# Output Sharing as a Form of Wage Payment During Harvest

*by*

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## I

Output sharing is frequently discussed in the context of rental market for agricultural land. Inspite of wide prevalence of such phenomenon in the labour market of underdeveloped agriculture, it has rarely been touched upon in the literature on development economics.[1] Practises of paying wages as shares of output have been limited to harvest and post-harvest labour markets only. In the case of reaping, it is a share of unthreshed paddy (including straw) ; while payment in grains (as shares) are observed for the combined act of reaping, threshing and winnowing. The present paper attempts to provide a rationale for the existence of such practise. Limited evidence are cited in the later part of this section, followed by conceptual discussion on labour contract during harvest in Section II. The third section presents the findings and a plausible explanation of the results, while the concluding note makes use of these to provide a critique on the perception about 'institutions'.

While we have information on state-levied taxes on land in different periods for the Indian sub-continent,[2] there are not much historical evidence on transactions at the village level. From the limited evidence available, one may conjecture that land was cultivated mostly by sharecroppers.[3] That no mention of out put-sharing in the labour market is found in earlier evidence, could be due to the prevalence of labour-sharing arrangement between these sharecroppers. To the author's knowledge, the earliest mention on practises of wage payment in shares of output in Bengal, is in Hunter (1877). Islam (1985a) mentions such practises during Sundarban *abad* cultivation in the nineteenth century, and it has also been observed in the Haor-Basin area of Bangladesh (Islam 1985b). This mode of payment has been discussed in Clay (1976) where

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[1]See Clay (1976) for reference.

[2]Mookerji (1958).

[3]Islam (1985a).

the shares have been perceived to be customarily fixed.[4] However, no attempt has been made to explain why such a mode of payment exists. From field queries made by the author and based on discussions with individuals from different regions (in Bangladesh), it appears that crop-sharing has been more frequently observed in areas where Local Transplant *Aman* had dominated the cropping pattern (e. g., in Khulna). It has also been reported in the cases of some high-yielding ( HYV) *Boro* crops.[5] Given the wide prevalence of practise, one ought to explain why it exists so as to be able to interpret current and future changes in the modes of payment.[6]

## II

Since the act of reaping involves no gestation period, uncertainty due to nature is unlikely to affect the nature of contract in the market for casual labour during harvest. We refrain from discussing the prevalence of permanent labour as a possible choice of labour-tying arrangement, as discussed in Bardhan (1984). Market for casual labour (during harvest) is also loosely defined to include the following forms of contract.

(1) Employment on daily wage basis. Wage payments may be either (a) in cash, or (b) in kind. (Mixed payments are ignored for convenience).

(2) Labourers employed to perform a defined task and the payments are on piece-rate basis. Like before, payments may be either (a) in cash, or (b) in kind.

(3) Labourers employed to perform a defined task, but the payments are in shares of output.

If the distinction between payments in cash and in kind is ignored,[7] latter two contracts may be preferred by the employer if monitoring cost is involved in employing wage labour. Due to the nature of the job, however, timing of the operation needs to be stipulated in the contract. If labour requirment is not proportionately related with output, equal remuneration to identical efforts would require the shares ( of output ) to labourers to vary between

[4]Clay (1976), p. 427. Out of 219 observations in Joydebpur area during the harvest of T. *Aman* in 1975-76 ; 73.5% were found to practise output-sharing.

[5]From field trips made by Dr. A. Quasem, it were gathered that output-sharing for reaping is practised for HYV *Boro* in Gazipur—a village of Dhaka district and in Tangramagur village under Bogra Sadar.

[6]Crude practises of identifying cash payment of wages with commercialization and/or capitalist development, and output-sharing with semi-feudalism ; are not uncommon in the literature on modes of production. Our inability to explain institutions could be one reason for such practises.

