

Bravin, Esther; Hanhart, Johannes and Carint, Dante

# Work economics data in apple production: an analysis

Labor accounts for a major outlay in apple production, amounting to 45 % of total costs. The aim of the study is to compare two methods used to evaluate labor time. The first one is the labor time measurement method used with the objective to evaluate labor time necessary to produce dessert apple and compare the pruning, thinning and harvest method. The second method compared is the field record system. Fruit growers collect by themselves labor time. The results of both methods - the labor time measurement and the labor time record - are used to obtain information for fruit growers concerning Labor Economy. Despite different approaches the percentage distribution of the working procedures is basically no different in both studies, but the harvesting times measured show wide variations. An important question of this study is to identify the reason of these differences and the data which are more practical.

## Keywords

Fruit-growing, labor management, labor time measurement, labor time record

## Abstract

Landtechnik 67 (2012), no. 4, pp. 282–285, 4 figures, 3 references

Between 2005 and 2006 Sichert et al. [1] conducted at the research station Agroscope Reckenholz-Tänikon a study (ART-study) to measure work economics data in apple production. Work economics data have been set up by using a „Hand-Held-PC“ for the work steps and have been filed in a database as planned time element [1]. These data have been used for the calculation system „Proof dessert apple“. Thereby following labor time requirement for dessert apples has been calculated. In 1947 the research station Agroscope Changins Wädenswil (ACW) started management and work economics inquiry [2]. In 1997 the use of the software ASAJAgrar has been introduced in the project. With this update the project has been named Support Obst Arbo (SOA). Since 2003 the research station Agroscope and AGRIDEA lead SOA together. Fruit growers conduct a working journal with the field record system ASAJAgrar by entering labor activities for each employee as well as machines, fertilizer and plant protection costs [3]. Yearly, twenty professional fruit growers provide the SOA project with their data. These data are used to generate relevant strategic and management information such as production costs, labor hours, cost effectiveness of investment. Growers involved in the project collect their data on the level cultivar-plot (a sub-

unit of the plot). Hence the labor hours per cultivar can be evaluated. All the data are calculated for one hectare.

## Approach comparison

### Approach labor time measurement

In Sichert et al. [1] time slices are calculated for distinct procedures for the total working time request. Working slices have been measured in particular and extrapolated on the total working process. Following plot structure has been used for calculation: orchard Surface: 1 ha, orchard density: 2 100 trees/ha, cultivar: Golden Delicious, yield: 45 t/ha. **Figure 1** shows, that 42 % of total labor time in fruit production is used for harvesting.

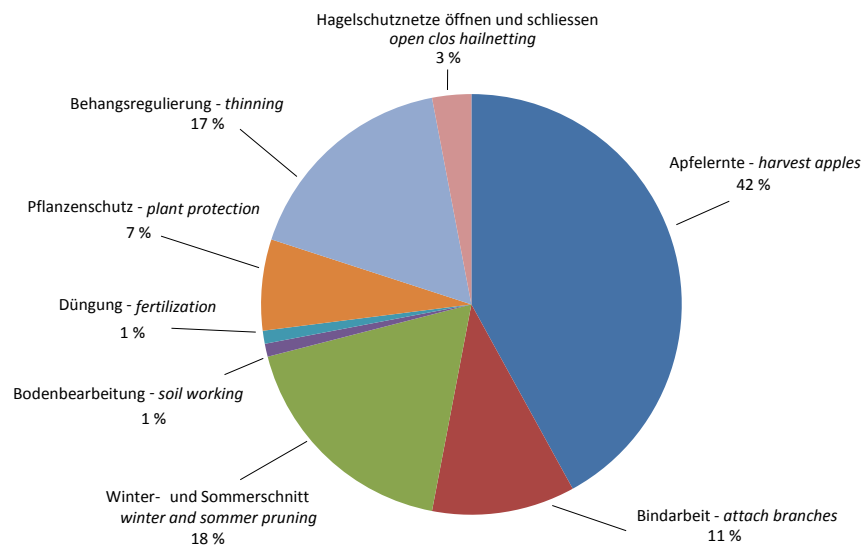
### Approach field record system

Within the SOA project data from 2007 to 2010 have been evaluated. Those data comprehend 17 farms, which together collected about 130 cultivar-plots. Different plot structures have been evaluated: Surface per plot > 0.10 ha – calculated on 1 ha, orchard density: 1 500–4 000 trees/ha, cultivars: boskoop, braeburn, gala, golden delicious, jonagold and maigold, yield: 45 t/ha +/- 10 % . **Figure 2** shows that 54 % of total labor is used for harvesting.

