ROLE OF THE LEADING INPUT IN SHAPING INSTITUTIONS:TENANCY IN THE CONTEXT OF IRRIGATION UNCERTAINTY

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1. Introduction

The past three decades have witnessed the growth of a voluminous literature on tenancy and related institutions. Problems of resource use efficiency, role of markets, inter-linkages between markets and the emergence of institutions have all emerged as major issues.[1] However, an aspect that has not received adequate attention in the past relates to the role of irrigation in relation to tenancy. Part of the reason could be the fact that in East Asian and Western European contexts (to which is related a lot of work on tenancy) there is no moisture constraint and therefore irrigation does not have the status of a leading input. However, in South Asia the incidence and form of tenancy are influenced by rainfall and irrigation. Though past studies have recognised the relevance of it, mostly it has been taken as one of the explanatory variables in regressions.[2] These studies though interesting are far from adequate in bringing out the process through which irrigation shapes the working of land lease market.

Another issue that has vexed researchers is the evolution of institutions. A recent summary by Bardhan brings out the state of confusion:

> "The Marxist, CDAWN,[3] and imperfect information theories are all equally murky on the mechanism through which new institutions and property rights emerge. All three sets of theory, in explaining historical transition, show how new institutions will serve the interests of economic progress and old institutions are a hindrance and are 'ripe' for a change - but as if ripeness is all: as if there is no need to specify a predictable model of the process of change".
>
> (Bardhan, 1989, p. 6).

Especially important in the context of South Asia is the evolution of tenancy in a

In a recent development a strong reaction has come about to the treatment of tenancy independently of the labour market. Hayami and Otsuka put it as: "separate analysis of land and labour contracts have resulted in much theoretical confusion as well as questionable interpretations of empirical data especially those drawing inferences about the relative efficiency of alternative contracts" (Hayami and Otsuka, 1993, p.2) and argue for a unified treatment. In their enthusiasm they fail to set out the limits of unified treatment. Unified treatment cannot be a general requirement; it may be relevant under specific conditions.

This paper seeks to address these three issues in an interconnected way. The paper begins by setting out the facets of irrigation uncertainty in a surface irrigation system of long standing and then establishes a relationship between the changing irrigation situation and the incidence and form of tenancy. The usefulness of a unified treatment in understanding the various dimensions of tenancy in a basically subsistence paddy cultivation is then brought out. In the very next step it was shown that such a unified treatment is not essential for understanding tenancy in cash crop (banana) cultivation.

The data for this study was collected from village surveys conducted in Kanyakumari district in Tamil Nadu. An important feature of this district is the significant variations in the agro-ecological conditions. The district has high rainfall zones similar to Kerala. There is also a large part of the district resembling the conditions in the semi-arid regions in India. The district has a long history of irrigation.[4] Before this century there existed in the district an interlinked system of tanks and diversion weirs for irrigation. From the early part of this century, there has been growth of canal irrigation. During the recent past the district has been witnessing acute scarcity of irrigation water and it has been felt more in the lower reaches than in the upper reaches. In order to understand how the changes in the availability of irrigation has influenced the land lease market we undertook case studies of four villages: two from the upper reaches (UR) Kothanalloor and Kadukkara and two from

of all the households was carried out, followed by the identification of the tenant households. From them were collected data on not only the current tenancy, but also on the tenancy history.

The paper is organised into six sections. Section 2 provides a brief analysis of the quantum of rainfall and goes to show that irrigation has suffered since the early 1970s. Section 3 using the data from two UR villages and two LR villages attempt to relate the shift from fixed rent to share cropping to the irrigation uncertainty in the LR villages. The usefulness of a unified treatment of land and labour markets is brought out in the section. The various dimensions of fixed rent in paddy cultivation - variation in rent across the villages, across plots within a village, across different size class of leased in land etc. - are gone into in Section 4. Section 5 turns to the terms of tenancy in one of the UR villages where banana cultivation is widespread. While section 3 brings out the relevance of a unified treatment, Section 5 clearly points to its limitations. Section 6 is the conclusion.