[7]One may assume that money acts as a medium of exchange only and that all exchanges are costless.

plots.[8] Under such circumstance, output-sharing may not be a desired choice due to associated inconvenience in computing the proportions. Finally, given the condition of proportionality, if there is a ramdom error in the estimation of output in a plot, risk averse labourers may prefer contracts on a piece-rate basis to output-sharing arrangement, while risk averse employers may prefer the latter.[9]

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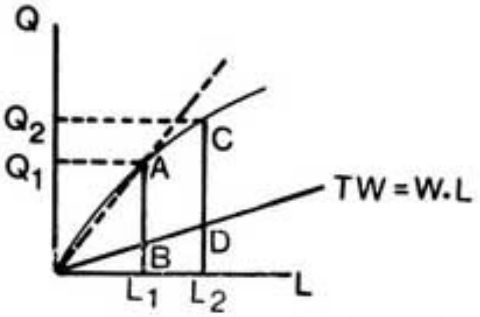
[8]Suppose, output (Q) and reaping-time labour ($L_r$) are related in a way shown in the following diagram,




If there is a fixed wage rate w for a unit of labour, for a plot with output $Q_1$, the share (of output) going to wages would be $BL_1/AL_1$. It may easily be verified that, if relatively greater amount of labour is required to reap an extra unit of output, shares ($DL_2/CL_2$) to be paid for reaping $Q_2$ ($> Q_1$) would have to be higher than that paid for reaping $Q_1$.

[9]Suppose preferences are defined over output only, i. e. $u = u(Q)$. For simplicity, we assume that output in a plot may be $Q_1$ with probability $P_1$ and $Q_2$ with probability $P_2$ ($Q^2 > Q_1$). Suppose, $P_1 = P_2 = \frac{1}{2}$. and total wages paid under piece-rate basis is given by, $\frac{\lambda(Q_1 + Q_2)}{2}$ ; where $\lambda$ is the share of output paid under the alternative arrangement. For a risk averse individual.

$$\tfrac{1}{2}u(\lambda Q_1) + \tfrac{1}{2}u(\lambda Q_2) < u\left(\frac{\lambda(Q_1 + Q_2)}{2}\right)$$

Thus, risk-averse labourers would prefer contracts on a-piece-rate basis, if the rates are related with shares in the way defined above.

Expected utility of the employer under share contract is given by,

$$Eu_s = \tfrac{1}{2}u\{(1-\lambda)Q_1\} + \tfrac{1}{2}u\{(1-\lambda)Q_2\}$$

and under piece-rate contract.

$$Eu_p = \tfrac{1}{2}u\left\{\frac{(1-\lambda)Q_1 + Q_2 - \lambda Q_2}{2}\right\} + u\,\tfrac{1}{2}\left\{\frac{(1-\lambda)Q_2 + Q_2 - \lambda Q_1)}{2}\right\}$$

Since $\dfrac{Q_1 - \lambda Q_2}{2} < (1-\lambda)Q1$ (because $Q_2 > Q_1$)

$$(1-\lambda)Q_1 > \frac{(1-\lambda)Q_1 + Q_1 - \lambda Q_2}{2}$$

Similarly,

$$(1-\lambda)Q_2 < \frac{(1-\lambda)Q_2 + Q_2 - \lambda Q_1}{2}$$

Thus, for risk-averse labourers, it is more likely that, $EU_s > EU_p$.

The above discussion suggests that the necessary condition for the existence of output-sharing in wage payment (during harvest and post-harvest activities) is the presence of a proportional relation between labour (in days) and output.[10]

We may extend the discussion further by verifying the condition that may lead to the choice of cash or kind as the form of payment. First, cash payment always involves payment from previously accrued fund. While it is so in case of payment in grains for the act of reaping only ; payment from current produce is involved in the case of output-sharing during harvest and in payments for the combined act of reaping, threshing and winnowing. Secondly, if there are speculative gains to be made from variation in market prices, the employers may prefer to pay wages in cash. Finally, while cash payment may involve cost for both employers and labourers, payment in kind is likely to restrict the budget set of labourers. The cost arises due to sale of previously accrued produce by the employer and due to the purchases (of rice) by the labourers. On the contrary, preference of individual labour may not conform with the particular variety of paddy reaped. In general, demand for cash payment by labourers may increase with the increase in product differentiation and also with the decline in the proportion of rice in total consumption.

