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CHANGING SUGAR TECHNOLOGY AND THE LABOUR NEXUS: THE CARIBBEAN, 1750-1900

Between 1750 and 1900 revolutionary changes took place in the agricultural and processing technologies of cane growing and sugar production in the Caribbean.¹ The innovations that altered the entire processing structure are fairly well documented: the application of steam power, better cylinders, vacuum pans, centrifuges, double to quintuple effect evaporation, and – regarding the scale of operations rather than their nature – ‘usines centrales’. Important changes are also to be found in the sector that bridges the gap between cultivation and processing, i.e. transportation: movable rails, fixed rails often combined with steam traction, and conveyer belts. Finally, somewhat less well documented, we find a number of modifications in the agricultural sphere: new cane varieties; more (or less) ratooning, alterations in planting distances, ploughs, better drainage and irrigation, and the application of manure and fertilizer.

During the same period the social organization of Caribbean sugar production changed considerably, although not everywhere at the same rate or to the same degree. The slave trade and slavery were abolished throughout the region. Indentured labour, free seasonal labour, and free permanent labour were substituted for slavery or initially employed in addition to it. In a number of cases the ‘new’ (ex-slave) peasantry started to produce sugar as well. Often, two or more of these employment conditions coexisted in one country during several decades, which may very well have led to modifications within each labour mode, even though we still would call it by the same name (slavery). But even in countries where slavery was the dominant type of social organization of production until the very end, alterations in labour relations occurred, partly as a result of the adoption of ‘amelioration policies’ and concomitant new legislation.

Given these two sets of fundamental changes, the question might be

(and indeed has been) asked, whether there existed any concurrent connection between technological development and changing labour relations in the Caribbean. And if so, how far the timing of the one was determined by the development phases of the other.

In the historiography of the Caribbean two major schools of thought have formulated explicit ideas on this subject. The Abolitionists argued that slavery was an obstacle to efficient production because the availability of cheap labour had rendered the application of new, labour-saving techniques unnecessary. Slavery, therefore, had created a tradition-oriented class of planters.² Secondly, marxist historians often have argued that an advanced technology and the existence of slavery are incompatible. Complicated, modern factories cannot be operated with slave labour; slavery, so the argument runs, had to vanish before the sugar industry could become thoroughly modernized.

These notions have permeated the historiography of the Caribbean sugar industry in the nineteenth century. Over the last decades, however, several scholars have reconsidered the sugar technology – labour nexus more thoroughly, casting doubt on both the underlying assumptions and the empirical viability of the two older theses. Clearly these notions can do with some rethinking.

THE CONTEXT

The discussion of sugar technology and the labour nexus is often embedded in a broader context, namely the debate on the profitability and viability of slave labour as such. It may be useful to disentangle some of the issues at stake. First, the economic background of abolition is still hotly debated. Since the publication of Drescher's *Econocide* (1977), the historiographical orthodoxy seems to be shifting from the economic determinism of Ragatz (1928) and Williams (1944) to Drescher's thesis, namely that the abolition of the transatlantic slave trade was brought about by genuine abolitionist fervour, not by a preceding decline in the profitability of the slave trade and West Indian slavery.

Did the ending of the trade immediately result in declining profitability of slavery itself? Here too, recent debates have corrected some of the older economic orthodoxies. It may be true that in the long run slavery without a replenishing slave trade to correct a usually negative demographic performance of the slave populations was not feasible or at least less profitable. Yet, recent research has contradicted at least the immediacy of a so-called age-related crisis of slavery. As Rebecca Scott (1985:91-7)

demonstrates, even the late abolisher Cuba did not suffer from an ageing and thus less productive slave force preceding emancipation. The same conclusion emerges from an analysis of the Puerto Rican slave population on the eve of emancipation (Nistál-Moret 1985:145). Higman (1976:212-26) does admit to an unfavourable change in terms of age and sex for the Jamaican slave population as a result of the abolition of the slave trade. Yet, he indicates that overall labour productivity did not suffer from this demographic set-back.³ Klein and Engerman (1985:267) even argue in more general terms that it "is doubtful that, in any major case, slave emancipation, however achieved, reflected a prior decrease in the profitability in the use of slave labor on the plantation. Broadly considered, emancipation usually came at times of expanding production, not stagnation."

Slavery, then, may not have been a decaying and obsolete institution in the decades preceding emancipation (Engerman 1986). It may be worthwhile bearing this in mind, since precisely the obsolescence and declining profitability of slavery are implicit corner-stones of the incompatibility-thesis. Moreno Fraginals (1985:4-5) for example situates the 'inevitable' transition to free labour in the Spanish Caribbean not only in a context of radical innovations in the sugar industry involving "highly sophisticated machinery that required skilled operators and efficient technical supervision", but also of a "crisis of the slave system" as such.⁴

The above indicates the broader context in which the innovation-cum-slavery debate is embedded. Some additional remarks may be appropriate in order to dismiss certain often raised issues which on closer inspection seem to miss the point.

