

Thesis Summaries

Use of Growth Substances in the Improvement of Growth of Budded Stumps of *Hevea brasiliensis* Muell. Arg.

Most clonal propagation of *Hevea* use budded stumps as the starting material. Currently, budded stumps are transplanted after pruning part of the taproot and all the laterals. The success of transplanting bare-root budded stumps is variable and severe casualties can occur in unfavourable weather conditions. Another problem faced in the field after transplanting is the non-uniformity of sprouting or bud breaks. Some buds stay dormant for a longer time and when the percentage of such cases are high e.g. 20%-30%, differences in growth rate are observed. One way in which we can solve these problems is to reduce the percentage dieback or increase percentage success. The most current approach is the use of plant growth substances to initiate earlier rooting in transplants and to induce earlier and uniform bud breaks, which could aid survival and help to withstand adverse weather conditions for a longer period. Here, we are also using growth substances for induction of earlier branching, which indirectly reduces the immaturity period of rubber through earlier girdling.

Treatment of taproots of bare-root budded stumps with IBA was found to increase root initiation significantly during the initial period after transplanting in the field. The optimum concentration of IBA for lateral root induction of stumps whose rootstock sizes are 1.5 cm to 4.0 cm was 2000 p.p.m. and for larger rootstocks (4.1 cm to 8.0 cm) the optimum was

4000 p.p.m. Currently, the most practical and largely used method is the Powder-dipping method. It was found that addition of carbofuran (75% a.i.) at 2000 p.p.m. to the powdered formulation of IBA increased extension growth of the scion significantly after six months; and secondly, addition of rock phosphate (CIRP) at 28.35 g into each planting hole at transplanting significantly increased extension growth and girdling of RRIM 703 buddings.

Examination of lateral roots induced by IBA compared to those induced by NAA showed that the lateral roots induced by IBA were finer and heavily branched while those induced by NAA were thicker, straight and long. These two types of laterals were found to have differences in nutrient and/or water uptake and in some structural anatomy.

Dikegulac sodium (20% a.i.) and BA (benzyladenine crystalline) were promising chemicals for induction of earlier bud break. Solutions of the test compounds were sprayed on to the bud patches using a sprayer or brushed-on using an ordinary paint brush. An average of about 2.0 ml was required for each bud patch alternate daily for one week. Multiple buds were obtained from a single bud patch when dikegulac sodium formular ACR 1139B at 4000 p.p.m. was used. With this discovery, other practical uses of dikegulac may be found in *Hevea* cultivation, e.g. in the multiplication of source bush materials for vegetative propagation of bud sticks.

Dikegulac sodium and TIBA (2,3,5 triiodobenzoic acid) also induce more

branching compared to other chemicals tested. Preliminary results showed that TIBA at 1000p.p.m. and applied in lanolin paste to terminal buds of seven- and fifteen-month-old RRIM 600 buddings was the most promising chemical for branch induction.

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A Socio-Economic Study of Performance Among Rubber Farmers in West Malaysia

The rubber smallholders form the major poverty group in Malaysia, constituting the major target group in the government's poverty eradication programme. Their poverty stems mainly from two major factors; the uneconomic farm size which they operate and the low productivity of their farms especially among individual rubber smallholders. Despite favourable rubber prices between 1975 and 1980, incomes in the unorganised and depressed rubber smallholding sector were very low compared to the organised sector as a result of low yields.

A known and established premise in explaining low productivity and income among rubber smallholders has been based on the agro-economic and environmental factors such as the agronomy of the crop, soil types, climate, diseases, pests, etc. This study explains low performance in terms of socio-economic factors such as management, sociological, biographical, marketing in addition to output and holding or planting factors. The ability of a farmer to perform well in the production process is related positively to the biographic and motivational antecedents in the human complex. Management contents and decision processes should be related to the outcome of management

or performance. The importance of this human factor called management cannot be underestimated as the key to success in a farm enterprise. The Nielson management model takes into account these contents of management (antecedents) in realising its outcome or performance through the management process.

Management performance which in turn is a measurement of management abilities can be measured by financial measures of the farm business as net worth, labour income and management returns. Better understanding of the human and management factor in farming can contribute positively in devising measures to improve the performance of farmers since in the production process a farmer aims at maximising his labour productivity and output performance for maximum income and benefits.

In this study, management performance criteria (output and income) of rubber smallholders and tappers are analysed by cross-tabulation and multiple regression analysis of four major socio-economic factors namely, output, income, sociological/biographical and holding or planting factors. They are variously cross-tabulated and regressed with management, output, income, sociological/biographical, expenditure, welfare, infra-structural and marketing factors to see their significant cause and effect relationships.

