

Reproductive Behaviour of Tribal Women Participating in Agricultural Works: An Empirical Study

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ABSTRACT

Based on empirical study, this paper plans to highlight the consequences of agricultural work participation upon reproductive behavior of tribal women analyzing the fertility pattern of 390 sample numbers of Deori and Mishing women of North East India. While analyzing the reproductive behavior of sample women, the agriculture related impact factors on fertility have been considered. Rank correlation and logistic regression have been used as analytical tools. The study has been completed in four sections: section-I deals with the paradox, section – II covers the literature reviewed, section-III includes research methodology & limitation of the study and section–IV has been devoted for discussion of analytical results and conclusion. The findings show that neither the agricultural farm size, nor the paddy farm size has any significant correlation with the reproductive health behavior of ever married women of the sample family.

Keywords: Reproductive health, Contraceptive prevalence, Work participation rate, fertility and abortion.

JEL Classification: A-12, A-14, C-35, I-11, I-18, J-11, J-13, J-16, J-68, Q-56.

I. The paradox

In South-East Asia and Indian sub-continent at least 70% of the female labour force are involved in agricultural activity though, they own less than 10% of land property.¹ The tribal people largely being agriculturists, their woman labour force

1 (i) Pillsbury, B., Tucker, G. M. & Nguyen, F. (2014), *Women's Empowerment & Reproductive Health*, A report of Interactive Population Center, Pacific Institute for Women's Health, Los Angeles, USA, retrieved from www.unfpa.org/intercenter/cycle/index.htm, in 2/5/2014

(ii) Soundari (2012), *Indian Women and Reproductive Health*, retrieved from www.studymode.com/essays/Indian-women-And-Health-968496.html, in 02/05/2014.

actively get involved in agriculture to share the work burden. The North east region (NER) of India, rural Assam in particular which is a museum of varied tribal communities, its population mostly depend on agriculture and they are supposed to have higher fertility resulting in burst of population in its rural areas shifting the burden of it to urban centers.²

There are two opposite views as regards the impacts of work participation of women in agricultural works, mainly in paddy cultivation upon their fertility level. Traditional view supposes to have positive impact on reproductive demography (RPD) leading to higher level of conception, live births and large numbers of siblings. The other view opposes it (Shaila Bhardwaj and Mary Grace Tungdim, 2010; Valentina Pindishyuk, 2014; Mark Scott, 2009; Soundari, 2012). This second group of researchers believes that work participation of a woman in agricultural activity during pregnancy period, exposure to pesticides and insecticides and harvesting work increases her risk of miscarriage, premature deliveries and spontaneous abortions; thus reduces the capability of child reproduction; and hence reduction of fertility level.³

Issues to be investigated

Indian tribal women self employed in agricultural and allied activities, work for about 12 to 15 hours per day.⁴ Heavy workload upon such tribal women brings about numerous RPH risks to them. Under such circumstances the RPD of tribal woman is most liable to change either increasing the fertility to meet the need of

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- 2 Deoram, J. (2013). 'Study of the Mishing and Deori Community of Assam', *International Journal of Research in Social Sciences and Humanities*, 2(3). Note : The author clarifies that Deori and Mishing are two separate tribes of Upper Assam.
 - 3 (i) Bhardwaj, S. and Tungdim M. G. (2010). 'Reproductive Health Profile of the Scheduled Caste and Scheduled Tribe Women of Rajasthan, India', *The Open Anthropology Journal*, 2010, 3: 181-187.
(ii) International Labour Office (2014), *Safety and Health in Agriculture*, A Program on Safety, Health and the Environment, Labour Protection Department, ILO, Geneva, Switzerland, retrieved from www.ilo.org/wcmsp5/...protect/---.../---safework/.../wcms_110193.pdf, in 24/06/14.
(iii) Pindishyuk, V. (2014), *State of the Art on Gender in Agriculture and Food Production System in Ukraine*, National Agricultural University of Ukraine, retrieved from www.ksre.ksu.edu/rff/Tatyana%20one.doc, in 24/06/14
(iv) Scott, M. (2009), *Pesticides and Reproductive Health*, www.smarttrain.com.au/-data/assets/pdf_file/0009/351864/pesticides-and-reproductive-health.pdf, 25/06/14.
 - 4 Badodiya, S.K., Tiwari, A. and Daipuria, O.P. (2013), 'Health Hazards among Tribal Farm Women in Agricultural Operations', *Indian Research Journal of Extension Education*, Vol.13, No. 3, September, 2013.

additional hands and being impressed by socio-cultural milieu or decreasing the level of reproduction.