First of all, there is a tendency to underestimate the level and diffusion of innovation actually achieved in the eighteenth- and nineteenth-century Caribbean, as will be demonstrated below. From this unjustified underestimation, it is but one step to 'successfully' establishing a link with planters' conservatism and/or the inherent incompatibility of slave labour and technological progress.⁵ Admittedly, in general terms the Caribbean mostly reacted to European inventions, not generating original contributions of its own. This, however, seems to be an unfair and ahistorical argument, as Europe, not any of the (semi-)peripheral regions of the world-economy, was the cradle of the Industrial Revolution. North-western Europe and later the United States determined the rhythm of innovations all over the world. Since neither Eastern Europe nor Asia, Africa or Latin America produced significant inventions, it is not surprising that the hardly urbanized and mineral-poor Caribbean did not do so either. Nor can we blame the

eighteenth century for being less inventive than the nineteenth. It seems untenable to attribute a major importance to the region's mode of labour here.

Metropolitan factors also significantly influenced the level and diffusion of innovation in the Caribbean. The availability of capital and technical know-how in the metropolis may be mentioned in this context, as well as absenteeism and the degree to which both the metropolitan government and West Indian interest groups in the metropolis stimulated the transfer of technologies to their Caribbean dependencies.⁶ An example may be useful here. The diffusion of innovations implemented in British Guiana's sugar industry in the three decades following emancipation undoubtedly compares favourably with the improvements realized during the same period in neighbouring Suriname, where slavery was upheld until 1863. Yet, on reading Adamson's (1972:167-77) analysis of British Guiana's technological progress, one feels that British capital and know-how (and the fact that Guiana was a 'new frontier') rather than the labour issue made the difference. After all, Suriname also faced acute labour shortages long before the abolition of slavery.

Finally, the actual profitability of the plantation sector determined the possibility of internally generating capital for innovative investments. Obviously, there existed crucial variations within the Caribbean as to these factors. Yet, whatever the different outcomes, all territories shared a predominance of slave labour well into the nineteenth century. Attributing their different records of innovation primarily to the mode of labour therefore seems highly questionable. In fact, it can easily be demonstrated that between 1833 and 1890 some slaveholding societies were characterized by profitable plantations, whereas other slaveholding economies were not. The same is true of non-slaveholding societies, of which some could boast of a profitable plantation sector, and others not.⁷

CONSERVATIVE SLAVEHOLDERS?

This being said, we may now turn to the heart of the matter. The debate will be separated into two related questions. First, did low levels of invention/innovation characterize slave-holding plantation economies, and if so, can this be attributed to the presence of a large, relatively cheap labour force rendering superfluous all attempts to introduce innovations? Second, we will examine the proposed incompatibility of slave labour with technological innovation in more detail.

The planters' traditionalist outlook and their refusal to innovate often have been cited as one of the causes of West Indian economic decline (Green 1973:448; Green 1976:51; Knight 1978:125; Watts 1987:391). Sometimes this attitude has been linked to one or two factors typical of West Indian sugar producers: they had access to a cheap supply of labour (slaves), and the leading sugar colonies produced their sugar behind the comfortable walls of a protective sugar tariff. The cheap labour argument, which is our main concern here, often has been formulated in a 'disguised', implicit form: labour saving innovations had to be introduced after abolition and emancipation, because 'free' labour was more expensive (Mintz 1986:69; Parry and Sherlock 1971:198). In this section we shall try to determine if the West Indian sugar planters indeed did refuse to innovate, and, if so, whether this can be attributed to cheap labour.

A glance at the number of inventions/innovations shows that it cannot be said that the technology of sugar production remained unchanged between 1640 and, let us say, 1840 (Deerr 1949, II:536-52; Green 1973; Green 1976:52-7; Watts 1987:383-446). Planters continually adapted the original Pernambuco 'model' (Watts) when the cultivation of cane spread from Brazil to Barbados and from there to other West Indian islands: the Barbados model.⁹ They also soon grasped the need for alterations when ecological conditions in the islands deteriorated, or when profit margins were falling, particularly after 1750. For a detailed treatment of these changes, both in the agricultural and in the processing stages of sugar production, the reader is referred to David Watts' recent study on the West Indies (Watts 1987).