Tabular analysis shows that output is significantly related to management and sociological factors like man-days, income and age. Man-days are among the most important element in determining output level. Income is shown to be significantly related to the number of family tappers, man-days and educational level. Man-days are related significantly to output and income since failure to tap rubber for a certain minimum days in a year will adversely affect farmers' total annual output and income particularly

in the unorganised sector. Biographical factors such as occupational background also affect productivity. Full-time tappers have higher output than part-time tappers. Contrary to expectation educational level is not significantly related to output and man-days. Comparing farm types it is observed that race is significantly related to man-days and the number of trees tapped per tapping day with the Chinese tappers performing better than the Indians, Malays and the Siamese in that order of significance. However, within the same farm types, their performance in these respects are comparable. Household size affects output and income significantly indicating that family labour contributes positively to total farm income.

Multiple regression analysis shows that output is generally positively and significantly related to farm management factors in the unorganised sector and less so in the organised sector. In the unorganised sector, most management decisions are made by the farmers themselves while in the organised sector most of these decisions are set or made by salaried management staff in the schemes or estates and farmers only comply to these decisions. Similarly, output is not significantly explained by socio-biographical factors in both production sectors. Subsequent combination of the management and the socio-biographical factors to explain output variation shows the former to be more significant in the unorganised sector and the latter in the organised sector. However, the degrees of the explained variation in both cases are small though significant at the 5% level.

Management performance measured by farm income indicates a more significant association of management factors on income level where almost all the management variables especially output, man-days and the number of trees tapped per day

are positively and significantly related to income in both sectors. Together, these factors explain almost 40% and 32% of the variations in income in the organised and unorganised sector respectively. With higher level of input and better management standards the organised sector realises higher output and income than the unorganised sector.

Relating income to sociological and biographical factors it is observed that farmers' incomes are positively and generally significantly related to their age, formal educational level, household size, total rubber cultivation experience and their period of farm operation. These socio-biographical factors explain about 25% of the variation in income in the organised sector but only 6% in the unorganised sector. The combined effect of the management and socio-biographical factors on income gives a better fit to the data in both sectors. However, management factors are more strongly and significantly related to income than socio-biographical factors. Jointly, these two sets of factors account for about 45% and 36% of income variation in the organised and unorganised sectors respectively with regression functions for both sectors having high *F*-values significant at the 5% probability level.

Therefore, as a general conclusion, socio-biographical factors by themselves do not explain much of the variation in output or yield level. The analysis shows that socio-biographical together with management factors explain small but significant variations in yield performance among rubber farmers. The substantial part of the variation in output may be explained by other factors not within the scope of this study such as soil classes, climatic and environmental factors. On the other hand, income performance among rubber farmers in both sectors is determined substantially by management

factors and to a much lesser degree by sociological and biographical factors considered in this study.

In order to highlight some of the relevant performance index based on output and income studied earlier and as a possible step to overcome mass rural poverty among rubber smallholders in the country, a farm income analysis of the RRIM Economic Laboratory land development model is elaborated. Land is the primary input into production. It is distinguished from other factors of production (labour and capital) in that its supply cannot be increased or that it is fixed in quantity although the supply of useful land may be increased by the use of fertilisers, irrigation and machinery. Recognising this eventual constraint on land in the context of the agricultural policy in Peninsular Malaysia, the RRIM has instituted a research project (the RRIM Economic Laboratory) in an effort, among other things, to observe small farmers' production performance and their responses to incentives under the constraint of non-landownership situation. This approach to modern agriculture can improve the socio-economic position of the rural poor rubber smallholders and transform them into one of the most progressive and motivated farmers in the agricultural sector as a whole.

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Inequality and Poverty among Rubber Smallholders in Malaysia

This study examines the dispersion of income and shares received by various groups of smallholders in Buloh Kasap and Menapoh. The dispersion measured by Gini Coefficient is found to be generally

low in both the investigated areas, under all types of income and income proxy data. The Gini coefficients are 0.309 and 0.301 for Buloh Kasap and Merapoh. By other relative measures of income inequality it was found that the top 10% received a share of 23% to 27% while the bottom decile's share is less than 3%. The major source of income inequality is found to vary with locations; rubber is the main source of income inequality in Merapoh, and property, in Buloh Kasap.

Another important aspect of this study is poverty. It is defined as the income level which equals an absolute threshold necessary to maintain minimum bodily nutritive requirements. By this definition, some 55%–60% of the smallholders are considered poor and acute poverty affects one in every fourteen families. The income required to relieve the smallholders through income redistribution programmes is \$20 000 per month for each area. Factors which seem to contribute to poverty are low income, small land holdings, large family size and old age.

With respect to housing conditions, a substantial number of smallholders live in 'low' standard houses in terms of space, types of building materials and basic amenities. The problem here is not so much on quantity but rather the qualities of the houses of smallholders are far below the standards for decent habitat.

In relation to the consumption patterns, the poor consume significantly less food and non-food items in terms of quality and quantity in comparison with the recommended diet.

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