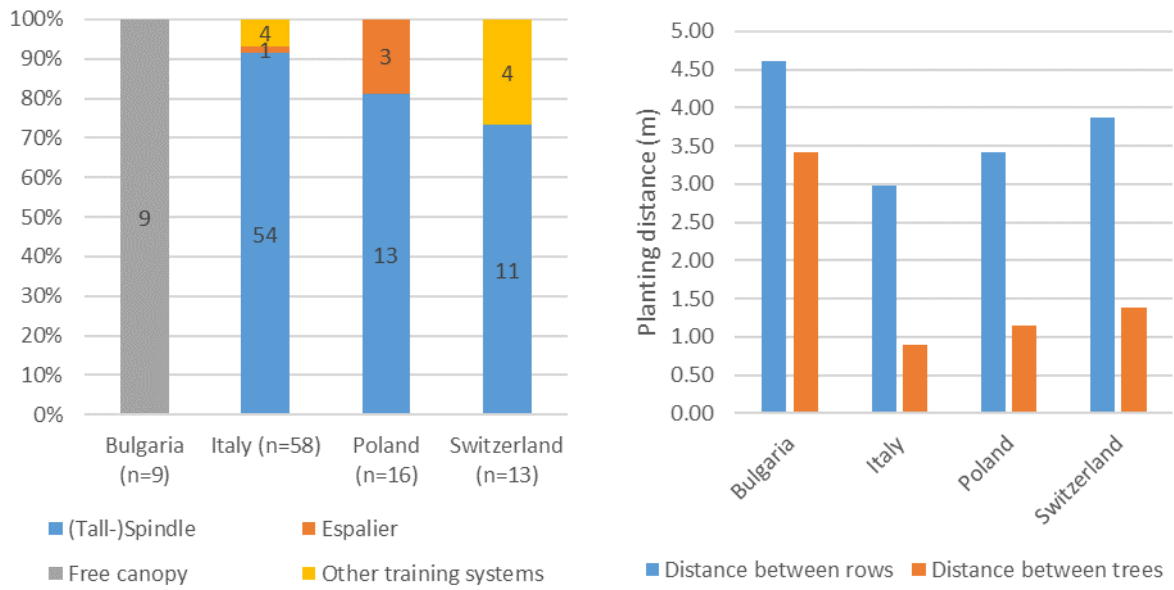


Fig. 11: Training systems (left) and planting distances (right).

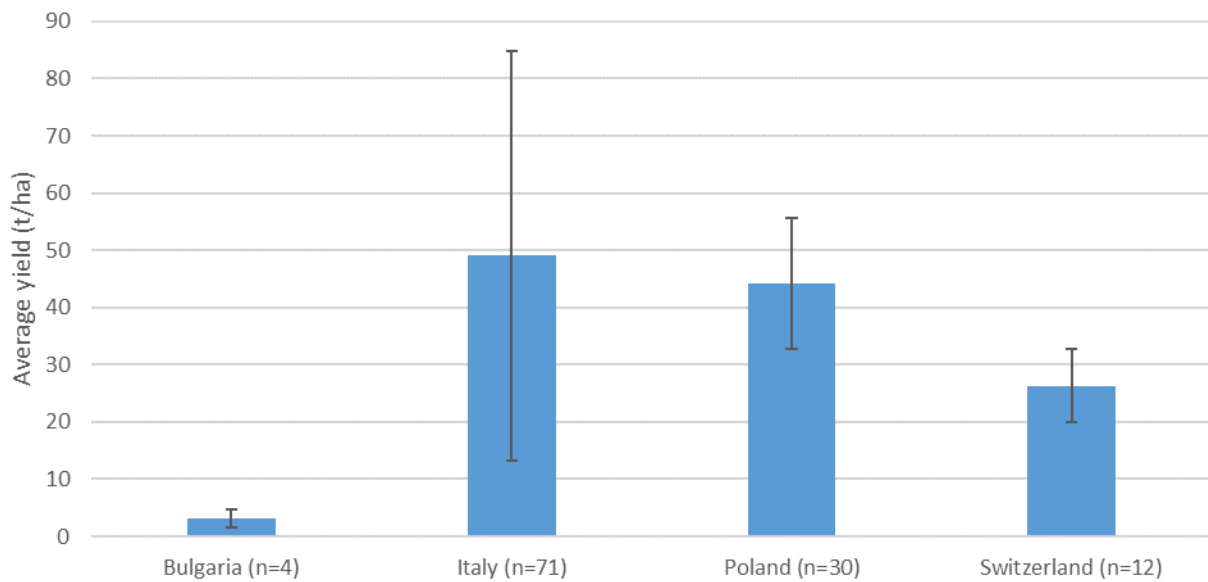


Fig. 12: Average yield.

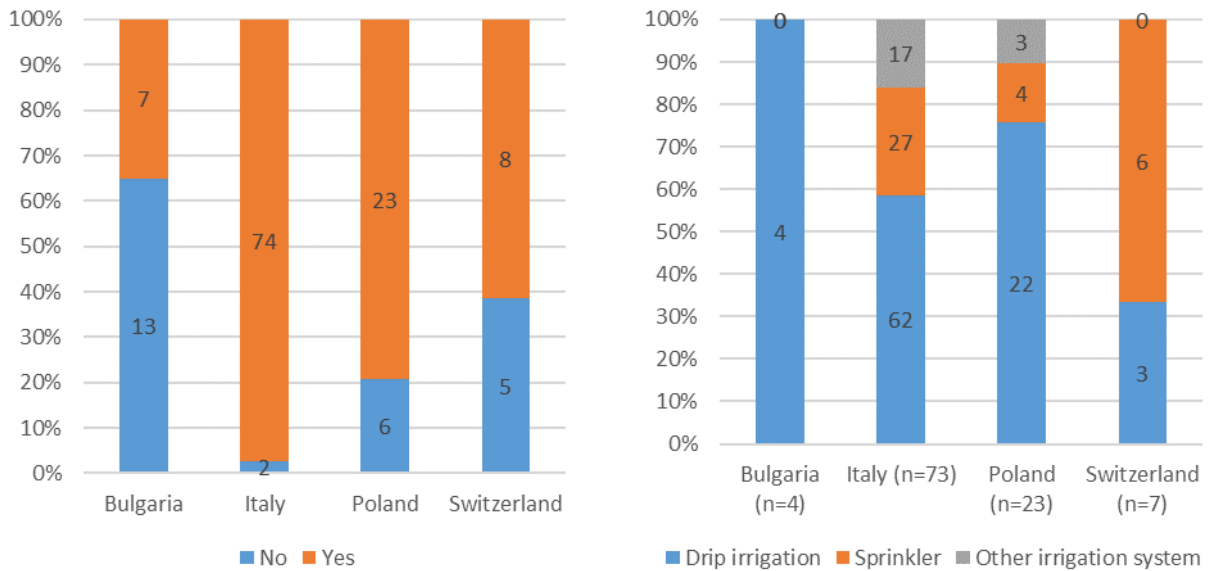


Fig. 13: Is the orchard equipped with an irrigation system (left)? Type of irrigation system (right).

