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First results from an experiment on on-farm planting material production in Cameroon

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Abstract

Rubber smallholdings have yet to be widely developed in Cameroon and, in the absence of a support programme for that sector, small and medium-sized farms are encountering numerous difficulties. One of their major constraints is access to budded planting material, resulting in a substantial use of seedlings to develop self-funded plantations.
Yet, the use of budded planting material is highly decisive in the future productivity of a plantation, and consequently in farmer incomes.
Based on experience in Southeast Asia, we put forward the hypothesis that Cameroonian smallholders could produce their own planting material. Developing budded plant production on farms would be well adapted to their socio-economic conditions.
An on-farm experiment was set up in two villages of South-West province in Cameroon to test the hypothesis. This paper sets out briefly to describe the methodology used, before going on to present the first results obtained. They indicated that the cost of budded material produced by farmers was generally well below the agroindustrial selling price; most of the farmers sought to reduce their financial investment; planting material production enabled farmers to clearly limit financial costs. However, several difficulties were encountered in the first year of the experiment.
The conclusion drawn is that, provided farmers receive ample technical supervision, support for budded planting material production on farms, by using a collective budwood garden, could be a worthwhile alternative for improving the incomes of small and medium-sized rubber farms in Cameroon. However, this experiment needs to be replicated on a larger scale to confirm the preliminary results.

Introduction

In Cameroon, the natural rubber supply chain is largely dominated by the agroindustrial sector. Smallholdings only supply 5% of national natural rubber production, whereas 80% of world production comes from family farms. Yet the merits of developing rubber smallholdings in Cameroon are generally acknowledged (Bouchitte A *et al*, 1996); (Lemaître P, Gergely N, 2005).

The two programmes providing support to small and medium-sized rubber farms in Cameroon came to a close in the 1990s. Farmers are now faced with various constraints (Michels T, 2001). One of the major constraints is difficult access to budded planting material: lack of available plants due to the agroindustrial replanting programme, distance from production zones, high cost. That difficulty has given rise to a substantial use of seedlings. The results of a survey in which farmers were interviewed in 2002 showed that 36% of plots, which were immature at the time, had been set up with seedlings and 17% were a mixture of seedlings and budded plants (Chambon B, 2002). Yet the use of such budded material is highly decisive in the future productivity of the plantation. The nature of the material planted therefore has major consequences for the income of family farms.

An experiment conducted in Indonesia in 1995 showed that, under certain conditions, smallholders could produce their own budded planting material from a smallholder budwood garden (Schueller W *et al*, 1997). In addition, work undertaken at the Sembawa research station (Indonesia) revealed that production costs were much lower for plants produced by farmers than for those produced by the research station (Rosyid MJ *et al*, 1996).

We put forward the hypothesis that, even though Cameroonian smallholders do not have such a long experience of rubber growing as Indonesian smallholders, it would be possible and worthwhile for them to produce their own improved planting material. Developing such a budded plant production operation on farms would be adapted to their economic constraints; it would facilitate access to that type of planting material, thereby contributing to the development of rubber smallholdings with a high production potential.

An experiment was therefore set up in 2004 in the South-West province of Cameroon to test the hypothesis[1]. This paper sets out to provide a brief description of the methodology and of the first results obtained.

1. Methodology

The experiment was set up in two villages of South-West province[2]: Bombe Bakundu and Mundame. The criteria for choosing the villages were:

- strong demand for budded planting material,
- farmers interested in and motivated by participatory research,
- plantation development possibilities (land availability),
- proximity to the Ekona research centre and accessibility of the village to facilitate monitoring.

In each village, the farmers themselves set up groups of 10 people on a voluntary basis.

[1] Experiment set up by the IRAD Rubber Programme (NRRP) with technical and financial backing from CIRAD and French cooperation.

[2] It is in that province that most rubber smallholdings are currently being exploited and where the NRRP is also located.