Nevertheless some doubt remains. The question could be asked whether the planters, given the available examples of 'modern' agricultural and industrial practices elsewhere, could not have innovated more than they did. Also, it is worthwhile to try and find out which part of the innovations that were introduced can be regarded as labour-saving ones, as one of the traditional explanations for the lack of innovation emphasizes cheap labour, and therefore the absence of the need to introduce labour-saving devices.

Did the planters innovate as much as they could have done? It can be said that the West Indian planters did not copy all Western European, particularly British, innovations which taken together often are referred to as the Agricultural Revolution. Watts (1987:446) mentions animal husbandry as one of the important elements in eighteenth-century British agricultural improvement that was largely neglected in the Caribbean.¹⁰

Another remarkable 'oversight' of the planters was the use of the plough. This at least has often been suggested. Yet the story of the plough in the Caribbean is a good example of the complicated nature of the problems we are dealing with. In general terms it is quite clear that the use of the plough instead of the hoe is a labour-saving innovation. Several factors, however, militated against using the plough in the West Indies. The rather shallow topsoil was much more subject to dehydration and erosion than the heavy European soils, while steep slopes and soils were too stony for the plough. Next, the presence of many drains and canals in 'polder'-like areas such as Suriname and British Guiana inhibited ploughing. Finally the absence or high price of strong draught animals proved to be an obstacle.¹¹

The question, therefore, may be asked whether introducing the plough in the West Indies was really such a good idea, given the adverse natural circumstances.

In addition, many plantations followed a practice called cane-holing, which could not be applied by using a plough only. Here the slaves still had to use the hoe after ploughing, which restricted the amount of labour saved with the plough. Even in the Dutch East Indian colony of Java, where the plough had been used since time immemorial, the introduction of the system of cane planting developed by the Cuban agronomist Reynoso, caused a switch from plough to hoe in the sugar districts around 1870 (Sollewijn Gelpke 1885:107).

These adverse circumstances notwithstanding, in several Caribbean islands the planters, after 1770 hard pressed for cost-cutting innovations, did experiment with the plough but found it wanting. After several decades most came back to the hoe (Watts 1987:429-32). Yet after emancipation, many planters once again reverted to ploughing, presumably because the need for labour-saving devices by now had become of paramount importance (Craton, Walvin and Wright 1976:333; Green 1976:205-6; Parry and Sherlock 1971:198).

The story of the plough suggests that at least some planters were interested in cutting costs, that they were aware of the advantages and disadvantages of certain innovations, and that they were prepared to experiment with 'novel' practices even in the face of serious obstacles. It might be interesting to investigate the use of the plough after its post-emancipation reintroduction.

Given the complicated nature of any innovative process (of which the varying fortunes of the plough in the West Indies are only one example) it might be worthwhile to direct research towards similar 'oversights'.

A further question is which part of the introduced innovations can be regarded as labour-saving, in contrast to innovations such as the introduction of iron and horizontal rollers or higher yielding cane varieties (Otaheite, Bourbon) which were not aimed at reducing labour input, but rather at an increase of the productivity per acre of cane. Watts (1987:384) distinguishes between the period 1665-1720, when most innovations were related to ecological deterioration, and the period after 1750, when in response to increased competition and rising costs planters attempted to increase efficiency. Perhaps we should concentrate on the latter period in our search for labour-saving innovations.

The plough was, of course, intended as a labour-saving innovation. So were the repeated attempts to increase the number of ratoon crops (more harvests from one cane plant). Another example was the introduction around 1755 of the so-called 'doubleuse' or 'dumb returner', "an iron shield which caught the once-crushed cane on the far side of the mill rollers from ingress, and turned it into a position for automatic re-entry back into the rollers for a second crushing" (Watts 1987:420).¹² In all these cases the primary motivation of the planters was to cut costs by substituting capital for labour or by reducing the number of labour-intensive operations.

In all probability this was also one of their motives for experimenting with steam-mills from the 1770s onward (Debien 1941:75; Deer 1949, II:549-52), though for a time experiments came to naught. It is less clear whether the planters realized that steam-mills could only be operated at a profit if used to their full capacity. Full capacity however required a larger input of cane and therefore more labour in the field!¹³

A next issue is whether slaves can be regarded as cheap labour and therefore as a disincentive to the implementation of labour-saving innovations. A first off-hand comment to this supposition is that the price of slaves did not remain unchanged during the two centuries between 1640 and 1840. Pares (1960:38) states that the prices of slaves more or less tripled between 1660 and 1790. Prices continued to rise subsequently, particularly after the abolition of the slave trade. So even if this argument may have been valid in the late seventeenth and early eighteenth centuries, it is highly unlikely that it is also applicable to the late eighteenth or early nineteenth centuries.¹⁴

The question is, however, more complicated. Various authors mention that the number of slaves required on a sugar plantation was not determined by typical agricultural activities, but "by the extraordinary demand for labour during the harvest season when sugar was cut, milled, boiled, cured,

packaged, and transported to port" (Green 1973:449). Outside the milling season the available labour force was not fully needed and, so the argument runs, had to be kept occupied (Pares 1960:23; Sheridan 1960:139).