From the above discussion, the following inferences may be drawn,

(1) In traditional societies, where the above-mentioned second aspect (i. e., speculative gain) is less active, payments in kind are likely to be dominant. Furthermore, since labour is likely to be more tied up with the produce it creates, output-sharing (for reaping, or for both reaping and threshing) and piece-rate basis for the combined act of reaping and threshing are likely to be the dominant contracts. Proportionality between labour and output is, however, necessary for the choice to be made in favour of output-sharing.

(2) Payment in kind, if it is from current produce, is compatible with profit-seeking farmers' decision. This is so because such payments involve less capital requirement, and thereby, a higher rate of profit.[11]

(3) Speculative gain due to variation in market prices appear to be the primary reason for payment in cash during harvest and post-harvest

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[10]It is not sufficient since, except for the case of risk-averse employers, contracts on piece-rate basis is equivalent to out-put-sharing even if proportional relation exists.

[11]This is pointed out only to suggest that profit seeking individual farmers may not necessarily enhance the cause of classical capitalism at the local level.

activities. However, in periods of technological changes, cash payments may prevail until new norms for piece-rate/output-sharing contracts get established.

## III

Data were initially collected from 16 villages in Bangladesh for the purpose of evaluating the Food for Work Programme. Plot specific information on production, collected from sample households during three seasons (separately) in 1982 ; have been used for our purpose. Due to limitations on time and assistance, data collected from only ten villages have been processed. Primary focus in choosing these ten, was to cover as much information as possible on traditional crops. Even though sample choice was not based on some criteria pertaining to the present study, it is unlikely to affect our analyses.

In order to verify if reaping-time labour ($L_r$) and aggregated harvest and post-harvest labour ($L_h$) are proportionally related with output (Q); OLS regressions have been run for individual crops separately for the following two equations,[12]

$$L_r = \alpha_0 + \alpha_1 Q \quad \ldots \quad (1)$$

$$L_h = \beta_0 + \beta_1 Q \quad \ldots \quad (2)$$

Findings presented in Tables I and II show that the specifications provide good fit when values of $\bar{R}^2$'s are considered. Test of proportionality is conducted by verifying if $\alpha_0$ and $\beta_0$, estimates of $\alpha_0$ and $\beta_0$, are significantly different from zero. It is interesting to note that only in case of Local Transplant *Aman*, the hypotheses of proportionality cannot be rejected in any of the four regressions. In all other crops, there is at least one regression where this is rejected. However, the three regressions for non-Irri HYV *Boro*, labour is found to be proportional to output. The tests provide identical results for both equations.[13] The results conform with our limited observation on presence of crop-sharing contracts during the harvest of Local T, *Aman* and HYV *Boro*.

Ignoring the difference between crops, we find labour to be proportional to output in 19 of the 28 regressions. Even though such proportional relation has been assumed in some theoretical literature,[14] one ought to explain the rational for its existence. It surely contradicts the assumption (of diminishing factor productivity) made for conventional production functions that aggregate

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[12]The error terms in equations (1) and (2) have been omitted. Nor is it necessary to justify the usual assumptions on the distribution of the error term.

[13]Even though five of the nine cases of non-proportionality are accounted by Bandabil and Gobindapur, the findings are not systematically affected by locality.

[14]See Bardhan (1979).