A collective budwood garden was set up in each village in June 2004. We used budded plants to enable exploitation right from the first year. Four different clones were used in the trial: PB217, PB260, PR107 (clones produced in the CDC nursery in 2004, hence readily available) and RRIC100 (recommended in smallholdings by CIRAD). In that way, the smallholders were able to choose the clone(s) that suited them best depending on their characteristics. The planting material was produced by the agroindustry present in South-West Cameroon (CDC, Cameroon Development Corporation). It was not possible to check the conformity of the planting material used. Each budwood garden contained 600 stumps (i.e. 0.075 ha); that amounted to a compromise between research requirements and the need to have enough budwood to be of interest to the farmers. The NRRP provided all the inputs needed, along with technical supervision from the choice of land up to cutting back. The farmers provided their labour.
The farmers were entirely responsible for rootstock production. The NRRP showed them the different techniques (seeds planted in the field, ground nursery or polybag nursery), along with the advantages and disadvantages of each. It also provided technical support during the rootstock production period. The farmers were able to choose the type of rootstock they were going to produce; if they wanted to use a nursery, they could opt for a collective nursery or individual nurseries; the individual nurseries could be grouped together or dispersed. For rootstock production, the cost of any inputs, along with the work force, were the responsibility of the farmers.
The farmers were then trained in budding techniques. Budding knives and plastic bands were supplied by the NRRP. The farmers provided the rest.

Trial monitoring focused on practices and agronomic performance, along with socio-economic data (see table 1). Data gathering on rootstock production and budding was irregular for two reasons:

- staggering of the nursery installation and budding periods for the different farmers
- absence of farmers when certain inspection visits took place.

This paper will primarily focus on the socio-economic data.

Table 1: Trial monitoring

	Agronomic data	Socio-economic data	Data gathering frequency
Budwood garden	- Number of plants - Plant development - Vertical growth of plants - Bud removal quality - Weed cover - Type and quality of mulching - Diseases and pests - Crop management	- Work time - Financial costs - Budwood garden management methods - Difficulties and problems	Every fortnight the first month, then monthly
Rootstocks	- Planting design - Crop management - Plant growth	- Work time - Financial costs	Irregular
Budding	- Budding success rate	- Work time - Financial cost	Irregular

The data were analysed per budwood garden and per farmer. We also calculated means per type of planting material produced (stumps/polybag plants).

2. First results and discussion

2.1 – Cost of on-farm plant production

The cost of budded plant production by farmers was lower than the cost-price of planting material bought from the agroindustry (see table 2). That was true for both types of planting material sold; however, the difference was greater for stumps (almost half the price) than for polybag plants. That was linked to the fact that, in general, the farmers who chose to set up a polybag nursery used more fertilizers and phytosanitary products than the farmers who set up a ground nursery. In addition, most of the farmers who opted for a polybag nursery used a budder, which increased budding costs (hence the cost of the plant), compared to budding by family labour.

Table 2 Cost of producing a budded plant in years 1, 2 and beyond (in US$[3]/plant)

Origin of the plants	Farmers				Agroindustry
Type of plant	Year 1	Difference	Year 2	Year 3 and +	
Stump	0.26	0.17 to 0.37	0.24	0.21	0.48
Polybag	0.79	0.64 to 0.79	0.79	0.75	0.87

The production cost indicated in table 2 takes into account total financial investment (inputs paid for by the NRRP or by the farmers, remuneration of labour if farmers used hired labour) along with the cost of family labour used for this activity. For the last case, we considered that the opportunity cost of labour in the zone corresponded to one day of agricultural work, i.e. US$ 3.86.

[3] Exchange rate used: US$ 1 = 518 CFA francs.

A large share of the expenses incurred in the first year was an initial investment that would be amortized over several years. To calculate the cost of producing one scion, we therefore took that amortization into account, by considering that:

- a smallholder budwood garden could be used for 10 years,
- insofar as that budwood garden was collective, its use would be the same throughout the exploitation period. Consequently, amortization was linear.

We have presented an average cost. However, there was a fair degree of variability between farmers producing the same type of planting material. It was due to:

- the diversity of nursery management techniques, leading to different work types and quantities of inputs used,
- use of hired labour by some farmers only; hired labour increased labour costs, particularly for budding,
- very different budding success rates from one farmer to another.

Variability was much greater for stumps than for polybag plants.

Lastly, the cost of budded plant production by farmers was expected to decrease in subsequent years, since the quantity of budwood would increase[4]. We simulated the cost price of the scion and thereby the cost of producing a ready-to-plant budded plant in year 2 and beyond[5]. Once the budwood garden was fully up and running, the cost price per budded plant would be further reduced by 4 or 5 US cents.