In Italy, 97% of farmers equipped the orchard with an irrigation system, while they are 79% in Poland, 62% in Switzerland, and only 35% in Bulgaria. Drip irrigation is most common in Italy, Poland, and Bulgaria, while irrigation with sprinklers is most common in Switzerland (Fig. 13). Anti-hail nets above the orchard are quite common in Italy (40 %) and Switzerland (50 %), rare in Poland and not existent in Bulgaria. Insect nets are rare in Italy and Switzerland (<10 %), and not existent in Poland nor Bulgaria. Rain covers are rare in Switzerland (<10 %) and Italy (3%), and not existent in Poland nor Bulgaria.

Information about biodiversity in the orchard

In Italy, 71% of the farmers are implementing flower strips in their orchard, while they are only 23% in Switzerland and 0.05% in Poland (Fig. 14). Hedges are more often present in the orchard compared to flower strips, and farms having hedges often have flower strips as well. Farms in Italy, Poland, and Switzerland have hedges in 76%, 54%, respectively 26% of the cases. No Bulgarian farm has hedges. The hedges are most of the time located outside the orchard compared to inside the orchard or inside and outside the orchard. Some plant species present in the hedges listed are: acacia, ash, barberry, birch, black alder, bladder-senna, boxwood, chestnut, cornelian cherry guilder-rose, dogwood, downy oaks, hazel, elderberry, field maple, forsythia hop-hornbeam, Italian woodbine, Japanese plum tree, liguster, lilac, quaking aspen, pink rugose, privet, rosehip, rowan, sea buckthorn, shark roses, thuja, white horn, wild cherry, wild figs, and willows. Other biodiversity elements are implemented in Italian and Swiss farms with the most common biodiversity elements being nesting boxes, cairns and insect hotels (Fig. 15). The question arises if the concept of biodiversity elements is unknown in Bulgaria and Poland, as no data is available for these countries.

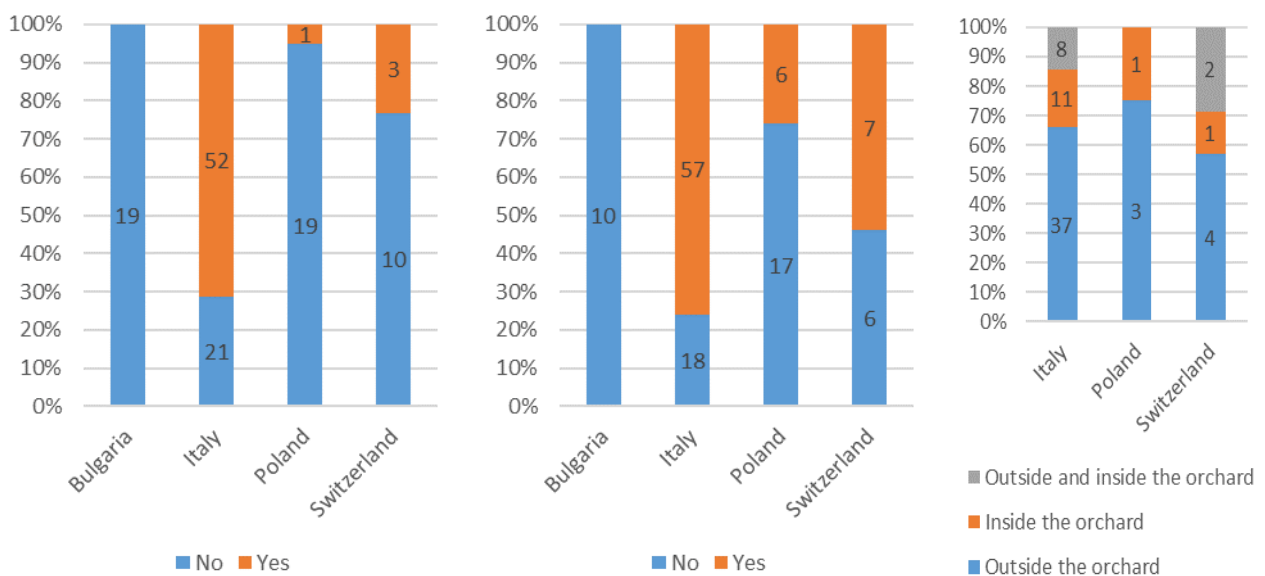


Fig. 14: Are there flower strips in the orchard (left)? Are there hedges inside or outside the orchard (middle)? Where are the hedges located (right)?

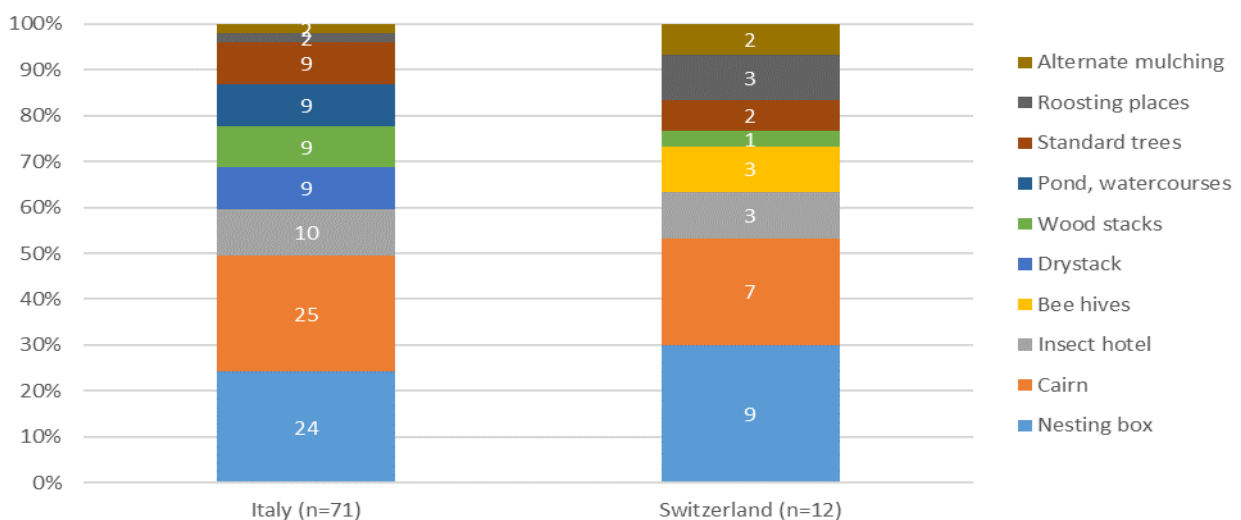


Fig. 15: Biodiversity elements present in the orchard.