So, it requires investigating into such paradoxical issues examining the correlation between the agricultural work participation of tribal women and their reproductive behaviour based on empirical study.

The present study is a humble effort in this direction with the presentation of the paradox in four sections – (i) Paradox, (ii) Literature review (iii) Research methodology and limitations, (iv) Results and discussions of the issue and conclusion.

II. Literature reviewed

So far, a few works have been done on this topic. These are as follows-

The study on “The Mishings of the Brahmaputra Valley” (1981) has been focusing the traditions and cultures of the Mishing tribe rather than analyzing the socio-economic and demographic profile of the tribe which is relevant to the time.⁵ B.N.Bordoloi, G.C. Sharma Thakur and M.C. Saikia have made a series of study on “*Tribes of Assam*”, (1987) on socio-cultural aspects of 18 tribes of Assam including the Deoris and the Mishings.⁶ Except the anthropological analysis this little work has left the investigation into impact of agricultural work participation on reproductive behaviour of Deori and Mishing women in the state. Jayati Gosh (1994) finds that structural adjustment programmes restructuring of economies that started from mid-1980s have accentuated the vulnerability of women belonging to poorer section of the society, in many of the developing countries including India.⁷ TISS and ILO (1998) have concluded that exposure to adverse environment may damage female reproductive system, thus agricultural work participation reduces the fertility.⁸ Nilufer A. Hazarika in “Health & Education among the Tribes of Assam: Problems & Prospects” (2002) has discussed the shortcomings of health and education programs in tribal areas and suggested the remedial measures; but refrains from analyzing the most relevant aspect of RPH behavior of such women

5 Pegu, N.C. (2005), *The Mishings of the Brahmaputra valley*, published by Mrs. Monumati Pegu, Dhemaaji, Assam, First print 1981), Revised 2005.

6 Bordoloi, B. N., Sharmathakur, G. C., and Saikia, M. C. (1986), *Tribes of Assam*, Part-I, Tribal Research Institute, Guwahati, Assam.

7 Ghosh, Jayati (1994), ‘Gender Concerns in Macro-Economics Policy’, *Economic and Political Weekly* 29 (18), referred in C. U. Thresia (2004): Women Workers in Agriculture: Gender discrimination, Working Conditions and Health Status, Discussion Paper, Centre for Development Studies, Thiruvananthapuram, p.5.

8 TISS and ILO, *Women’s Occupational and Reproductive Health: Research Evidences and Methodological Issues*, Report of the Workshop. (23-25 February 1998), Tata Institute of Social Science, Mumbai, p.6.

largely involved in agricultural activity.⁹ Prof. H. Goswami, who has pioneered in this field and completed several works on health and demographic aspects of tea garden women labour of Assam till 2011, has left the reproductive behavior of tribal women of the state unstudied.¹⁰

Significance of the Study

This study bears immense importance for policy making for effective health caring which has gone almost beyond the capacity of the developing nations to afford and in containing the rapid population growth in a state, to formulate National Population policy for a developing country like India in order to achieve a stable and optimum size of population. Though this type of inter disciplinary study is difficult, yet it provides enormous information and knowledge for the academia and policy makers. And hence, such study is widely demanded.

III. Research Methodology & Limitation of the Study

The study and its findings are based on a research project work relating to reproductive demography and land use pattern of the tribals.¹¹ Under the study the impacts of agricultural work participation of women upon the reproductive behaviour of two tribal communities, viz.: the Mishings and Deoris, the former is dominant and the latter is minority in number in the state, have been covered.