2. Rainfall and Irrigation

Kanyakumari district, falling within a low rainfall zone has a long history of irrigated agriculture. Historically, the irrigation system consisted of a network of tanks and diversion-weirs. This century has witnessed a significant change in the characteristic of the system; large reservoirs were superimposed on the system. In 1906, the Pechipara dam was commissioned; in 1956, the Perinchani dam was added; and in 1964, the Chittar-Pattanamkal scheme increased the storage capacity further. With the construction of reservoirs, the tanks have gone into disuse, their numbers having come down from 3045 in 1935 to 1613 in 1962.

Turning to the variations in the quantum of annual rainfall during the last 90 years or so, it is evident that there had been somewhat of a cyclical behaviour (Table 1). In terms of deviations from the long-run average, the rainfall was deficient by over 15 per cent during 1901 to 1915. This was followed by 10 to 20 per cent above

average rainfall during 1916 to 1936. The period 1937 to 1978 witnessed near normal rainfall followed by over 15 per cent deficiency beyond 1978.

Table 1 : Rainfall in Kanyakumari District

Years	Seven year annual average (mms)	Deviation from the normal
1902-1908	1160.7	-14.99
1909-1915	1121.3	-17.88
1916-1922	1518.1	+11.18
1923-1929	1650.7	+20.89
1930-1936	1520.3	+11.35
1937-1943	1399.5	+2.50
1944-1959	1405.3	+2.92
1951-1957	1300.8	-4.73
1958-1964	1434.1	+5.03
1965-1971	1438.8	+5.38
1972-1978	1341.8	-1.73
1979-1985	1173.9	-14.03
1986-1989	1109.2	-18.76
Overall	1365.4	-

Source: Tamilnadu Statistical Abstracts (Various issues) Govt. of Tamilnadu, Madras.

Note: Deviation from the Normal is defined as

$$\frac{(\text{Seven Year Average} - \text{Overall Average})\ 100}{\text{Overall Average}}$$

The deficiency in rainfall has given rise to lower release of water from the reservoirs (Table 2). During a period of seven years from 1980-81 to 1986-87, the release of water as a percentage of yield was close to 100 only in one year (1981-82); during the rest of the years the deficiency was between 22 to 44 per cent of yield.

Table 2 : Water Release as a Percentage of Yield

Year	Pechipara	Perunchani	Total
1980-81	52	60	56
1981-82	75	138	97
1982-83	79	70	75
1983-84	53	66	58
1984-85	78	78	78
1985-86	75	77	75
1986-87	49	102	68

Source: Government of Tamilnadu, Tamilnadu : An Economic Appraisal (various issues).

As the quantum of water release is not known before sowing, the area sown may not come down in anticipation of a deficient rainfall. And as the water released may not be equitably distributed over the ayacut, the deficiency in water release may not directly get translated into a shortfall in the area harvested to area sown. Further, various methods of allocating water may be tried during periods of scarcity and supplementary sources may be exploited. Thus, an indication of the extent of water scarcity may be had by the intensity of use of supplementary sources. The data from the two UR and two LR villages showed that the use of supplementary sources was absent in the former two villages. In the LR villages, their use showed a wide variation (Table 3).

Table 3 : Utilisation of Wells and Ponds as Supplementary Sources

		Tenants		Owner cultivator	
		Season I	Season II	Season I	Season II
Percentage of Tenants Puchasing water	Az	54.55	18.18	28.57	24.49
	Pv	9.52	9.52	14.28	11.90
Average Hours for which pumped	Az	12.00	13.67	13.46	12.54
	Pv	*	*	*	*
Average cost incurred per reporting tenant/ owner cultivator	Az	191.66	258.33	262.50	302.80
	Pv	157.50	42.50	324.00	252.40

Source: Field Survey.

Note : * Cannot be computed because diverse sources and lifting devices have been used. Electric motors, oil motors, hand pumping and low lift using vessels have been used. So a comparable unit of measure could not be deviced.

While in Az, in Season I, 55 per cent of the tenants were using such sources the incidence was only 29 per cent among the owner cultivators; but in Season II the percentages were 18 and 25 respectively. In Pv., although the percentages were higher among owner cultivators (12 to 14) compared to tenants (10), there was not much variation between seasons. The cost incurred per reporting household also showed considerable variation between seasons, across villages and between tenants and owner cultivators. It may be concluded that Az is the more seriously affected compared to Pv.

In sum, even during severe overall irrigation deficiency UR villages remain unaffected, LR villages get affected with varying intensities.