Information about fertilization of the orchard

Around half of the farmers in Italy, Poland, and Switzerland are using a decision support system regarding the fertilization (Fig. 16). Soil analyses are the main decision support system mentioned by farmers. In Bulgaria, farmers only use farm manure (dung, compost) as fertilizers (Fig. 17). In Switzerland, farmers mainly use farm manure, but also use commercial (solid) fertilizer. In Italy and Poland, farm manure and commercial fertilizers are used equally often. The most common organic fertilizer (manure, compost) in Italy is cattle dung and cattle dung compost, whereas it is chicken dung in Poland, and green compost in Switzerland (Fig. 18). Fertilizers are mostly applied in spring and/or fall, and usually only into the tree row (Fig. 19). Only around 20% of farms in Italy and Switzerland, and none in Poland and Bulgaria are using legumes as intercrops. Legumes and other species mentioned as intercrops are: alfalfa, clover, faba bean, pea, field beans, vetch, mustard, phacelia, barley, rye, buckwheat, sunflower, canola, and cruciferous vegetables. The comment of one farmer regarding legume intercrops was: “doesn't work, aren't growing, tried different legumes; still trying”.

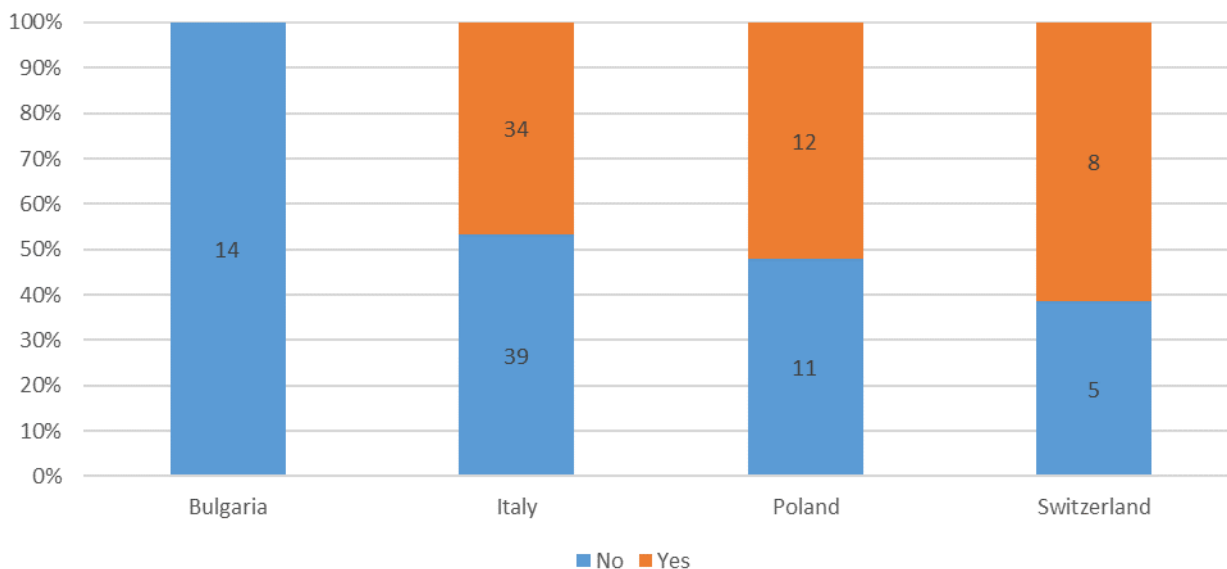


Fig. 16: Are you using a decision support system?

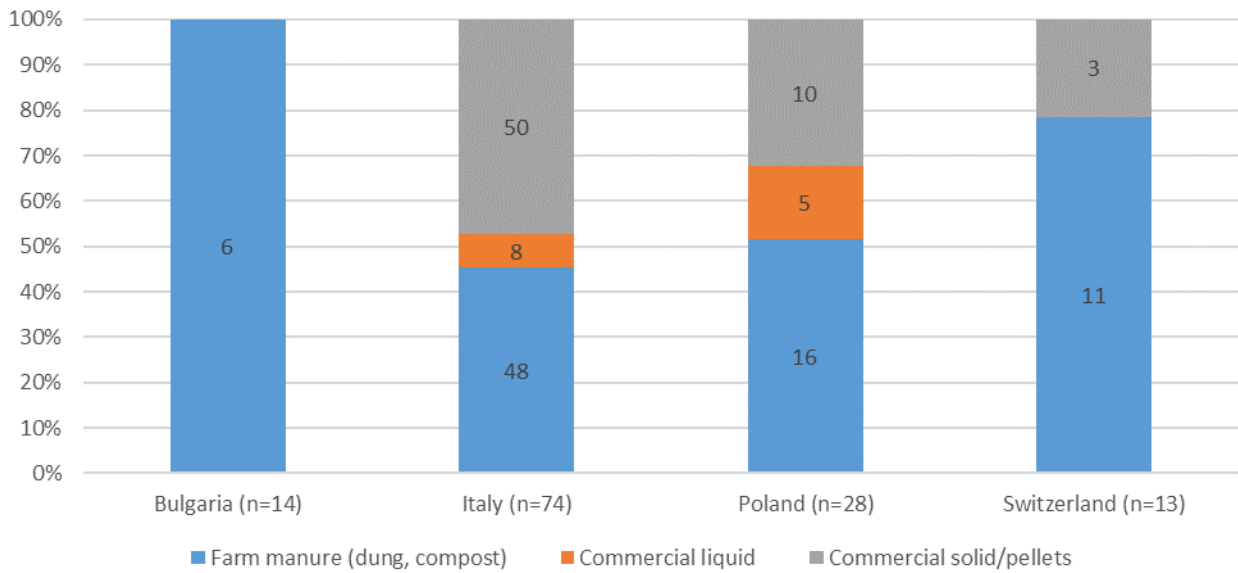


Fig. 17: Type of fertilizer used.