This generally held belief among historians implies that one busy season for which a minimum number of slaves had to be acquired characterizes the sugar plantations. Labour-saving innovations for activities outside the milling season, when part of the labour force was apparently redundant, were therefore not needed. For a number of reasons this line of argument is not entirely satisfactory, and a closer look at plantation labour requirements seems necessary.

Case studies on Surinam sugar plantations suggest that these plantations did not have only one milling season. Cutting and milling cane could be done throughout the year, and a prudent planter might have hoped to avoid an extraordinarily busy period at the mill by staggering his planting and thus his harvest.¹⁵

Moreover many Surinam plantation records indicate that the maintenance of buildings, fences, and ditches was in arrears. This state of affairs implies that labour outside the milling season was far from redundant. Suriname may not have been exceptional as far as these two examples are concerned, and it might be worthwhile to look for similar evidence from other Caribbean areas. In fact, Scarano in his analysis of a Puerto Rican sugar county explicitly contradicts the notion of a dead season as opposed to the harvest time: "the intensity of work did not diminish noticeably during the off-season; rather, workers employed in industrial tasks were transferred to the fields to prepare the canes for subsequent harvesting" (Scarano 1984:102).

Finally, even though the milling season might have been a peak period in some plantation areas, it was not the only one. Planting cane, particularly in those areas where the caneholing system had been introduced, was tedious and hard work. "The work was so laborious and exhausting [...] that selfinterest alone prompted most overseers to seek assistance for their slaves by hiring a jobbing gang" (Patterson 1976:66). This quotation merits our attention for more than one reason: not only does it demonstrate that it would be erroneous to regard all activities outside the 'campaign' as the slack season, it also draws our attention towards a phenomenon often overlooked in discussions on Caribbean labour supply and demand under slavery: the jobbing gang. The existence of jobbing gangs implies a much greater flexibility in the supply of labour during peak activities than has been assumed by scholars equating the minimum number of slaves needed for a sugar plantation with the minimum number needed during the harvest. One should establish how often and for which kind of activities plantation

owners hired jobbing gangs, instead of just assuming that as far as labour was concerned the plantation was a closed system.

Taking all the evidence together there seems therefore to be ample room for questioning the validity of the abundant labour supply thesis.

SLAVE LABOUR AND TECHNOLOGICAL PROGRESS

Europe's Industrial Revolution emerged in a free wage economy where bonded labour had disappeared. With the diffusion of modern technology and the Western economic system over the world, in the long run bonded labour was also elsewhere increasingly combined with, and subsequently replaced by, free wage labour. This historical connection between industrial progress and free labour has led many scholars to posit a causal relation between the two. The conclusion with regard to the Caribbean would be obvious then. Free wage labour replaced slavery as the latter was incompatible with the growing demands for skilled labour concomitant with the 'mechanization' of Caribbean sugar production.

Contemporaries sometimes posited an incompatibility of slave labour with technological progress with reference to the supposedly backward, lazy, unreliable etc. nature of the slaves - in short, in terms of the contemporary racist ideology.¹⁶ Others blamed the system of slavery for degrading the slaves, the slaves' incapacity to adjust to innovation thus being the result of a regime of repression and a lack of incentives, not of any personality traits. Small wonder that only the latter interpretation has survived in modern scholarship on the Caribbean. An early example of this is to be found in Williams' 1944-classic *Capitalism and slavery*: "The labor supply of low social status, docile and cheap, can be maintained in subjection only by systematic degradation and by deliberate efforts to suppress its intelligence. Rotation of crops and scientific farming are therefore alien to slave societies." (Williams 1981:7).¹⁷ Perhaps the most prominent recent protagonist of the incompatibility-thesis is Moreno Fraginals. Analysing innovation in the Cuban sugar industry in the 1840s, he maintains that "the new machines were too complicated to be operated by slaves. [...] The industrial revolution implied the transition to the wage labourer."¹⁸ In another, more recent reflection on the same issue he situates the crisis in the 1860s rather than in the 1840s. Yet, the arguments are similar (Moreno Fraginals 1985:4,15-6).