## Results

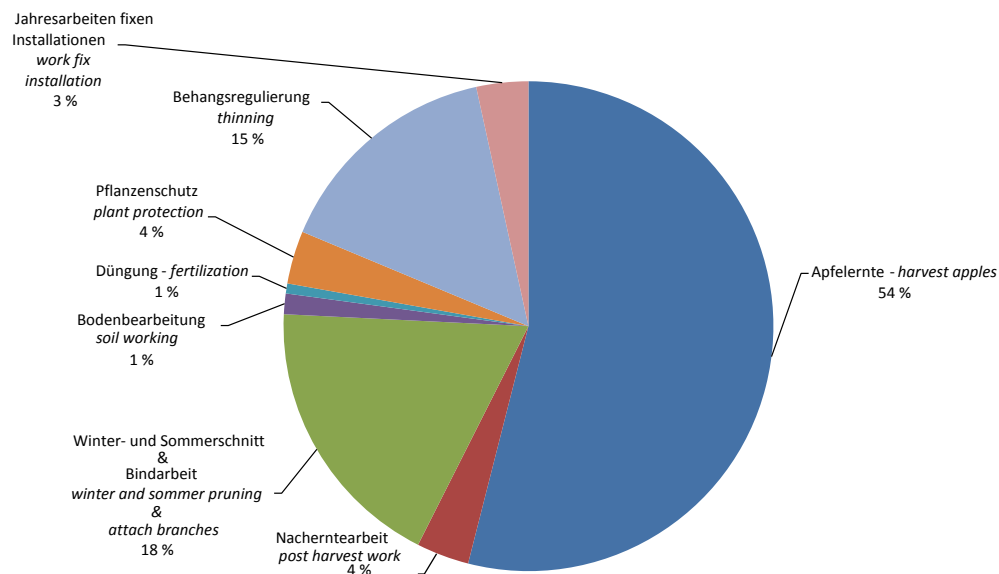
Harvesting, pruning and thinning are with both approaches the most time intensive labor on the orchard. Together constitute almost 90 % of total labor hours on the orchard (**Figure 3**). The comparison between both approach shows that the total labor hour average with the approach field record system (SOA project) is about hundred hours higher than the approach labor time measurement (ART-study). The average labor hour of SOA-

Fig. 1



Time slice different workflow of the whole labor time using the method labor time measurement [1]

Fig. 2



Time slice different workflow of the whole labor time with the method labor time measurement using the method labor time record [3]

farms is about 680 h/ha. Results from the ART-study show that the total time demand is between 400 to 600 h/ha with 45 t/ha – depending on the level of mechanization. Research results of ART and SOA-evaluations differ in the procedure „harvesting“. The yield of both projects is comparable – however the results from the SOA project show 45 % higher values in harvesting time than the project from Sichert et al. [1]. With data from the SOA-project it's also possible to evaluate the working hour difference between cultivars. Thereby only the cultivar-plot with between 40.5 and 49.5 t/ha were evaluated (+/- 10 % from 45 t/ha). The difference in the harvesting hours between cultivars is quite low respectively not crucial to explain the different results between both approaches. Referred to the SOA-project Gala is