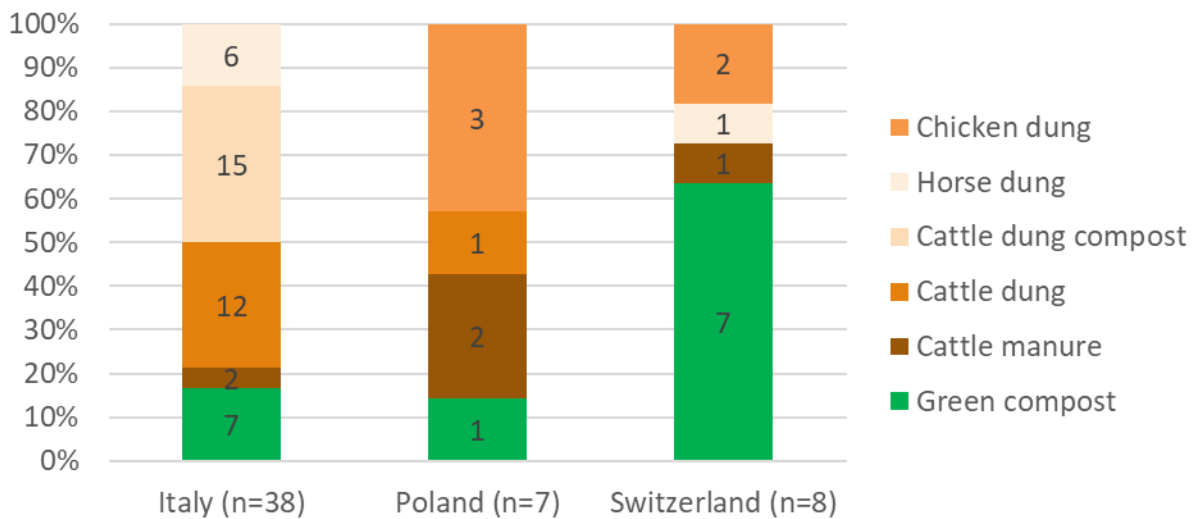


Fig. 18: Type of organic fertilizer (manure, compost) used.

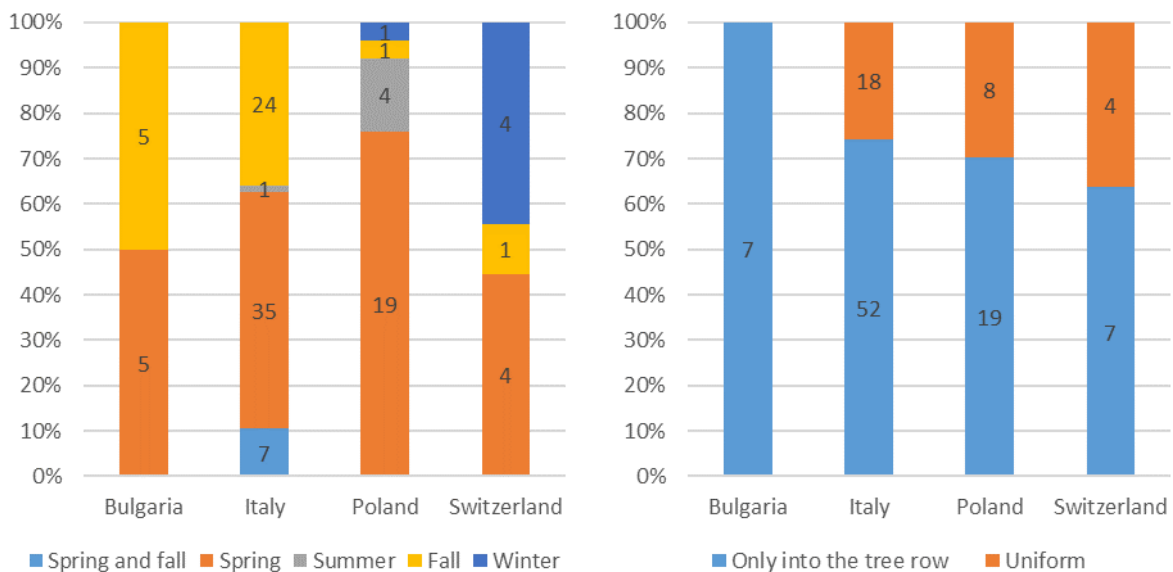


Fig. 19: Time of fertilizer application (left) and distribution of the fertilizer (right).

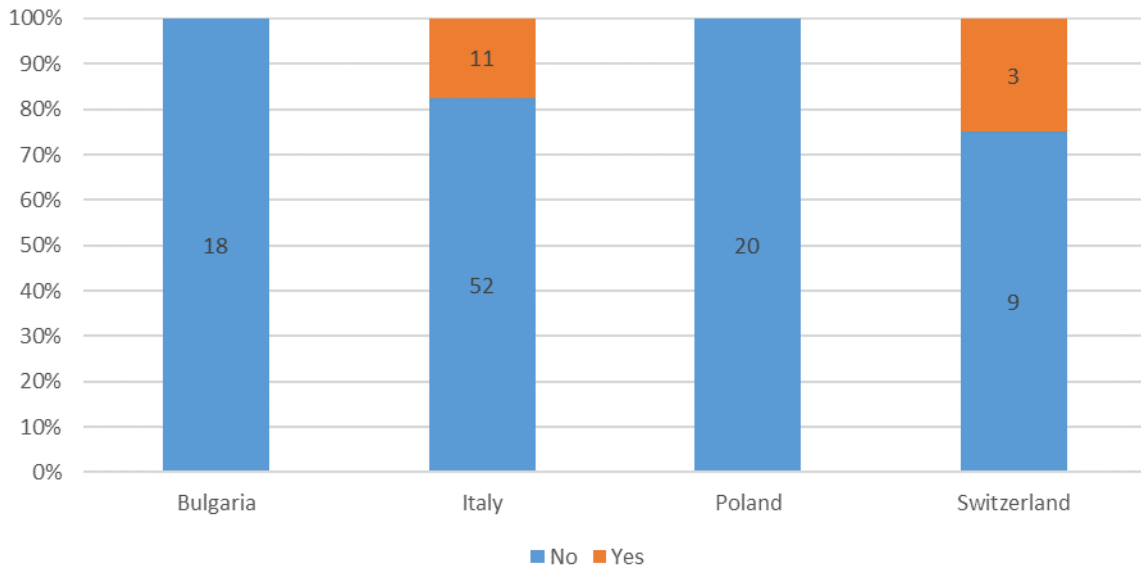


Fig. 20: Are legumes used as intercrops?