Although few would disagree that in the long run slavery is indeed an anachronism in a world of sophisticated technology, strong arguments have been put forward to counter the relevance of the incompatibility

issue in a nineteenth-century Caribbean context.¹⁹ Broadly speaking, there are two lines of argument intertwined in the literature.

First, some scholars have contradicted the incompatibility thesis by demonstrating that some of the countries clinging for the longest time to slavery were technologically among the most advanced Caribbean sugar producers. Cuba is a clear case. Abolishing slavery only in 1886, half a century after the British West Indies, Cuba became the pinnacle of technological accomplishment among the Caribbean sugar producers from the 1820s onwards, slavery apparently notwithstanding. Recently, Scott has produced even more devastating evidence against the incompatibility thesis by demonstrating that even within Cuba there was a positive, not a negative, correlation between the predominance of slavery and technological innovation. Thus, in the 1860s, the technologically most advanced sugar producing regions were precisely those where slavery was dominant and, eventually, held out longest; even in the 1870s, Scott concludes, "where sugar prospered, slavery persisted" (Scott 1985:87, also Scott 1984:87-9, Bergad 1989). Consequently, she explicitly challenges Moreno Friginals' view of a conservatism necessarily linked to slaveholding. On the contrary, the most technologically progressive planters clung tenaciously to slavery while also employing other types of labour simply because not enough slaves were available to them. The resulting mixture of types of labour may be interpreted as a sign of the slaveholding planters' flexibility instead of rigidity (Scott 1985:91).

The second line of reasoning centers on the nature of work on sugar plantations and on the competence of slave vs. free labour to perform qualified tasks. As to the nature of work, though the overall low qualification of work entrusted to plantation slaves is not debated, various authors emphasize that on every slave plantation slaves performed some qualified labour. This 'slave aristocracy' of skilled artisans traditionally consisted of sugar boilers, drivers, carpenters and other craftsmen. Their levels of skill must have been considerable according to contemporary standards. From our own research on Surinamese plantations we found abundant evidence of slave children serving years of apprenticeship either on the plantation or in the city of Paramaribo before being entrusted with qualified positions within the hierarchy of the slave work force. Similar evidence on skilled slaves is recorded in studies on other Caribbean slave plantations.²⁰

The obvious next question is whether technological innovation indeed occasioned a demand for labour that could not be met by qualified slaves. The evidence on this matter seems inconclusive. Clearly most of the

sophisticated apparatus installed on nineteenth-century plantations needed the supervision of technical experts. Incidentally, these engineers were mostly recruited from Europe or the US, implying that it was their previous experience with modern technology, not their being free instead of slave which made the difference; after all, some free labour as such would have been available within the colonies too. Moreover, quite some evidence has been put forward on slaves actually working with modern technology (Scott 1985:26-7; see however Heitmann 1987:38-9).

A further test of the incompatibility thesis would be to establish whether alternative forms of labour were indeed intrinsically better equipped to perform the qualified tasks demanded by the new technologies. Foreign engineers certainly were; yet engineers formed only a tiny minority of the labour force.²¹ After Emancipation (in the Cuban case also in the preceding decades) indentured labour from Asia was imported to add to the labour pool. It seems highly debatable whether the Chinese in Cuba, the East Indians in Trinidad or the Javanese in Suriname, often with no educational background and scarcely any on-the-job training, would be better equipped than slaves to perform qualified tasks. This reasoning applies a fortiori to the freedmen themselves; one wonders if a change in their legal status really made them more intelligent and dedicated craftsmen from one day to the next.

Perhaps the most serious objection to the incompatibility thesis raised in this context is whether the technological innovations in the sugar production throughout the eighteenth and nineteenth centuries really resulted in a significant qualitative change in labour demand. It may well be that innovations in sugar processing provoked a change in demand for skilled labour; whether slaves were intrinsically incompetent to perform these new tasks has been discussed above. But whatever the answer to that question, a more fundamental query remains: did innovation really affect more than just a few jobs, and hence was it really of any significance for the average plantation's labour demands?

Strangely absent in most writing on the topic, this query seems to raise serious doubts about the incompatibility thesis.²² Whatever the innovations introduced in the eighteenth and first decades of the nineteenth centuries, they coincided with the dominance of slavery. The innovations implemented subsequently in a context of slavery-on-the-retreat were situated primarily in the processing stages of sugar production. This left field work to the old routines; even where manuring and other agrarian devices were implemented, this did not entail the use of elaborate machinery in the cane fields. Consequently, it may be argued that the bulk of labour on

Caribbean sugar plantations continued to be performed by field labourers throughout the nineteenth century. It seems that the nature of this fieldwork did not change much in the period from the seventeenth-century establishment of the Barbados model, to borrow Watts' (1987) phrase, until the twentieth-century mechanization of cane-cutting.²³ If so, it would be difficult to maintain that slavery had to be abolished in the nineteenth century because of any significant change in the labour demand of the Caribbean plantation.