To conclude, budded plant production by farmers would clearly reduce their investment in improved planting material. To date, when self-funded plantations were set up, the main reason for not using budded plants was their excessive cost. In South-West province where a spontaneous move to plant rubber was seen in the second half of the 1990s, the planting material (polybag plants) amounted two third of the investment needed to set up the plantation (US$ 713/ha) and 40% of investment from land clearance to tree opening (US$ 1 186/ha) (Plaza C, 2003). Many farmers do not have the capital required for such investment. Consequently, planting material production by farmers themselves seems to be an appropriate way of facing their economic constraints.

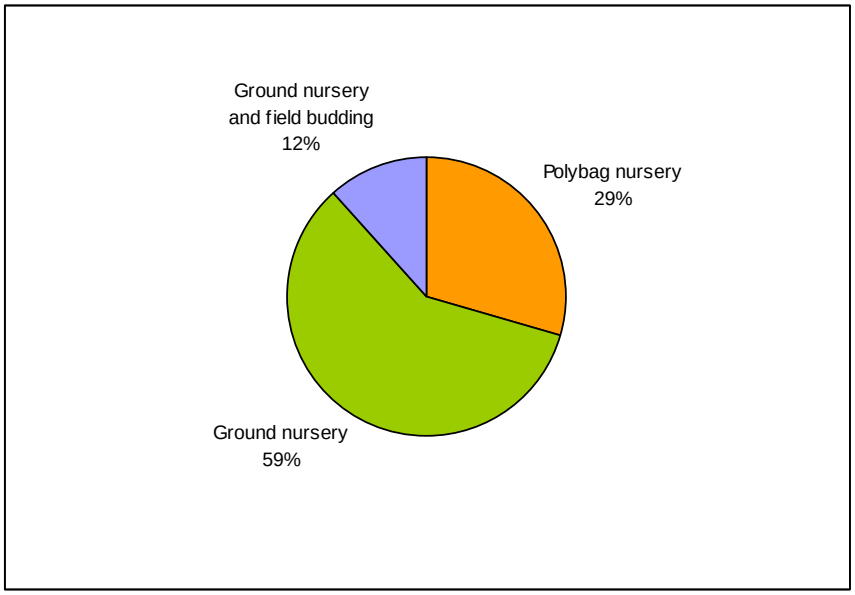
2.2 – Limiting financial investment

As already mentioned, the farmers were free to choose their rootstock production method (ground nursery, polybag nursery, or seeds planted in the field). Most of the farmers opted for a ground nursery (see figure 1). The aim was to limit financial investment. In fact, plant production in polybags meant buying polyethylene bags that cost at least $US 0.116 each (40 x 30 cm bags bought in Douala). For those farmers who produced polybag plants during this trial, bag purchases amounted to an average 15% of the total cost of plant production.

[4] Twice as high in the second year and three to four times greater in subsequent years, depending on the budwood garden management method.

[5] It is considered that the budwood garden was managed in such a way as to leave 3 suckers/plant.

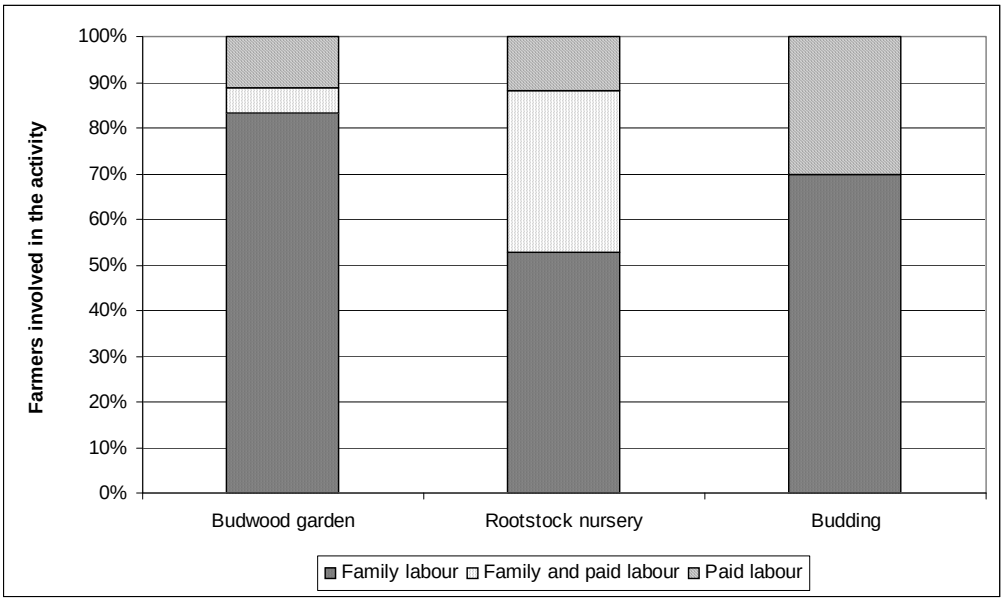
Figure 1: Rootstock production method chosen by farmers



