YILCAN – Synthesis

Over the last few years, the Belgian judiciary noticed a considerable rise in the number of confiscated indoor cannabis plantations. Prosecution of perpetrators is based on the (huge) gains that go hand in hand with cultivation and trade of cannabis. However, to this end judicial authorities use outdated figures (i.e. 28 g of cannabis per plant and a sales price of € 3 per gram). The YILCAN project aims at adequately and scientifically estimating profits in the illicit value chain of cannabis in Belgium. The research consisted of two components: i) an agronomic part in which a cannabis plantation was constructed in order to adequately estimate the physical yield of current indoor cannabis cultivation; and ii) a criminological part in which price setting and monetary benefits obtained in the different links of the illicit Belgian cannabis value chain was studied in detail.

In the agronomic research, three cannabis grow cycles of each 10 to 12 weeks were performed. The first cycle investigated the influence of three cultivation factors on yield: plant density (16 and 20 plants per m²), light intensity (assimilation lamps of 400 W and 600 W) and variety (strains Big Bud, Northern Light #5 x Haze, Super Skunk and White Widow were tested). Further, also the influence of these factors on quality of the harvested cannabis (i.e. concentrations of Δ^9-tetrahydrocannabinol (THC), cannabinol (CBN) and cannabi-diol (CBD)) was tested. Results show that yield is higher with cultivation under 600 W lamps in comparison with plants grown under 400 W lamps; that yield is higher for varieties Super Skunk and Big Bud in comparison with yield of varieties White Widow and Northern Lights #5 x Haze; and that yield per plant is higher when plants are grown at a density of 16 plants per m² in comparison with yield per plant at a plant density of 20 plants per m². However, when yield is expressed as g per m², no differences in yield were found between the two plant densities. Cultivation factors had no influence on THC concentrations which depended only on the variety. Varieties with the highest yields also exhibited the highest THC concentrations (Super Skunk and Big Bud with average THC concentrations of 14.7 % and 14.6 % respectively). THC concentrations of varieties Northern Lights #5 x Haze and White Widow were 11.3 % and 10.3 % respectively. Variation in concentrations of CBN (0.1 % - 0.3 %) and CBD (0.2 % - 0.4 %) in analysed samples was too low to draw statistically sound conclusions.

The second cycle consisted of two sub-experiments in which on the one hand yield of the same varieties as in the first cycle were tested at densities of 9, 12 and 16 plants per m² (using exclusively 600 W lamps); and on the other hand, the effect of a less sophisticated fertilization scheme on yield was evaluated. Again it was concluded that yield per plant is higher with plants at lower densities (9 and 12 plants per m²) in comparison with yield of plants grown at a density of 16 plants per m², but that these differences vanish when yield is expressed in g per m². Sub-optimal plant nutrition can reduce cannabis yield by one third.

The third cycle used the Big Bud variety from the first two cycles as well as three new varieties: Silver Haze #9, Skunk #1 and X. The latter was propagated from cuttings confiscated by the Belgian

Federal Police from an illicit indoor plantation and were used as a reality control. In the third cycle all grow factors were optimized (600 W lamps, optimum environmental control and fertilization, etc.) and yield was tested under a realistic plant density range of 12 and 16 plants per m². Again it was found that there were no significant differences between both plant densities when yield is expressed in g per m². The unknown variety (X) had an average yield (549 g per m²) which was lower than the average yield of highest yielding varieties Silver Haze #9 (843 g per m²) and Skunk #1 (596 g per m²), but was higher than the average yield of the Big Bud variety (517 g per m²). Accounting for the variability across the different cannabis varieties, it can be concluded that the yield of a present-day indoor cannabis plantation is at least 575 g per m² (lower bound of the one-sided 95 % confidence interval). This means at least 48 g per plant at a density of 12 plants per m², or at least 36 g per plant at a plant density of 16 plants per m².

At confiscation of illicit cannabis plantations, police ideally takes account of the total cultivation space (in m²) in stead of merely counting the number of plants. Multiplication by 575 g per m² will provide an adequate estimation of the yield obtained in one grow cycle (assuming a standard situation of cultivation in peat soil with a light intensity of 600 W per m²). The hypothesis that a single grow cycle can be completed in 10 to 11 weeks is confirmed in this research. The illicit grower will consequently generate 5 grow cycles per year, provided that no crop failures occur as a result of pests, diseases or abiotic stress. Since varieties and cropping techniques in illicit cannabis cultivation continuously evolve, it is recommended that illicit cannabis cultivation is continuously monitored by agronomic research. To this end, judiciary should invest in a reference laboratory that continuously evaluates new data on indoor cannabis growing. Ideally, such data consists of accurately measured and centralized records of at least plant density (plants per m²), lamp density (lamps per m²) and lamp power (W) found at confiscation of indoor cannabis plantations.

The criminological research in the YILCAN project focused on the price setting of indoor cannabis in Belgium. Researchers analysed how prices evolve along the Belgian distribution chain for cannabis and which influencing factors are significant. To this aim, a triangulation of research techniques (literature study, stakeholder survey and analysis of judicial files) was used.

Study of literature showed that The Netherlands and Belgium are particular breeding-grounds that enable the expansion of organised cannabis cultivation. Criminal organisations systematically set up large-scale plantations and interfere with organised domestic cannabis cultivation. Increased pressure by the Dutch authorities caused a waterbed effect resulting in a subsequent increase of confiscations of cannabis plantations in Belgium and the finding of a significant Dutch involvement in the criminal organisation of the plantation. It is beyond question that these criminal organisations besides the cultivation are also involved with other links in the cannabis distribution chain.

The stakeholder study surveyed 27 respondents in the Belgian cannabis distribution chain. Survey results reveal that price setting at the level of the grower is predominantly determined by

mutual relations between chain links and specific characteristics of the network; but also that certain quality features play a role as well. At other levels in the distribution chain, it was found that quantity discounting, i.e. a price decrease with increasing transaction volumes, is the predominant price determining mechanism. Further, geographical characteristics of the customers also play a role in cannabis price setting. Cannabis prices in Dutch coffee shops are used as a reference for the unit price at the lowest level in the cannabis distribution chain.

A total of 15 judicial files derived from 5 different judicial districts were scrutinized. Analysis confirms price setting mechanisms that were found in the stakeholder survey, which increases validity of the latter. Judiciary files further revealed a spectrum of organisation models in illicit cannabis cultivation. Each file represented a unique collaboration which confirms that cannabis cultivation has a strongly dynamic and adaptive character. Also in the judicial files, quantity discounting was identified as the predominant price setting mechanism.

The research concludes that the criterion of € 3 per g, currently used by the Belgian Federal Police in estimating the profits of illicit cannabis growers is below the real market price at the grower's level. It is recommended to increase this criterion to at least € 4 per g and to tune it with criteria used by neighbouring countries (particularly The Netherlands), where judicial authorities already use higher criteria in profit estimation. Doing so, the incentives of organising large-scale plantations from The Netherlands in Belgium might be mitigated. It is further of major importance that profit calculations and its financial consequences target the organisers of the criminal networks instead of the persons that are merely charged with subtasks in the criminal network.