The concentrated areas of Mishing and Deori communities that consisted of seven districts¹² in the plateau of Assam in the North East India are the topography covered under the study. The study is concentrated in investigating into the adverse

9 Hazarika, N. A. (2002), *Health & Education among the Tribes of Assam: Problems & Prospects*. Assam Institute of Research for Tribals and Scheduled Castes, 1st edition

Note. Some important literature in Mishing language are- i) British Political officer, Joseph Francis Needham, published a Mishing grammar '*Outline grammar of the Shaiyang Miri Language*' in 1886 as spoken by the Miris residing at Sadiya area. ii) First Mishing books were published by James Herbert Lorrain in 1902 and named it 'Isorke Doyinge' (Story of God) and Jisuke Doyinge (Story of Jesus) in 1902. He also published First Mishing dictionary in 1910, from Shillong . After that, Rev. LWB Jackman published "Keyumkero Kitab (1914)", "Rom Kidingkela Korintian Doying (1916) and "Mathike Annam Baibal" (1917). Thus, Mishing language was converted in to written form with grammar long back in 1849.

10 Goswami, H. (2011), *Health Demography of the Tea Gardens Labour Population of Assam*, A Report on Reproductive Health of Tea Garden Labour Community of Assam submitted to UGC, New Delhi. Health status of tea garden women labour.

11 Reproductive Demography and Land Use Pattern of Deori and Mishing Tribes in Assam (2014), A research project work submitted to University Grants Commission, New Delhi, by P. Hazarika (2014)

12 Dibrugarh, Sivasagar, Dhemaji, Lakhimpur, Tinsukia, Jorhat and Golaghat.

or passive affects of agricultural work participation on the reproductive behaviour of women such as fertility, abortion, still birth, health problems and disability. The topography covered is seven districts and the time period covered is three years only, viz. 2010, 2011 and 2012.

The sample design for data collection from different locations:

- (i) Of Deori tribe : 10 hhs or respondents \times 3 villages \times 6 districts= 180 numbers women
- (ii) Of Mishing tribe: 10 hhs or respondents \times 3 villages \times 7 districts= 210 numbers women
- (iii) Total sample women in RPH age groups= 390 women.

The secondary information/data has/have been collected from the state and semi-government sources and published works of various departments.

The scope of the study has been confined two major tribal groups of Assam, viz.: the Deori and the Mishings. The major limitation of the study is that its analysis restricted to see the impacts of work participation of tribal women in paddy cultivation upon their level of fertility. Reproduction of child or child breeding is a universal phenomenon; high breeding has led to various socio-cultural and national economic problems. Thus, development problems of developing countries have been viewed by developed nations as human problems. Though the study is of micro type, it may have universal applicability, mostly in developing countries.

IV. Results and discussion

Work participation rate both of male and female population is a notable phenomenon in the state. Rural families employ their children too in household agricultural activity without wage payment. However, work participation rate of females widely differs from district to district and between rural and urban areas depending upon necessity of the family, work opportunity, changing views on work.

Average work participation rate of based on Table 4.1, women in seven sample districts of state works out to be, $\bar{X}=27.0143$ with standard deviation (σ) of 5.71706. The female work participation rate has been found to be high in the sample district Tinisukia, but low in Dhemaji.

Rural urban difference in female work participation rate has also been found to be remarkable as it works out to be on an average (\bar{X}) 17.87 for urban areas, and (\bar{X}) 29.3714 for rural areas. Work participation rate differential of women amongst the urban areas is low. For, the standard deviation (σ) for urban areas of the sample districts has been estimated to be 2.41633 only.

The differential of work participation rate of females amongst the different sample rural areas works out to be high (23.7). The estimated standard deviation is (σ) 7.48303. The variation of female work participation rate ranges between 39.3 for Tinisukia district and 15.6 for Lakhimpur district, resulting an average work participation rate of women \bar{X} = 29.3714. Higher is the value of (σ), the larger is the deviation of work participation rate from the mean value.

Except to the equality in the case of urban areas, the average work participation rate of females in the sample districts works out to be high for rural areas. For, the average female work participation rate for rural areas works out to be high (\bar{X} =29.3714) compared to the state level female work participation rate of (\bar{X} =19.1) for the same.