Also, in this experiment, one of the farmers' contributions was the work force. They could either use family labour, or call upon hired labour.

Family labour was largely used at the different stages of budded plant production (see figure 2). It was often the only work force used for setting up and managing the budwood garden, and for budding. Despite the training provided, some farmers preferred to call in a budder (a CDC employee who was either retired or still in active employment) to guarantee successful budding. Hired budders were found to be used more by group members who had non-agricultural activities as their main source of income, and others who found their knowledge of budding wanting. The former either did not have enough time for that activity or perceived budding as a menial task similar to tapping. The latter relied on hired budders to reinforce their skills and complement their individual productivity and enable them to meet planting deadlines. These farmers did not feel they had a sufficient command of the technique and they did not want to take the risk of losing the investment made in terms of labour and capital. For rootstock production, many farmers used hired labour to assist the family, mainly when setting up, for bag filling which was a long and laborious job.

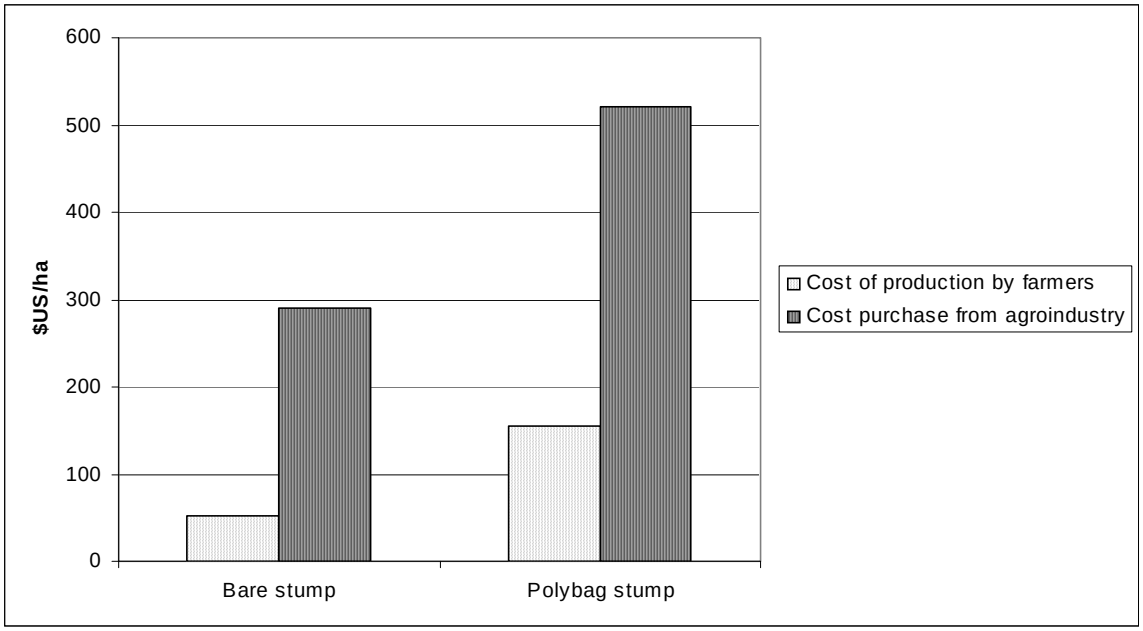
Figure 2: Labour used for rootstock production



Generally speaking, the farmers therefore preferred to use the family work force, rather than investing capital in hired labour. The head of the farm was virtually always personally involved in this activity; however, he often called upon family help, usually the children, sometimes also his wife, or brothers in the case of the youngest farmers. Those farmers who only used hired labour had a non-agricultural activity and therefore extra income that they were able to invest.