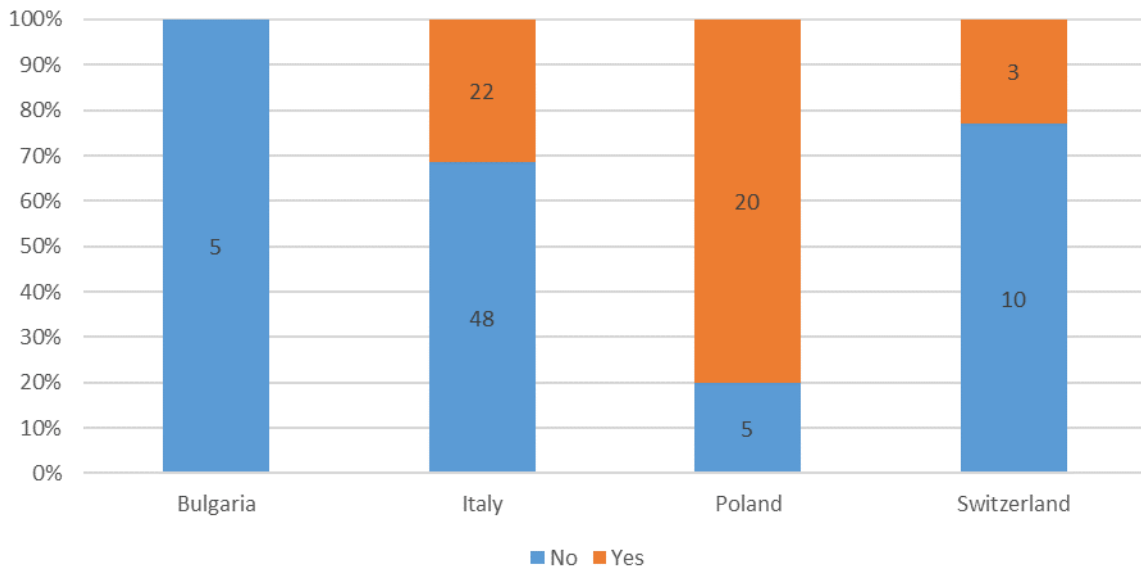


Fig. 21: Is liming practiced?

Information about plant protection in orchard

Overall, copper and sulphur are the two main fungicides used (Fig. 22). In Switzerland, farmers more frequently forgoing copper compared to the other countries. The use of clay as a fungicide is more common in Italy and Switzerland, as opposed to Poland or Bulgaria where it is rarely used or not used at all. The number of fungicide applications is around 10 to 14 in Italy, Bulgaria and Switzerland, and around 4 to 9 in Poland (more applications for not resistant varieties e.g. 10-14 (resistant), >20 (Gala)). The same applies to the number of insecticide applications (Fig. 25). Farmers use a variety of insecticides in Italy, Poland and Switzerland, but only four in Bulgaria (Fig. 24). The main insecticide used is azadirachtin in Italy, paraffin in Poland, and kaolin in Switzerland. In Italy, Poland and Switzerland apple scab is often reported as disease causing problems, followed by sooty mold in Italy and powdery mildew in Poland (Fig. 26). However, in Poland 50% and in Switzerland 20% of farmers report having no major disease problems. As for pests, aphids and the codling moth are most often mentioned (Fig. 27). Regarding the leaf litter management, more than half of the farmers are mulching the leaf litter in Italy, Poland and Switzerland, whereas in Bulgaria no leaf litter management is done (Fig. 28). Mating disruption is practiced by over 80% of farmers in Italy and Switzerland, only about 50% in Poland and less than 20% in Bulgaria (Fig. 29).

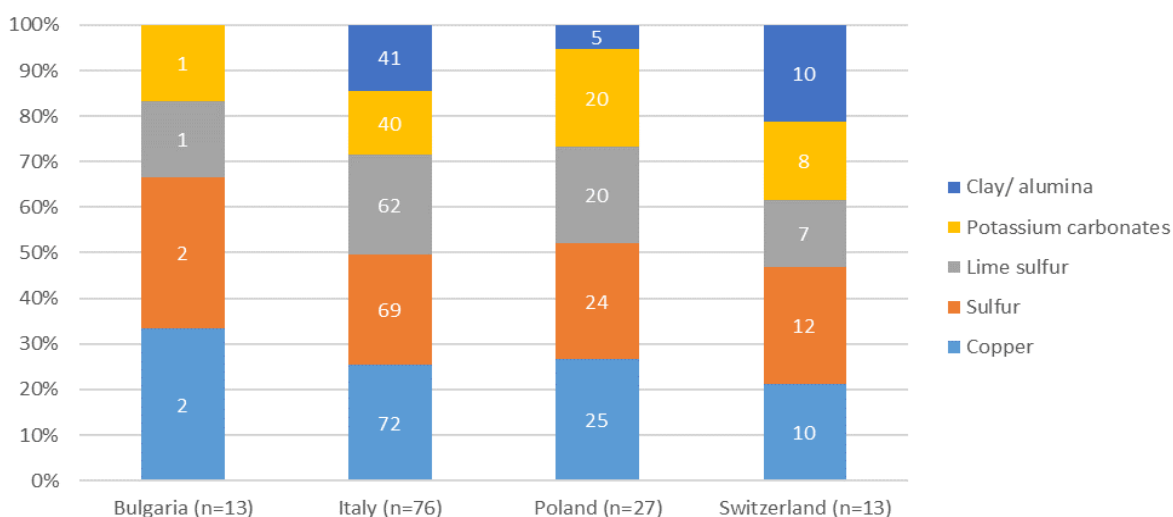


Fig. 22: Fungicides.

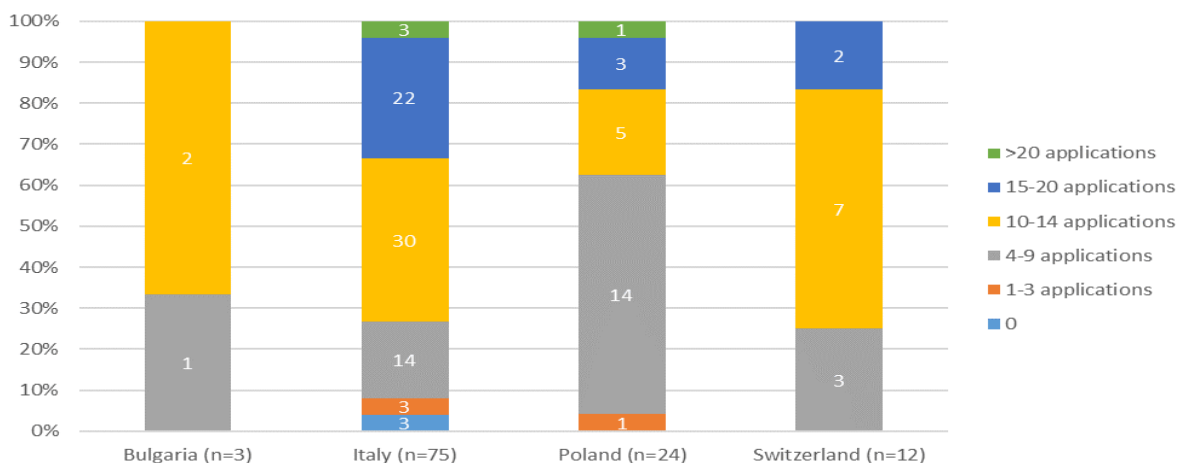


Fig. 23: Number of fungicide applications.