At this stage of our research, our knowledge of the extent to which job demands on Caribbean plantations actually changed as a consequence of innovation is limited. Yet precisely this aspect should be explored before we can conclude more confidently whether or not slaves were able to perform these tasks, whether indentured labourers or freedmen were actually performing significantly different work routines, and so forth.

Incidentally, a focus on the changing nature of labour demands and qualifications in the Caribbean sugar industry may indirectly also enhance our understanding of the social history of Caribbean slavery. If innovation indeed changed the nature of plantation work, then one would expect those affected to have responded to these changes. If only job qualifications in the higher echelons of the slave hierarchy changed, it would not be surprising to find a kind of artisanal protest of formerly privileged slaves comparable with the Luddism of early industrial Europe. Some authors have indeed given examples of slaves' protests against innovation. Green (1973:451) for instance cites the desperate comments of the Jamaican planter Lewis (1834), who in vain tried to economize on labour by introducing the plough: "the awkwardness, and still more obstinacy, of the few negroes, whose services were indispensable, was not to be overcome: they broke plough after plough, and ruined beast after beast, till the attempt was abandoned in despair". In a later publication, Green (1976:52-7) gives more evidence of slaves' sabotage of modern machinery. He attributes this to a firm resistance among the slaves against changes in "either the tools or techniques employed in West Indian agriculture".

If we were to find more general evidence of such an attitude, we would be obliged to admit to more than a kernel of truth in the argument that the nature of slavery was incompatible with innovation. The argument would have to be given an elegant twist though: it was not the slaves' inability – through lack of education rather than by nature – but their conscious resistance which impeded adequate innovation. This argument then would even serve to attribute diminishing plantation profitability at least partly to slave resistance to change.²⁴

Innovation may also have had profound effects on the plantation work force as a whole. Perhaps, as argued above, this was not the case in terms of overall labour qualifications. It may not be ruled out though that new technology did change work loads across the board. Thus, as has been mentioned above, the introduction of the steam mill and subsequent processing innovations, while diminishing the work load at the mill, increased the demand for cane. This demand for more cane may have been translated into a more intensive exploitation of slave field labour.²⁵

Generalizations as to the influence of innovation on the slaves' work loads seem difficult to make. It may be a rewarding line of research though to try to determine slaves' (and, perhaps, freedmen's and indentured labourers') responses to technology-derived changes of work patterns and loads.

CONCLUDING REMARKS

No doubt the very issue of the links between the 'peculiar institution' and the level of modernization of the Caribbean sugar industry derives much of its relevance from the direct consequences of this debate for the larger question of the explanation of the abolition of slavery. Clearly the incompatibility thesis fits nicely into an economic explanation of abolition, whereas denying incompatibility squares with 'econocide', or at least with refuting that slavery had already exhausted its possibilities at the time of its abrogation.

In the foregoing, several aspects of the debate came up for discussion. In addition to providing information on the level of innovation actually achieved (often underestimated in the literature), we have discussed both planters' and slaves' behaviour and the rationales underlying both. In doing so, we have dealt with a number of ongoing debates and suggested specific topics for further analysis regarding the structure and development of labour conditions. If such a research programme were to be carried out, it may be expected to enhance our understanding of the social history of Caribbean labour.

The considerations presented in this article, based as they are mostly on a re-analysis of known facts rather than new research, do not lead to any firm conclusions. Nevertheless it is appropriate to conclude with some suggestions for a re-examination of the issues involved.

Regarding the period before abolition it can be said that planters have shown more 'innovativeness' than they are usually credited with. Insofar as they could have adopted more innovations than they actually did, this might have been related more to tariff protection than to cheap labour.

That takes us back to the question of whether, indeed, high tariff barriers constituted a disincentive to innovation (Craton, Walvin and Wright 1976:294-5). Here at last we do have an argument that cannot be refuted easily. Even if one might be inclined to defend protection for an industry that in its early stage of development has to compete with older, established industries elsewhere (the infant-industry argument), continued protection for a mature industry with a sizeable share in the market tends to create a lazy entrepreneurial class, hardly noted for its innovative zeal.

Turning to the period after 1800, it may be, in the end, that the partial concurrence of the rather abrupt innovations in the nineteenth century with the abolition of slavery was hardly more than coincidental. In fact, many authors argue that the most crucial change since the seventeenth century was the emergence of the central factory, disconnecting the agricultural and the processing stages of sugar production (Engerman 1983, Moreno Fraginals 1985). If so, it should be brought to mind that several of the factors which facilitated this minor revolution had nothing to do with the Caribbean as such.