TABLE I

**ESTIMATES OF REGRESSION EQUATION : $L_r = \alpha_0 + \alpha_1 Q$**

| Crop | Village | $\alpha_0$ | $\alpha_1$ | $\bar{R}^2$ | N |
|---|---|---|---|---|---|
| Local *Aus* | Bandabil | 3.185* | .558 | .62 | 28 |
| | | (1.016) | (.083) | | |
| | Gabindapur | .082 | 1.482 | .74 | 18 |
| | | (.822) | (.211) | | |
| Broadcast *Aman* | Bandabil | 3.264* | .459 | .71 | 17 |
| | | (1.170) | (.073) | | |
| | Harispur | —.239 | .725 | .93 | 20 |
| | | (1.130) | (.045) | | |
| | Patgari | .808 | .489 | .98 | 28 |
| | | (.670) | (.015) | | |
| Local T. *Aman* | Birat | .443 | .278 | .96 | 23 |
| | | (.712) | (.011) | | |
| | Chasapara | —.046 | .576 | .88 | 10 |
| | | (.766) | (.071) | | |
| | Gobindapur | 1.323 | .439 | .93 | 12 |
| | | (1.119) | (.035) | | |
| | Taliamara | —.338 | .297 | .96 | 17 |
| | | (.732) | (.014) | | |
| Local *Boro* | Charkhamer | .495 | .527 | .89 | 25 |
| | | (1.287) | (.038) | | |
| | Gobindapur | 2.121* | .747 | .62 | 16 |
| | | (.811) | (.149) | | |
| | Rajarampur | —.120 | .463 | .94 | 22 |
| | | (.481) | (.026) | | |
| Irri *Boro* | Gobindapur | 1.602* | .235 | .80 | 26 |
| | | (.504) | (.023) | | |
| | Patgari | 2.089* | .208 | .93 | 13 |
| | | (.811) | (.017) | | |
| | Rajarampur | —.295 | .314 | .85 | 33 |
| | | (.950) | (.023) | | |
| | Rowtora | .262 | .284 | .99 | 21 |
| | | (.746) | (.008) | | |
| China *Boro* | Chasapara | .549 | .298 | .94 | 32 |
| | | (.614) | (.013) | | |
| $BR_3$ *Boro* | Chasapara | .184 | .254 | .94 | 26 |
| | | (.499) | (.013) | | |
| Chandina *Boro* | Chasapara | 2.425 | .243 | .72 | 14 |
| | | (1.632) | (.041) | | |

*(Continued)*

TABLE I *(Continued)*

| Crop | Village | $\hat{\alpha}_0$ | $\hat{\alpha}_1$ | $\bar{R}^2$ | N |
|---|---|---|---|---|---|
| Irri *Aman* | Chasapara | .970 | .374 | .88 | 30 |
| | | (.839) | (.026) | | |
| | Harispur | 5.950* | .284 | .87 | 21 |
| | | (2.800) | (.025) | | |
| $BR_4$ *Aman* | Bandabil | .645 | .424 | .91 | 24 |
| | | (.778) | (.028) | | |
| | Chasapara | 1.426* | .364 | .93 | 26 |
| | | (.533) | (.019) | | |
| | Harispur | .125 | .356 | .99 | 20 |
| | | (.543) | (.009) | | |
| Pajam *Aman* | Chasapara | .700+ | .387 | .97 | 26 |
| | | (.357) | (.013) | | |
| Irri *Aus* | Bandabil | 1.230* | .439 | .92 | 19 |
| | | (.418) | (.030) | | |
| | Charkhamer | −.183 | .279 | .88 | 30 |
| | | (1.002) | (0.019) | | |
| | Harispur | 1.168 | .343 | .78 | 46 |
| | | (1.455) | (.027) | | |

**Notes :** (a) All $\hat{\alpha}_1$ coefficients are statistically significant. However, for the intercepts ($\hat{\alpha}_0$): those with * are significant at 5% level of significance, and those with + supscript are significant at 10%.

(b) Output is measured in maunds, while $L_r$ is in days.