Lastly, rootstock production on farms considerably reduced the farmers' capital investment in planting material (see figure 3). In this trial, the capital used amounted to less than 20% of the capital the farmers would have had to invest to buy budded stumps from the agroindustry; it amounted to 30% for the farmers opting for polybag plants.
Investment in labour (corresponding to the family labour used for budded plant production) was relatively limited, especially when considering that it was spread over about a year. Bare stumps required almost half as much work as polybag plants (27 man-days for the former, 50 for the latter).

Figure 3: Capital investment for 1 ha of plantation



To conclude, planting material production by farmers enabled them to reduce the capital invested in plants, replacing it with family labour. The decision taken by most of the farmers involved in the trial to invest labour rather than capital seemed to validate the basic hypothesis of the experiment, namely that, for the farmers, capital was more of a limiting factor for production than labour was. It might be necessary to determine capital and labour productivity, in order to substantiate that hypothesis.

2.3 – Difficulties encountered

The main difficulties encountered during this experiment concerned the collective dimension of the planting material production activity and the competition for labour between budded plant production and other agricultural activities on the farm.

► *Collective budded plant production activity*

For this trial, we decided to set up a collective budwood garden[6] assuming that its installation and upkeep would be ensured collectively, i.e. all the farmers in the group working together for most of the technical operations.
In practice, in the first weeks following planting, the farmers from the two villages decided alone to divide the budwood garden into equal sections. Each farmer was supposed to ensure the upkeep (weeding, watering, mulching) in his section. The reason for the division was to ensure that each member fulfilled his responsibilities. It was a consequence of the poor commitment of some of them to take part in joint work. In one of the two villages, despite that division, the farmers continued to work together. However, in the other, each farmer maintained his section independently from the other members of the group, which led to a degree of heterogeneity in budwood garden upkeep.

[6] The choice of a collective budwood garden was based on two main considerations: 1) There was no guarantee that an individual budwood garden would be worthwhile for small and medium-sized farms; 2) forming a group would offer a certain number of advantages: facilitate the transfer of information, promote mutual help, enable grouped input purchases, etc.

Another difficulty observed with individual management of the collective budwood garden was an abusive or poor harvesting technique perpetuated by inexperienced members.
Surprisingly, some farmers, through the influence of hired budders and the proximity of the rootstock nursery to CDC plantations, continued to collect budwood material from neighbouring CDC plantations. A greater effort therefore seemed required to make farmers aware of the consequences of such practices for the quality of the planting material produced.

Also, in this experiment, the farmers could opt for grouped or individual rootstock production; in the latter case, the nurseries could be geographically grouped or dispersed. During the first year of the experiment, in both villages, the farmers chose to set up geographically dispersed individual nurseries. The main two reasons given were:

- not all the farmers wanted the same quantity of plants; under those conditions, it was difficult to run a collective nursery,
- setting up a collective nursery (or geographically grouped individual nurseries) would require too large an area.

However, due to certain constraints in the second year of the trial, namely drought and stray animals, the Bombe farmers decided to create a collective and partitioned rootstock nursery (managed like the budwood nursery), next to a spring a little further from the village. Those farmers therefore changed their minds and became more interested in reducing their cost and hardship through collective efforts, which seemed to progress over time.

The farmers from the villages involved in the trial therefore seemed to have problems in developing this budded plant production activity in a collective manner. Yet, all those farmers were used to working together in mutual aid groups. In addition, despite the problems encountered, the farmers acknowledged the benefit of a collective budwood garden rather than an individual one. The main reasons given were:

- it guaranteed good budwood garden upkeep because, if one person was exceptionally unable to carry out the work, the group could continue to operate,
- the work was quicker,
- it particularly enabled the farmers to work together and mutually train each other, with the more experienced passing on their knowledge to those less familiar with rubber growing, or to farmers who were gradually going to embark upon budded plant production in the villages.

Initially, farmers had the perception that they were going to receive some form of financial assistance to enable the participants to run the trial and open their farms. A continuous information campaign led the farmers to change and to better appreciate the budwood nursery as an asset for long-term use.
Monitoring what becomes of this budded plant production activity in the villages involved in the trial should provide further information on the constraints or advantages associated with collective budwood garden management, or even with this new activity.