A final word of caution may be called for. In this article we have taken another look at a number of arguments often brought forward in connection with the slavery – innovation debate. We have not been trying to formulate a ‘unified field theory’²⁶, explaining the varying fortunes of the Caribbean between 1750 and 1900. Such a theory should not be restricted to labour and technology only. It should also take account of variables such as availability and quality of land, availability of capital and credit, and the role of management strategies, market fluctuations, imperial economic policies, and global shifts in supply and demand.

Furthermore, we have not attempted to answer the tricky question whether ‘free’ (i.e. non-slave) labour was really free. Clearly it could be argued convincingly that various labour systems, such as debt peonage and indentured labour, are in fact not much more than the continuation of slavery with other means and under another guise. In this article we simply have dissected the arguments as used in the literature, and found them wanting in many respects.

NOTES

1. We should like to thank Dr. Rosemary Brana-Shute who kindly suggested various editorial corrections.

2. Clearly this argument is linked to the liberal ideology as expressed in Adam Smith's *Wealth of Nations*: "the work done by freemen comes cheaper in the end than that performed by slaves" (Smith 1976,I:99). Also: "the work done by slaves, though it appears to cost only their maintenance, is in the end the dearest of any. A person who can acquire no property, can have no other interest but to eat as much, and to labour as little as possible." (Smith 1976,I:387). Smith reasons strictly along economic, not racist lines. Thus the inferiority of slave labour is further attributed to the management "by a negligent master or careless overseer" and the master's hostility to any innovative proposal advanced by a slave (Smith 1976,I:98, II:684).

3. Van Stipriaan (this issue of *NWIG*) proposes a slightly contradictory conclusion.

4. Tomich (this issue of *NWIG*) defends a similar position: "The closely integrated technical organization of sugar production and the need to maintain the balance between its various elements, including labor, gave internal solidity to the sugar plantation and made it resistant to change".

It may be argued that the question whether free labour was preferable to slavery is simply beside the point, or at least anachronistic. As long as there were no real alternatives in terms of an ample supply of local free labour, Caribbean planters simply had to rely on imported bonded labour. No wonder then that planters in declining colonies such as Suriname clung just as tenaciously to slavery as their more prosperous colleagues in booming Cuba.

Both Scarano and Baud discuss problems of labour recruitment. The former indicates that in late eighteenth-century Puerto Rico, slavery was but one strategy to secure plantation labour; an alternative strategy was to deny free rural dwellers opportunities for independent farming, forcing them to accept plantation labour and thus trying to overcome the stalemate of 'much gente, pocos trabajadores' (Scarano, this issue of *NWIG*). Baud, in contrast, discusses the ways in which an abundant supply of labour from Haiti and a degree of technological innovation even "provoked new forms of unfree labour" (Baud 1988:13), and continues to do so in the Dominican sugar industry.

5. Both Emmer (1988:3) and Ward (this issue of *NWIG*) emphasize the considerable rise in productivity achieved in the Caribbean sugar industry during the period of slavery.

6. The significance of absenteeism clearly merits further research. For instance, Craton and Walvin (1970:120) state that 'absenteeism was the most notorious of all the burdens laid upon the West Indian estates'. Yet Sheridan (this issue of *NWIG*) links efforts to reform the British West Indian sugar plantation during the third quarter of the eighteenth century with growing absenteeism.

7. In his thorough analysis of the sugar industry in Pernambuco (1840-1910), Eisenburg makes several points of relevance to the issue at stake here, particularly in reviewing the traditional arguments concerning the presumed obstacles to technological innovation imposed by slavery. As the author indicates, the labour market situation in this Brazilian sugar producing region contrasted fundamentally with the Caribbean. In Pernambuco, an abundant supply of free wage labourers enabled the planters to make a smooth transition from slave to free labour, even lowering overall labour costs. Frequently, Eisenberg emphasizes that various factors account for the technological backwardness that characterized Pernambuco sugar production until the 1870s. Yet he seems to attribute particular importance to low labour costs under slavery as an obstacle to innovation. A comparison of this circum-Caribbean

sugar industry with mid-nineteenth century Cuba eventually leads him to the surprising conclusion that an abundant labour supply was a liability rather than an asset: "The happy combination of fertile land, scarce labor, and available capital allowed Cuba to lead the world in modernizing its cane industry." (Eisenberg 1974:219; see also 41-4, 217-9, 228).