3. Irrigation, Uncertainty and Tenancy

In the literature on tenancy it is often argued that uncertainty and the associated risk gives rise to various forms of tenancy. The issue of tenurial forms in relation to the specific irrigation uncertainty is taken up in this section.

The incidence of tenancy, defined as the percentage of households leasing in to the total, showed significant variation across the sample villages. It is fairly high in the two UR villages and low in the two LR villages (Table 4). But the average size of leased in land itself had little to do with the incidence of tenancy; it varied with the average land-man ratio for the taluk as a whole. The average size of leased in land varied from 44 cents to 136 cents in the two UR villages and from 37 cents to 94 cents in the two LR villages. It is evident from the data that wherever there is irrigation uncertainty the incidence of tenancy is low.

Table 4: Tenancy - Incidence and Size of Leased in Land

Village	Incidence (%)	Average size of leased in land (cents)	Land-man ratio for the taluk, 1981 (cents/person)
Kothanalloor	33	44	21
Kadukkara	31	136	43
Pattarivilai	5	37	21
Azhagappapuram	10	94	30

Source: Field Survey and District Census Hand Book, 1991.

Turning to the form of tenancy of land under paddy, in both the UR villages all the households reported fixed rent tenancy. Between the LR villages, Pv reported 89 per cent fixed rent tenancy and 11 per cent share tenancy and Az reported 64 per cent share tenancy and the rest under fixed rent. If the percentage of households using supplementary sources of irrigation (Table 3) is a measure of the irrigation uncertainty then, the incidence of share tenancy is related to it.

In order to collect information on the process of change two questions were asked to the respondents: (i) the terms and conditions of the initial tenancy as distinct from the current tenancy; and (ii) in case of acute water scarcity/drought the rent rule followed. As to (i) above, in Pv for the two tenants (out of 18) who reported share tenancy the current tenancy was their initial tenancy. For one of them the tenancy was less than one year old at the time of the survey. The second has been a tenant for over 70 years and for the entire duration the share has been 50 per cent. In Az, of the 11, eight had been tenants for less than ten years, and six out of the eight had become tenants only during the last five years. The initial tenancy of the eight was distributed as three fixed and five share. Of the three one has become a share tenant during the last ten years. Of the three tenants (out of 11) whose initial tenancies were over 10 years old, two were fixed and one (leasing in temple land) was share tenancy. Out of the two one had secured share tenancy in the current tenancy. Overall the picture is one of moving from fixed to share tenancy in the recent past owing to the irrigation uncertainty. Such a movement from fixed to share tenancy is intense in Az where the irrigation uncertainty is also intense.

The information on rent rule during drought again brings out the relation between irrigation uncertainty and share tenancy. As is evident from Table 5, the UR villages reported fairly simple rules. In Kn., there was no mention of any change in the rule: if the yield of paddy fell short of the rent the latter was demanded in cash. Only in three out of 34 cases, the concession of payment during the next season was given. In Kd, it was a straight 50 per cent of yield in case of drought.[5] Between the two LR villages, in A_z it was predominantly the 50 per cent rule; there were two cases where no rent was demanded and in one case fixed rent had to be paid if the yield was greater than the rent. In Pv, where irrigation uncertainty was not as intense as in A_z, there were a larger number of tenants (9/20) reporting no rent or lower rent rule in case of drought; but there were an equally large number (6/20) reporting the rent rule of payment in cash after the harvest or payment during the next season. It may then be inferred that wherever irrigation uncertainty existed there was a proviso for 50 per cent

rent in a drought year. As the uncertainty increased this proviso in the rule became the rule itself.

Table 5 : Rent Rule in Case of Drought

	Number reporting			
	Kn	Kd	Az	Pv
50 per cent of yield	0	39	8	5
No rent	0	0	2	7
Lower rent	0	0	0	2
Fixed rent if yield > rent	0	0	1	0
Fixed rent				
To be paid in cash	31	0	0	5
To be paid next season	3	0	0	1
Total	34	39	11	20