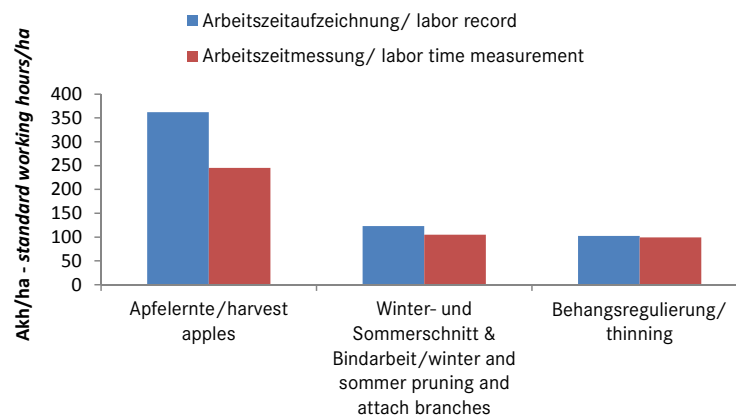
with 400 h/ha harvesting, compared with six other important cultivars, the one with the highest harvesting effort (**Figure 4**).

### Conclusions

Both used approach to evaluate work economics are different. However results are comparable, except for harvesting. In the ART approach labor time measurement working steps are individually quantified with repeated measurement. Collected on-farm data during four years have been evaluated with the approach field record system.

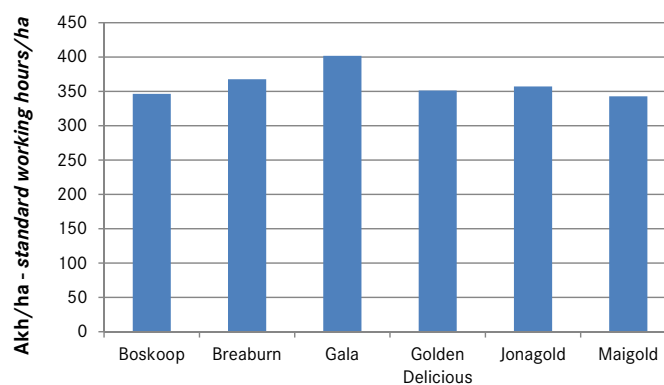
Harvesting, pruning and thinning represent together almost 90 % of the total labor time in the orchard. Harvesting is with both approaches the most time-consuming activity: 42 % with

Fig. 3



Labor time for harvest, pruning and thinning

Fig. 4



Harvest time for six cultivars [3]

the labor time measurement approach (ART) and 54 % with the field record system approach (SOA). The difference between both approaches is given by the harvesting performance (kg/h). With the ART-method the harvesting performance is in average 184 kg/h (45 000 kg/ha in 245 h/ha). The harvesting performance between SOA growers is 33 % lower with an average of 124 kg/h. Practical experience shows that with a yield of 45 000 kg/ha high quality dessert apples an harvesting performance between 120 and 130 kg/h is realistic. Though the harvesting technic is important. Sichert et al. [1] show, that with 45 t/ha with a partly mechanized harvesting 90 h/ha are necessary (harvesting performance: 500 kg/h), the harvesting with basket (car elevator or ladder) takes between 211 and 215 h/ha (harvesting performance about 210 kg/h) and the harvesting with Big box and basket (car elevator or ladder) takes between 272 and 279 h/ha (harvesting performance: 160 h/ha). These harvesting performances are high compared to data from practical experience (SOA project). With an exhausting work such as the harvesting it is difficult to keep an optimal performance on a longer period. Team coordination and weather can play an important role. Those components should also be included in the labor time measurement.

## Literature

- [1] Sichert, I.; Heitkamper, K.; Schick, M. und Marbe-Sans, D. (2006): Arbeitswirtschaftliche Kennzahlen zur Tafelapfelproduktion, ART-Bericht Nr. 663, Forschungsanstalt Agroscope Reckenholz-Tanikon ART, Ettenhausen
- [2] Meli, T. (1991): Kosten und Erträge in Tafelapfelanlagen, Eidgenössische Forschungsanstalt für Obst-, Wein- und Gartenbau, Wädenswil
- [3] SOA (2011): Verschiedene Auswertungen aus dem Projekt Support Obst Arbo

## Authors

**Esther Bravin** is research associate at the research station Agroscope Changins-Wädenswil ACW, Switzerland.

**Johannes Hanhart** is adviser and **Dante Carint** is computer scientist by AGRIDEA, Switzerland.