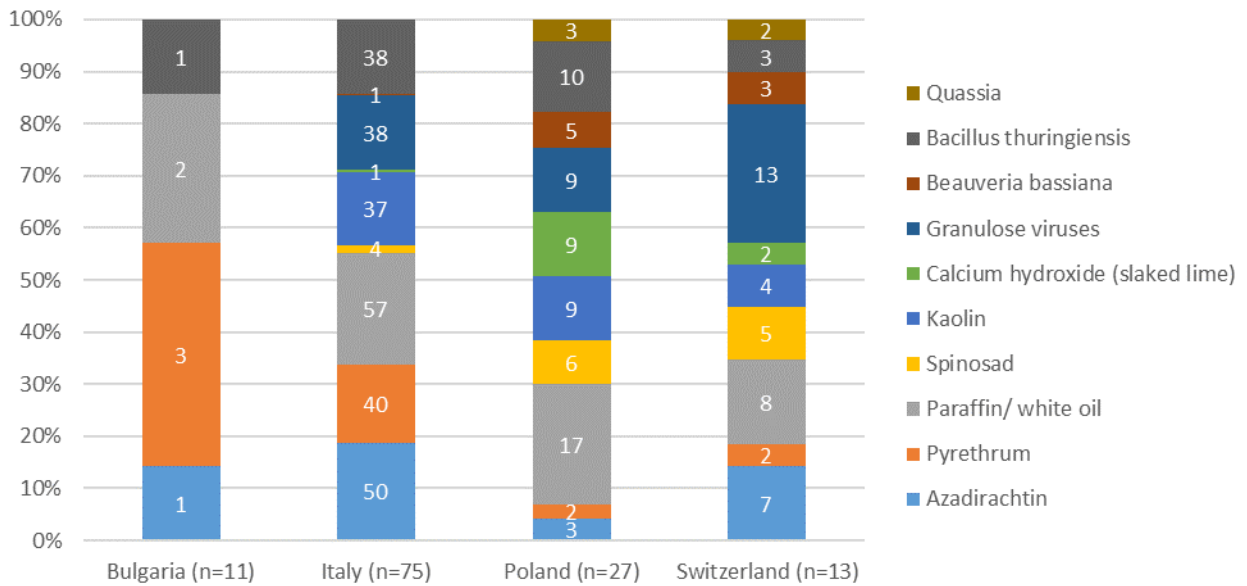


Fig. 24: Insecticides.

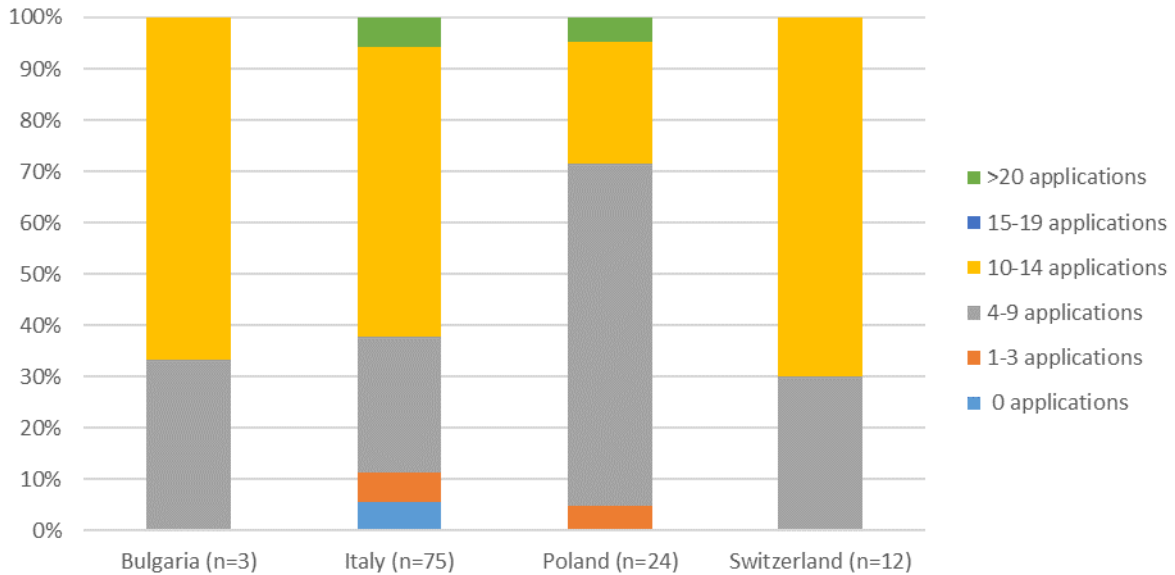


Fig. 25: Number of insecticide applications.

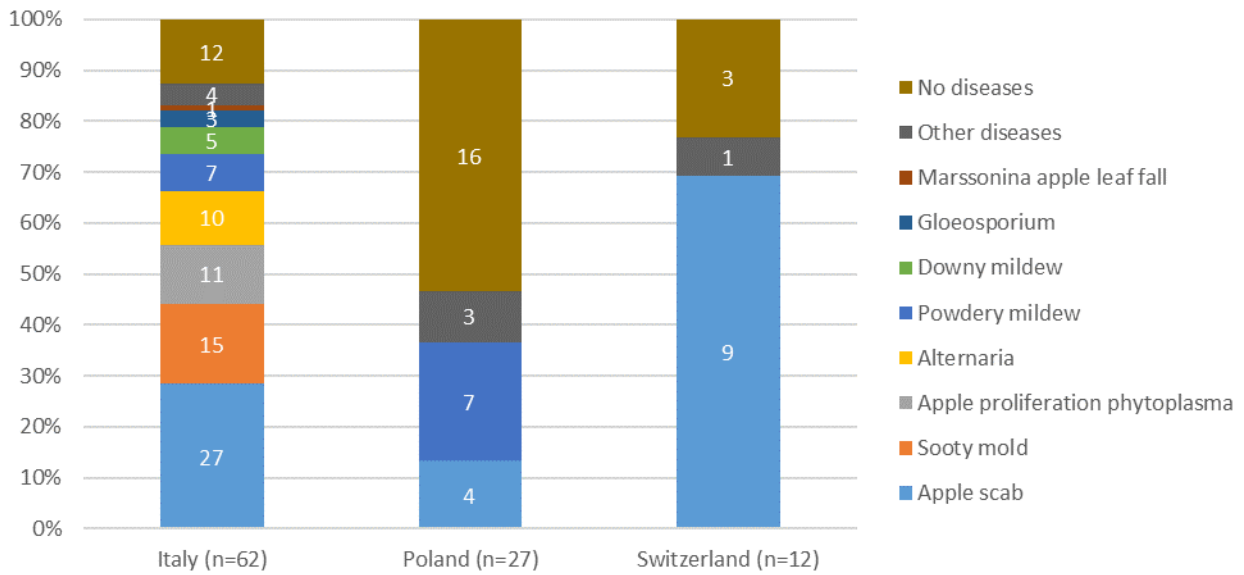


Fig. 26: Main diseases causing problems.