Following Table 5, it is appropriate to discuss an issue which has attracted a lot of attention in the literature, namely the tenant reneging the contract. When the rent rule has so many provisions, knowledge of the actual yield from the plot becomes absolutely essential. How does the lessor ensure it? In answering this question the point raised by Otsuka et al, op.cit., namely a unified treatment of land and labour contracts, becomes relevant. In all the four villages surveyed, the harvesting and threshing operations were carried out by gangs of labour and the wage payment is in paddy. Though the wage rule itself varied within a village across plots as well as across villages, (A detailed discussion of this issue may be found in Nair and Narayana, 1990) what was common in all the villages was the following: a fixed number of Kottahs[6] of paddy per acre plus a share for every kottah of yield over a certain minimum had to be paid as wages. Such a wage rule ensured two things: (i) yield is accurately measured and became common knowledge, and the output is amassed in one place (mostly threshing yard) at some point of time after harvesting and threshing. This would simply leave no scope for reneging the contract.

A related issue is one of ensuring adequate application of inputs and labour under sharecropping. In the literature three possibilities are discussed:

(i) landlord stipulates levels of input use and closely monitors;

(ii) landlord shares input costs; and

(iii) puts the threat of termination of tenancy.

Taslim (1992) emphasised the third of the above. Our data (Table 6) seems to confirm Taslim going by the fairly high proportion of tenancies of shorter durations in the LR villages. But the pattern could also be because of the unwillingness of the tenants to lease in land in the LR villages in the face of irrigation uncertainty. The fact that over 70 per cent of the tenants in Az had been tenants for less than ten years seems to suggest the latter.

Table 6 : Distribution (%) of Tenancy by Duration

Duration in years	Percentage of Tenants Reporting			
	Kn	Kd	Pv	Az
Below 3	2.94	0	23.82	9.09
3 - 6	26.47	23.08	33.33	36.36
7 - 10	20.59	48.72	9.52	9.09
11 - 15	35.29	15.39	0	27.27
15+	14.71	12.82	33.33	18.18
Total	100.00	100.00	100.00	100.00

4. Fixed rent paddy cultivation

This section takes up the question of fixed rent paddy cultivation. As elaborated in the previous section, in one of the LR villages fixed rent tenancy has almost disappeared. Hence for the discussion of this section only three villages, two UR villages and one LR village, are considered.

As is evident from Table 7, the average annual rent (per acre) varied from 19.44 kottahs in KN to 13.26 kottahs in Kd. The variation in rent across the villages is proportionate to the variation in the annual yield levels in these villages. The yield level varied from 50.08 kottahs in Kn to 32.71 kottahs in Pv. The argument that the variation in rent is proportionate to the yield levels across villages gets confirmed when the ratio of rent to yield are computed. The average for the three villages did not show much of a variation lying between 0.40 and 0.44.

Table 7 : Rent, Yield and Size in Paddy Cultivation

	Villages Kn	Kd	Pv
	Rent (kottahs)		
Mean	19.44	13.26	13.96
SD	2.56	2.56	3.03
CV	13.15	19.36	21.68
	Yield (kottahs)		
Mean	50.08	34.05	32.71
SD	14.68	4.73	8.88
CV	29.31	13.89	27.16
	Rent/Yield		
Mean	0.42	0.40	0.44
SD	0.14	0.13	0.08
CV	32.95	31.04	18.54
	Size of Leased in Land (Cents)		
Mean	49.23	165.55	35.64
SD	25.64	147.68	20.21
CV	52.07	89.21	56.71

Source: Field Survey

Note: The average size of leased in land shown here is different from that shown in Table 4 because only land under paddy is considered here. CV is in percentages

It is pertinent to note here that the yield levels are not higher in the UR villages compared to the LR villages. Although it is significantly higher in one of the UR villages, 50 kottahs in Kn, it is not so in the other UR village where it is only comparable to the level in the LR village. The observed differences in the yield levels cannot be explained by the irrigation uncertainty but by the rates of adoption of high yielding varieties (HYVs) which are not entirely governed by irrigation. The adoption rate is over 85 per cent in Kn in the two seasons across tenants and owner cultivators, but is below 10 per cent in Kd. In Pv, the adoption rate varied between 35 and 50 per cent in the two seasons between owner cultivators and tenants. The observed adoption rate in Kd cannot be explained by the yield differential between HYVs and local varieties (LVs). But the yield differential does explain the difference in the rate of adoption between Kn and Pv. In Kn, the yield differential varied between 110 to 148 per cent and the rate of adoption was high. But the yield differential was not significantly different for the two varieties in Pv - the yield differential varied between 60 to 114 per cent - and the adoption rate was also lower.[7]