TABLE II

**ESTIMATES OF REGRESSION EQUATION : $L_h = \beta_0 + \beta_1 Q$**

| Crop | Village | $\hat{\beta}_0$ | $\hat{\beta}_1$ | $\bar{R}^2$ |
|---|---|---|---|---|
| Local *Aus* | Bandabil | 4.897* | .823 | 0.68 |
| | | (1.309) | (.108) | |
| | Gobindapur | 1.070 | 2.304 | 0.71 |
| | | (1.361 | (.353) | |
| Local B. *Aman* | Bandabil | 5.209* | .745 | 0.73 |
| | | (1.787) | (.113) | |
| | Harispur | -.370 | 1.107 | 0.90 |
| | | (2.068) | (.083) | |
| | Patgari | 1.669 | .870 | 0.97 |
| | | (1.306) | (.028) | |
| Local T. *Aman* | Birat | -.464 | .551 | 0.97 |
| | | (1.423) | (.022) | |
| | Chasapara | -.685 | .988 | 0.92 |
| | | (1.045) | (.098) | |
| | Gobindapur | .844 | .692 | 0.98 |
| | | (1.043) | (.033) | |
| | Taliamara | -1.498 | .656 | 0.93 |
| | | (2.283) | (.046) | |
| Local *Boro* | Charkhamer | 2.173 | .675 | 0.88 |
| | | (1.563) | (.047) | |
| | Gobindapur | 3.016+ | 1.578 | 0.63 |
| | | (1.634) | (.305) | |
| | Rajarampur | -.179 | .647 | 0.95 |
| | | (0.629) | (.034) | |
| Irri *Boro* | Gobindapur | 3.998* | .358 | 0.77 |
| | | (0.842) | (.039) | |
| | Patgari | 3.473* | .366 | 0.92 |
| | | (1.513) | (.032) | |
| | Rajarampur | -.427 | .422 | 0.86 |
| | | (1.220) | (.030) | |
| | Rowtora | 1.039 | .434 | 0.99 |
| | | (0.814) | (.008) | |
| China *Boro* | Chasapara | -.200 | .459 | 0.94 |
| | | (1.011 | (.022) | |
| $BR_3$ *Boro* | Chasapara | .308 | .396 | 0.94 |
| | | (0.809) | (.021) | |
| Chandina *Boro* | Chasapara | 2.764 | .399 | 0.84 |
| | | (1.872) | (.048) | |

*(Continued)*

TABLE II *(Continued)*

| (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|
| Irri T. *Aman* | Chasapara | 1.859 | .552 | 0.85 |
| | | (1.371) | (.043) | |
| | Harispur | 9.588* | .450 | 0.88 |
| | | (4.165) | (.037) | |
| $BR_4$ T. *Aman* | Bandabil | 1.296 | .650 | 0.87 |
| | | (1.427) | (.052) | |
| | Chasapara | 2.891* | .519 | 0.92 |
| | | (0.825) | (.030) | |
| | Harispur | .255 | .562 | 0.99 |
| | | (0.732) | (.012) | |
| Pajam T. *Aman* | Chasapara | 1.429* | .563 | 0.98 |
| | | (0.472) | (.017) | |
| Irri *Aus* | Bandabil | 2.808* | .647 | 0.91 |
| | | (0.649) | (.048) | |
| | Charkhamer | .534 | .413 | 0.89 |
| | | (1.356) | (.027) | |
| | Harispur | 2.483 | .499 | 0.76 |
| | | (2.257) | (.042) | |

**Note** : See explanatory notes in Table I.

labour inputs accross all operations. With the same set of data, analysed above, alternative specifications of production function were tested by the author. It was found (based on $\bar{R}^2$'s) that loglinear specification with land and pre-harvest labour provide fits as good as those provided by the conventional specification (land and all labour as explanatory variables).[15] This, however, does not establish that $L_r$ or $L_h$ is proportional with output. Possible reasons of the latter are discussed below.