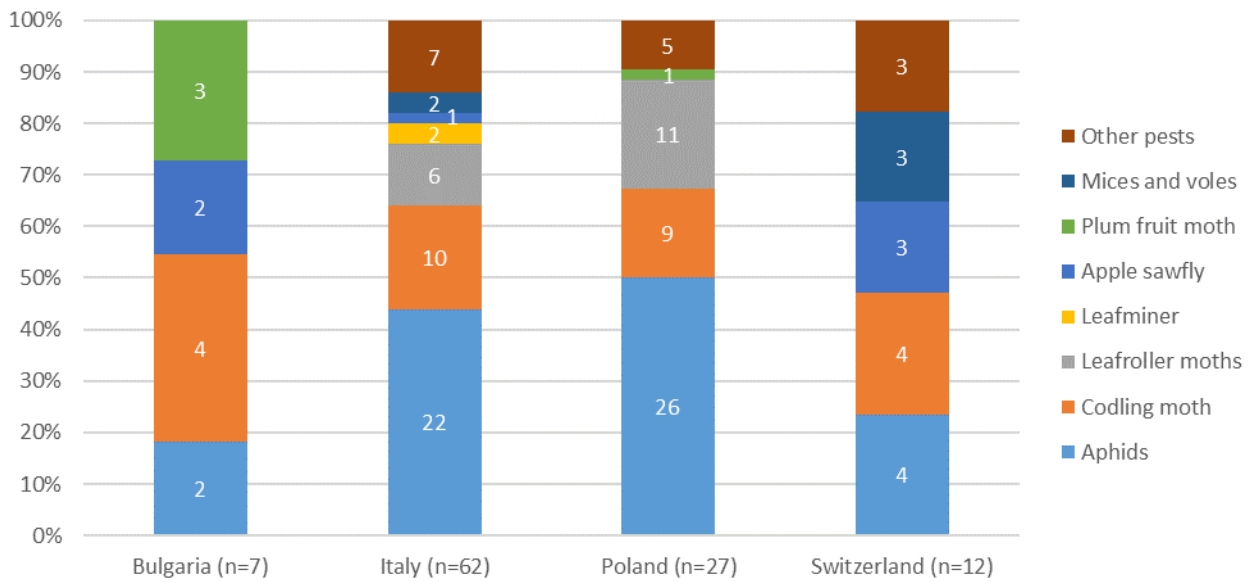


Fig. 27: Main pests causing problems.

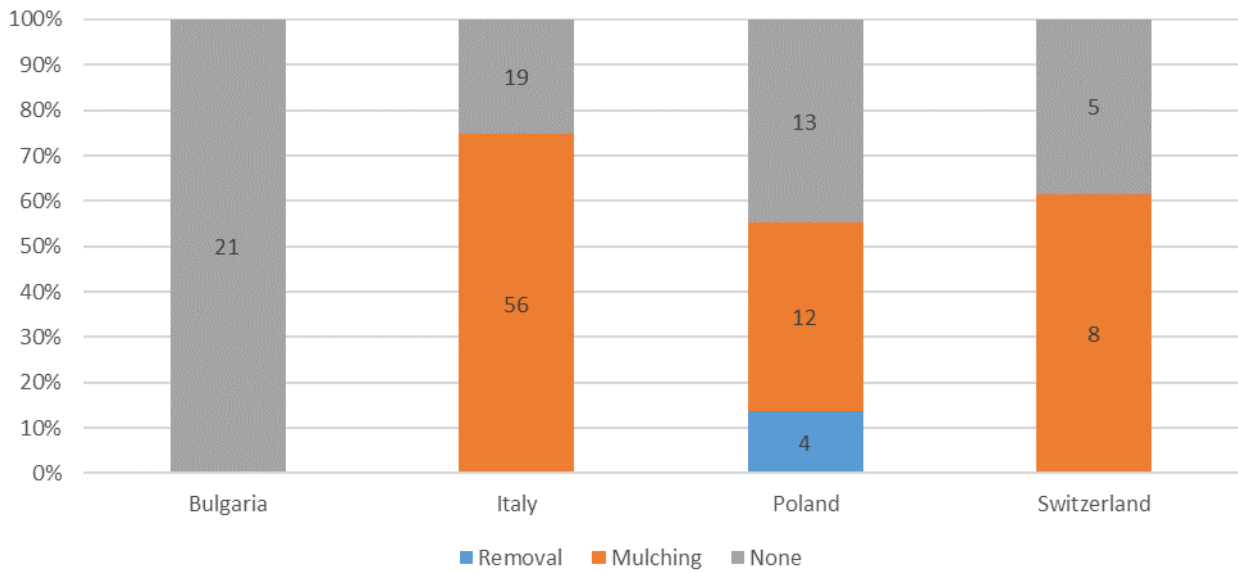


Fig. 28: Management of the leaf litter.

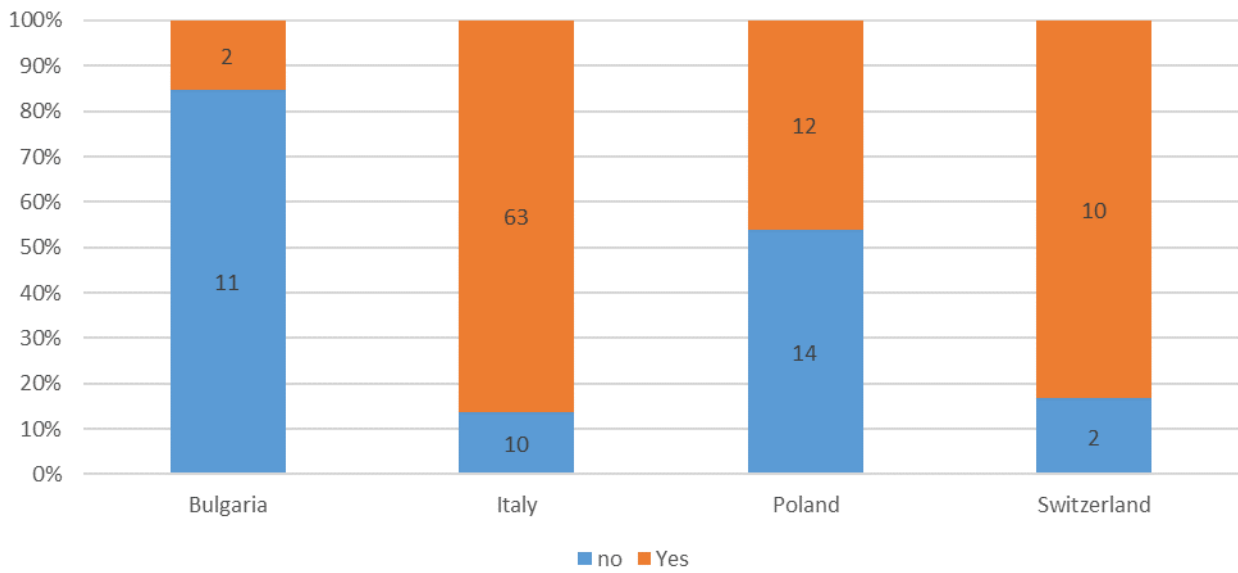


Fig. 29: Is mating disruption practiced?