Taking up the question of the variation of rents within the villages across plots, it may be seen that the variation measured in terms of CV was the lowest in Kn; it was higher in Kd and Pv. What explains such variation? It may be observed that the variation in yield is high in Kn. In the face of a fairly high variation in yield if the variation in rent is low then, it implies that rents do not vary with yield. This gets confirmed when the CV of the ratio of rent to yield is computed. It was very high for Kn and very low for Pv. It may be that rents go up and stabilise at a certain level given the assured irrigation and use of HYVs, as in Kn but do vary with yield when there is irrigation uncertainty and high variation in yield.

In order to test the relationship of rent with yield and size of leased in land, linear regressions were run using OLS method. The results are shown in Table 8. It is evident that in Kn with assured irrigation and high incidence of tenancy the landowners are able to impose higher rents on smaller tenants who are mostly landless agricultural labourers. This is not to be observed in Kd where the average size of leased in land was fairly high, or in Pv where in the face of irrigation uncertainty the incidence of tenancy itself is low. Hence, in both Kd and Pv rent is positively related to yield, where size of leased in land itself played no significant role. In Kn it was the size of leased in land which played a significant role in the determination of rent, being higher for small lease holders.

Table 8 : Regression of Rent on Yield and Size

Village	Constant	Coefficients of Yield	Size	Adj. R^2	No. of observations
Kn	21.97		-0.05 (1.962)*	0.26	13
Kd	9.16	+0.12 (2.06)*	-	0.10	40
Pv	7.65	+0.20 (2.23)*	-	0.35	14

Note: t values are shown within parenthesis.
Yield and rent are in kottahs, size in cents.

Overall, it may be concluded that irrigation uncertainty plays an important role in determining the rental rates. But the role itself is mediated through the incidence of tenancy and average size of leased in land. In a situation of assured irrigation, when the size is small and the incidence of tenancy is high rents tend to be higher for the smaller ones. This gets altered when the size of leased in land itself is high. Also when there is irrigation uncertainty and the incidence of tenancy is low even if the average size is small, rents tend to move with yield.

5. Fixed rent, incentives and banana cultivation

It has often been argued (Rao, 1971) that fixed rent tenancy is an incentive system "permitting the tenants to capture the returns expected in consequence of their decision-making". Such incentives have taken the tenants in one of the UR villages, namely Kn with assured irrigation, to cultivate banana, for which there has emerged an ever increasing market in the neighbouring state of Kerala. What new features have been introduced into the terms and conditions of tenancy when the crop grown is banana?

Among the four villages surveyed, banana cultivation on leased in land is reported to any significant extent only in one of the UR villages, namely Kn, with 36 per cent of the area cultivated accounted for by it. The average size of leased in land for banana cultivation is 36 cents compared to 49 cents for paddy cultivation (Table 9). But the variation is much higher in the case of banana cultivation, CV being 110 per cent, compared to 52 per cent for the land under paddy.

Table 9 : Size, Rent and Deposit in Banana Cultivation

	Size (cents)	Family Labour share	Rent (per acre) Rs.	Deposit (per acre) Rs.	Rent for non-deposit paying tenants	Size of leased in land (cents)
Mean	36.08	61.08	3957.04	2863.47	4330.00	15.56
SD	39.51	34.85	1584.85	2002.15	1518.77	10.40
CV (%)	109.51	57.05	40.06	69.92	35.08	66.85
Incidence	-	-	-	65.38	-	34.62

A significant aspect regarding banana cultivation is that the share of family labour in total labour applied is very high. The average share is 61 per cent with a CV of 57 per cent. The share of family labour (FL) when regressed on the size of leased in land (in cents) gave the following equation:

FL = 78.23 - 0.478 Size Adj; R^2 = 0.29
(2.56) (3.08)* No. of obsns = 25
(t values are given within brackets)

Thus, the share of FL is inversely related with the size of leased in land. The small tenants take to banana cultivation with a view to utilise their family labour. Here it is important to note that this cannot be done in paddy cultivation because the operations are time bound and lumpy in nature. In banana cultivation there exists considerable flexibility which is taken advantage of by households with family labour.