► *Competition with other farming activities*

One of the characteristics of rubber smallholdings in the South-West province of Cameroon was the diversified farming systems. There were usually several tree crops (cocoa, oil palm, rubber), along with food crops, often partly intended for sale. Family labour was therefore used for various farming activities. Monitoring of farmer practices in the budwood gardens thus revealed competition between budwood garden upkeep and the other agricultural activities.

The labour in the province was in much demand at the end of the year, when the land was prepared for food crops, then from February onwards for sowing those crops, which also corresponded to the period when farmers were beginning to deal with their cocoa plantations. During those periods, upkeep in the budwood gardens was neglected.
As the nurseries were set up late, the plants were ready for budding late, towards May and June, when the farmers were busy maintaining their cocoa plantations (weeding, pruning). Labour was therefore not available for budding work.

Consequently, in order for budded plant material production to develop under good conditions in that zone, where the farming systems were highly diversified, it seemed necessary to take into account the different agricultural activities in order to limit possible competition. It seemed that farmers could do more with the same work load if they decided to plan their work over the year. Observations in Mundame (2005) and Bombe (2006) confirmed that farmers could programme their activities to effectively participate in training and even manage multiple tasks.

Conclusions and prospects

Although Cameroonian rubber smallholders do not have a long experience of rubber growing, in our experiment they were able to produce their own budded plants. However, close technical supervision of the farmers at all stages of planting material production appeared to be essential for the success of the operation.
The cost of planting material was thus reduced; the farmers had the possibility of limiting their financial investment, by replacing capital with their labour, even though competition was found for labour use between the different agricultural activities. Plant production by the farmers therefore seemed to be adapted to the economic constraints of many smallholders. It also offers other advantages:

- it removes the problem of organizing and paying for the transportation of plants, which could be expensive due to the distance from the nurseries,
- it more effectively guarantees the quality of the planting material in smallholdings, because the producers are also the users. However, that presupposes that the farmers have been made fully aware of quality issues and have received the corresponding training,
- it can generate another source of income for the farmers. Indeed, farmers produce these budded plants for private use as well as commercial purposes, as is already the practice. Due to the need for capital to prepare farmland, some seemed to take advantage of the budded stumps to raise funds that would enable farm development and satisfy household needs. In Mundame, a bare stump (from a 2004 nursery) was sold to the villagers for US$ 0.48. So far, many individual farmers and groups have already taken steps to become part of these groups so as to share the benefits.

A few farmers, such as those who had a non-agricultural activity, did not seek to limit their financial investment by using family labour. For those farmers, the important thing was to have access to budded planting material nearby. For that category of rubber farmers, budded plant production by the farmers themselves was undoubtedly of only relatively limited interest. The development of private nurserymen in the villages might be an interesting alternative for providing them with access to planting material with a high production potential.

The results presented in this paper came from an experiment with only two replicates. Consequently, although we worked with two villages displaying very different socio-economic situations (Chambon B, Owona Ndongo P.A, 2005), it is essential to repeat the experiment in other villages to confirm these initial results. It is also necessary to test the agronomic performance of the planting material produced by farmers, in particular the level of genetic conformity, clonal purity and rate of recovery after planting out, to compare them to plants sold by the agroindustries.

Despite these limitations (which might be lifted in future work), it seems that budded plant production by farmers is a promising avenue for facilitating their access to planting material with a high production potential. That would make it possible to improve the income of farmers and also encourage the development of rubber plantations, as rubber is an economically worthwhile crop, given current natural rubber prices. However, the marketing conditions for selling smallholder rubber to CDC create doubt in the minds of rubber farmers, with aggressive conditions experienced early this year leading to some rootstock nurseries being abandoned, thereby threatening the very existence of the trial and the future development of this activity. This is a serious factor which seems to considerably affect the rate at which rubber smallholdings are developing.
Despite these difficulties specific to the CDC zone, continuing with this work seems to be perfectly justified insofar as supporting the creation of smallholder budwood gardens and providing training then technical supervision for farmers seems to us to be a good way of sustainably supporting the development of rubber smallholdings in Cameroon.

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