One possible explanation is that output is proportional to the number of tillers in a plot and labour requirement is also proportional to the latter. Thus, $L_r$ will be proportional to output. If nature affects output equally in all plots, labour required for threshing and winnowing may be found proportional (to output) in cross-sectional data. Thus, $L_h$ would also be proportional to output. One may. however, choose the number of stalks in a plot rather than the number of tillers. Yet, the above arguments would hold. These are empirical issues that could not be verified with available data.

[15]That output is explained by only pre-harvest inputs, has also been suggested in Bliss & Stern (1982).

Since land was found to provide marginally better explanation of $L_r$ and since linear specification of production with land (plot size) as the single explanatory variable was found to provide fits as good as the conventional specification ; an alternative explanation is suggested below. Suppose,

$$Q = ax, \text{ and} \quad \ldots \quad (3)$$

$$L_r = bx; \quad \ldots \quad (4)$$

where $x$ = plot size, and $a, b > O$. It follows from equations (3) and (4) that,

$$L_r = (b/a)Q. \quad \ldots \quad (5)$$

implying a proportionate relation between $L_r$ and Q. However, estimated linear regressions, in most cases, have intercepts significantly different from zero. Most interestingly, intercepts (in different regressions) for individual crops are not found to be concentrated in either positive or negative quadrant. It is, therefore, difficult to rule out the case of proportionality. It may be verified that with multiplicative uncertainty correlated with plot size, cross-sectional data will provide linear fits (for output with land, and for labour with land) with intercept terms significantly different from zero.[16] However, no convincing explanation is known to the author as to why uncertainty should be related with plot size in the way suggested above.

## IV

Quite often, unexplained phenomena in the sphere of economy are identified as 'institutions' 'customarily' established. This is reflected in the following passage on output-sharing arrangement during harvest, quoted from Clay (1976) ;

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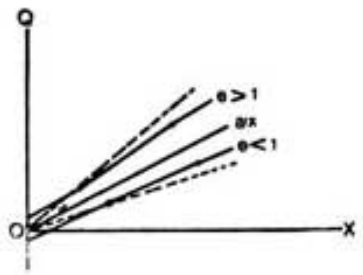
[16]Suppose, $Q = \theta ax$, such that $E(\theta) = 1$. In cross-sectional data, values of $\theta$ for all X's are expected to lie in only one of the three ranges : $\theta > 1$, $\theta < 1$ and $\theta = 1$. However, $\theta$ is assumed to be negatively related with X, when $\theta > 1$; and it is positively related when $\theta < 1$. As shown in the diagram, cross-sectional data would give positive intercept when $\theta > 1$; and negative intercept when $\theta < 1$.



> "These modes of payment, with shares, sanctioned by custom, have been seen as exemplifying customary, patron client relationships, or as mechanisms for spreading poverty. From the narrower economic viewpoint of farmers in a region such as the Joydebpur area, who maintained links with the same groups of labourers from a food deficit area such as Faridpur over many years, the relationship assures a guaranteed supply of labour for the peak pariods of labour shortages".[17]

As a counterpart to sharecropping in land rental market, if we consider output-sharing contract in the labour market to be an 'institution', the present exercise provides an alternative explanation of why such an 'institution' may have existed and still persists. Based on our discussion in Section II and the findings presented in Section III, it is expected that the incidence of output-sharing contract will decline with the adoption of most HYV crops. The decline would be faster in areas where wider varieties of crops are cultivated in a single season. However, unless there is a significant (qualitative) change in the overall economy, it is most likely to be replaced by contracts on piece-rate basis. In places where the newly adopted HYV crop fulfills the necessary technological condition (of proportionality), we may observe revival of output-sharing contracts with changed shares paid to labourers. In order for a permanent shift towards wage economy (during harvest), a substantial change is required that would involve the non-agricultural sector as well.

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