In the case of land leased in for paddy cultivation the percentage of tenants with duration of lease below three years was almost insignificant (Table 6). In the case of banana, less than 4 per cent of tenants reported indefinite duration; seven per cent a duration of two years and for the rest - almost 90 per cent - the duration was one year only. Thus, land for banana cultivation is leased out for one year only.

The rent on the land leased for banana cultivation is to be paid in cash. The average rent per acre came to 3957 rupees per year with a CV of 40 per cent. This was about 30 per cent higher than the average rent for land leased in for paddy cultivation at the ruling price of paddy. In the case of paddy land, it was observed that rent was inversely related to the size of leased in land but no such relationship was observed in the case of banana. No statistical relationship was observed with size or output value.

In the context of paddy cultivation the possibility of the tenant reneging on the contract was ruled out owing to the specificities of harvesting and threshing wage contracts in existence in the area. But harvesting of banana is not bound by such specificities. The sale of banana is a contract entered into by the tenant with a trader

and the price may not be known to others at all. In such a situation the landowner has no way of knowing the sale value of the output from the plot or ensuring timely payment of rent. In order to get out of such a situation a system of deposits has come into vogue in banana cultivation. A fixed sum which is less than or equal to the rental value is to be paid by the tenant six months after planting. This is quite comparable to the sewa reported by Morooka and Hayami (1989) for a Javanese village.

The incidence of deposit is not 100 per cent. Deposit is not collected from all the tenants cultivating banana. Only 65 per cent of the tenants reported paying a deposit and the average deposit was 2863 rupees per acre which was 76 per cent of the average rental value for the group (Table 9). The group not paying deposit accounted for 35 per cent of the total tenants and the average size of leased in land for the group was only 16 cents compared to the overall average of 36 cents (which implies that the average size for the tenants paying deposit is 47 cents). Thus, they are extremely small tenants.

Another important difference between the two groups of tenants - deposit paying and not paying - is that the rents collected from the latter are on an average higher at 4330 rupees per acre compared to 3759 rupees per acre for the former. Even when the amount is time discounted taking the minimum interest charged in the informal credit market of the area (24 per cent) the rents are higher by about 230 rupees. Although the smaller tenants do not pay a deposit the rents collected are higher.

Two points need to be noted regarding the deposit amount. Firstly, it is almost equal to the rent for paddy cultivation but for the fluctuations in the price of paddy. Secondly, the deposit amount as well as the rent on land under banana respond to the changes in the price of paddy (or rice). It may be observed that the trend in the price of rice is characterised by a sharp increase in one or two years followed by a small fall or relative stagnancy. A sharp increase in the price of rice is often followed by an increase in the deposit and the rent on land under banana.

6. Conclusion

Irrigation plays an important role in shaping tenancy is known. This paper has shown how. Both the incidence and form of tenancy are governed by the irrigation situation and the changes therein. Irrigation uncertainty leads to a lower incidence of tenancy and the form itself changes in the direction of share-cropping. In understanding the terms of contract in the land market a unified treatment of the land and labour markets does help a great deal. But its application is limited to the case when the crop cultivated is a subsistence crop. Such a unified treatment is not essential for the understanding of land contracts when the crop cultivated is a cash crop.

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NOTES

1. For a recent study of literature in tenancy and related institutions see Otsuka et.al. (1992) and Otsuka and Hayami (1988).

2. See for instance Bardhan (1984).

3. CDAWN stands for the Coase-Demsetz-Alechian-Williamson-North School. Imperfect information theories are attributed to Akerlof and Stiglitz.

4. For a discription of the evolution of irrigation system in the district see Nair and Narayana (1990).

5. For details regarding the methodology of the survey See Nair and Narayana (ibid.)

6. It may be noted that Kn and Kd lie on the upper reaches of two different canals. The canal irrigating Kd is very long and ends in an extremely dry stretch and it is possible that in bad years Kd is also deprived of adequate water while letting some water to the tail end.

7. Kottah is a volume measure used in this district. Although in terms of Kilograms a kottah of paddy varied from 74 to 97, we have taken 97 kgs as the standard.

8. There is an argument that the straw content of HYVs is lower than that of LVs and this could be a factor in the adoption of HYVs. In the sample villages the ratio of the value of straw to value of yield was not significantly lower in Kn compared to Kd or Pv.

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