Information about used machinery in the orchard

Flower thinning is mainly performed chemically in Italy, manually in Switzerland, and both mechanically, chemically and manually about the same in Poland (Fig. 30). The highest amount of mulching passes per season is recorded in Switzerland (around 5), followed by Poland (around 4), and Italy (around 3) (Fig. 31).

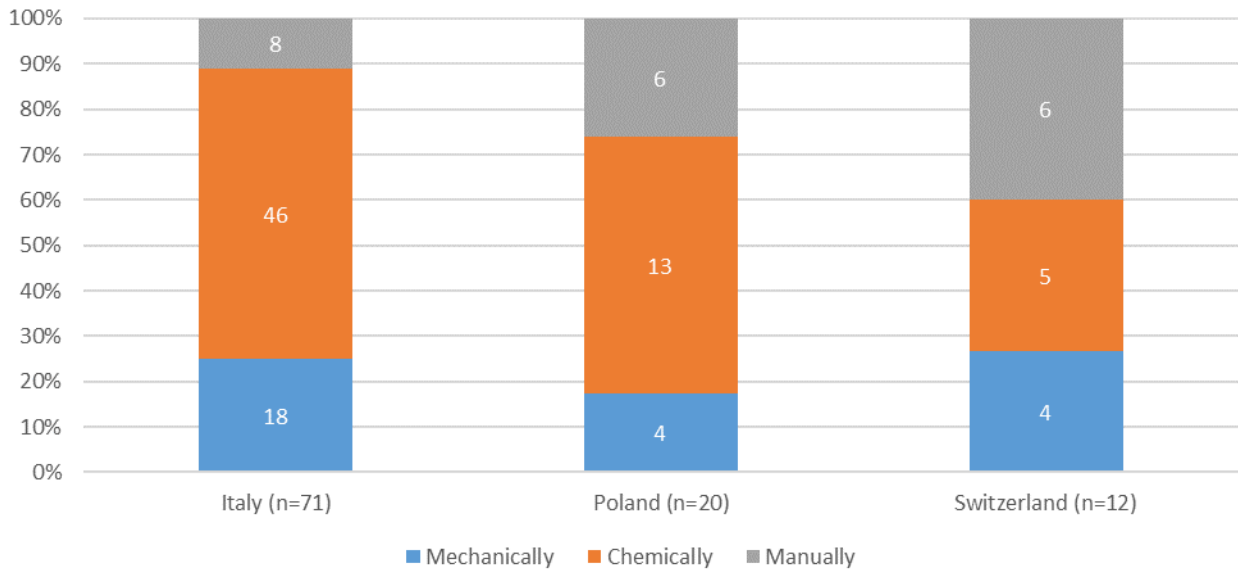


Fig. 30: Thinning method.

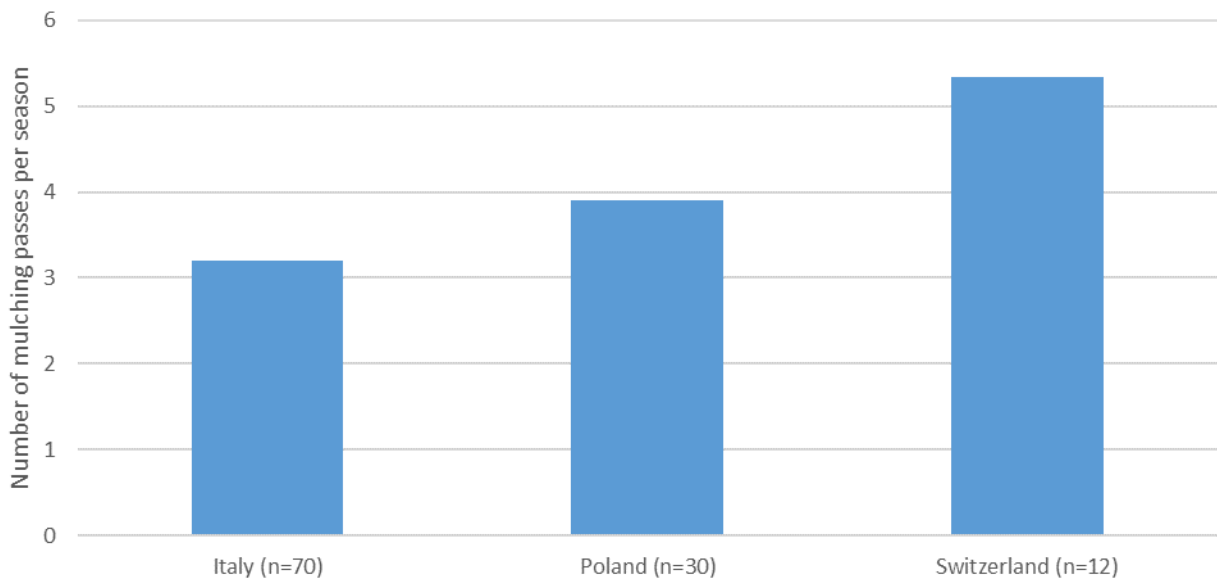


Fig. 31: Average number of mulching passes per season.

Where do you see a need for research activities to further develop/improve organic orchards?

Control measures

- Diseases: sooty blotch, alternaria, white haze, bark diseases, apple scab, powdery mildew,
- Pests: aphids, psyllid, codling moth, Tortricidae, *Leucoptera xitella*, voles, invasive species (stink bugs, *Pseudococcus comstocki*, ...)
- Weeds

Varieties

- New (resistant) varieties suitable for organic farming
- Have an early apple variety with good conservation/storability (Julka maybe?)

Management, economy

- Focus on the economic viability
- New technologies, electrical tractor
- Tree strip management without plastic abrasion, new machines for soil care of in-row areas, hoeing with Ladurner very laborious, maybe better using a combination of machine or a roller hoe?
- Anti-hail covers

Sustainable farming

- Ecologization of the orchard
- New systems for extensive farming
- Undergrowth grazing with livestock
- More biodiversity in the orchard, flower strips, ecological control of the orchard with beneficial insects, birds and other animals
- Soil fertility, soil biodiversity, relationship between soil health and diseases (min. 5 years of trial)
- **Plant protection products**
 - Reduction of the plant protection product applications, improve the application techniques
 - Copper replacement, alternatives to lime sulfur
 - Plant-based plant protection products
 - Alternative remedies/ homeopathy
 - Research on the methods of disorientation of various pests, pest repellent production
 - Speed up the testing and registration of biological pest controlling agents
 - Expand the list of biological plant protection products allowed