8. For a discussion on post-emancipation labour costs in Suriname, see Höfte 1987.

9. To cite but one case in point, the choice for various, in certain colonies successive sources of energy is an indication of planters' flexibility. See f.i. Van Stipriaan (this issue of *NWIG*).

10. See however Sheridan (this issue of *NWIG*) on the introduction of Guinea grass (for fodder) as an important innovation introduced in Jamaica.

11. See Aufhauser 1973b:39-40; Green 1973:449-51; Pares 1960:23, Watts 1987:429-32 and particularly the contribution of J.R. Ward to this issue of *NWIG*.

12. Van Stipriaan, in this *NWIG* issue, mentions the dumb returner too, but in a nineteenth-century context. If Suriname indeed was that late in introducing this apparatus, this is an indication of the colony's backwardness. With labour as such this need not have anything to do: both Suriname and the British West Indies used slave labour.

13. Under favourable circumstances, a merger between adjacent plantations, producing cane for one steam mill only would be an alternative solution to the supply problem.

14. See for instance Van Stipriaan and Ward, both in this *NWIG* issue. Also Oostindie 1989:96, 120-2, 234, 245-6.

15 See Oostindie 1989:38-40 and Van Stipriaan (this issue of *NWIG*). There seem to have been clear chronological and regional divergences as to optimal planting and harvesting cycles. Not only the availability of labour, but also climatological and agronomical factors have been at work here. Clearly the 'dead season' was not as general, perhaps not even as optimal, as many authors have it. See Baud(1988:2), Scott (1985:24) and Sheridan (this issue of *NWIG*) for positive conclusions as to one harvest season, against, in addition to Scarano (1984:102), Van Stipriaan and Ward (this issue of *NWIG*).

16. Irony has it that in the Mexican sugar industry black slaves, in preference to the indigeneous Indian population, were entrusted with qualified positions on sugar plantations. Admittedly, an order of 1599 prohibiting the use of Indians in the mill or boiling house was of influence here. Yet, as Barrett indicates, "Negro slaves were capable of becoming skilled workers – smiths, cartwrights, and sugarmasters – and many did so [...]. It is true that fewer Indians assumed these positions of responsibility." (Barrett 1970:99; also 78-80 and 97-9).

17. Sheridan (1960:130), in an article on the highly innovative Antiguan sugar planter Samuel Martin, depicts the newly arrived African slaves in rather bleak terms ("crude, clumsy, and unintelligent by modern standards [yet] adaptable to the simple, routine methods of tropical agriculture"). A minority however is said to have "possessed the intelligence and manual dexterity to learn skilled crafts". The author does not link these assessments to a perceived inability of slaves to cope with innovation.

18. Moreno Friginals 1978,I:220 (our translation); see also II:29. A similar position is maintained by Genovese (1967:48-51) in his analysis of the economy of the US slave South. See also Mandle (1982:48-9), who even claims that a plantation economy was by definition incapable to be innovative.
19. The thesis of a fundamental incompatibility of slave labour with innovation in pre-modern Europe is also under attack; see Davis 1984:31-2, 326-7.
20. Craton and Walvin 1970: 111, 139-41, Debien 1941, Dunn 1987, Moreno Friginals 1978, II:36, Nistal-Moret 1985:155, Oostindie 1989:100-7, 113-6, 237-43, Patterson 1973:57-65, Ramos-Mattei 1985:172, Scott 1985:97-8, Sheridan 1960:131 and 1974:115, Van Stipriaan (this issue of *NWIG*).
21. See Van Stipriaan and Tomich (this issue of *NWIG*).
22. See however Aufhauser 1973 a and b. Not only does he refute the presumed incompatibility between slavery and technological progress; he even goes as far as claiming that the plantation slaves' work was comparable in many ways to the work regime according to Taylor's principles of scientific management in early twentieth-century American industry: "Instructions to [plantation slaves'] overseers read like Taylor's directions in the Midvale Steel Company" (Aufhauser 1973a:816).
23. Indeed, Scott (1985:228) observes that "[r]eturning to, or remaining on, the plantation as an agricultural worker often meant continuing the same kind of labor, under the same direction, that one had experienced as a slave". She also questions the emergence of an *apartheid*-like segregation of black freedmen in the field as against whites in mill work.
24. Yet, in his account of the immediate post-emancipation period, Green (1976:196) claims that sabotage and negligence increased. This would obviously weaken the incompatibility argument.
25. Lammens 1982:148; Moreno Friginals 1978,I:214, also II:27-9; Teenstra 1835,I:224.
26. This felicitous phrase was one of Michael Craton's contributions to the discussion during the Amsterdam seminar in July 1988. See also his contribution to this issue of *NWIG*.

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