Mainly for livelihood, the populations of North East India (NEI) in tribal mode of living, inclusive of Assam, which is essential to support the economy, mostly engage in productive work in their family farms. In such socio- economic fabric a woman well as others, belonging to farm family traditionally carry out laborious productive functions in agricultural fields, in addition to her child bearing and rearing of responsibility .Women of Deori and Mishing tribes in the surveyed areas are not exception to such traditions as they accept the responsibility of extending

Table 1. Work Participation rate of Women in the Sample districts (15+ years)

District	xi	yi	Total	xi-yi	xi-A	yi-A
Sivasagar	30.0	21.2	29.3	8.9	0.63	3.33
Dibrugarh	33.8	16.8	29.3	17	4.43	-1.07
Dhemaji	25.0	18.3	24.4	6.7	-4.37	0.43
Lakhimpur	15.6	17.87*	15.6	-2.27	-13.77	0.00
Jorhat	32.3	17.7	28.4	14.6	2.93	-0.17
Tinisukia	39.3	14.0	33.7	25.3	9.93	-3.87
Golaghat	29.6	19.2	28.4	10.4	0.23	1.33
Assam	19.1	17.7	18.8			
Average work participation rate of females in Seven sample districts	29.3714	17.87	27.0143		Mean deviation from mean = 0.00142	Mean deviation from mean = 0.00285
Standard deviation (σ)	7.48303	2.41633	5.71706			

Source: Annual Health Survey, 2010-11, Office of the Registrar General & Census Commissioner, India, New Delhi.*The estimated figure based on average of six districts.

Where, xi= Rural work participation

yi= Urban work participation

Total= total work participation of the state

xi-yi= Rural-urban difference

xi -A= Deviation from the mean in rural areas

yi -A= Deviation from the mean in urban areas

the services in paddy fields and livestock farming to assist their spouse and support the family income. This has been a part of their life as division of labour.

Spearman rank correlation estimates between rural-urban work participation of women using the formulae $(\rho) = 1 - \frac{6\sum d^2}{n(n^2-1)}$ based on information in Table 1 gives the value- 0.643, which shows that there is a moderate negative correlation.

Usually, a woman involved in agricultural works is exposed to health hazards, conception problem, deterioration of general health and her reproductive capability. Theoretically an agriculturist family on an average is supposed to have more children to perform the time consuming, laborious and extensive cultivation. The reality differs. The circumstance has changed, attitude of people have been found to be twisted constrained by high cost of living, income and assets limits and growing density of population in the state.¹³

This paper attempts to examine whether reproductive behaviour of a woman is influenced by her activities or not, analysing the interrelationship between agricultural work participation and selective health indicators and fertility based on 390 samples of Deori and Mishing women. The reproductive health indicators of women have been related to the following proximate influencing variables, viz.- (i) Occupational structure, (ii) Size of the farm owned and (iii) Income level of the sample families.

(i) Occupational structure and reproductive behaviour

After 22 years of adoption of New Economic policy in 1991, featured by liberalization, privatization and globalization, the secondary and tertiary sectors have not been expanding sufficiently to absorb a large percentage of redundant populations of the state.

During 2011-12, almost 52 percent¹⁴ of the total populations have been found to be occupied in agriculture, signifying minimal impact of the new economic policy in structural transformation in the state. Females, are in most cases, have been found viewing the husband as owner of all family property inclusive herself. Empowerment of women section, thus, has been a self-defeating war.

In the sample districts as much as 90% Deori woman have been found involved in agriculture and allied activities for livelihood and the major suppliers (90.70%) of children. The average number of children given birth by a sample Deori woman involved in agriculture has been estimated to be as low as 1.75 numbers.

13. The population density of the state has gone up from 186 in 1971 to 397 in 2011. Directorate of economics and statistics, Govt. of Assam, Economic survey, Assam,2010-11, Also, planassam.info/Assam.../Economic%2010-11

14 Economic Survey, Assam, 2011-12

But, woman of this tribe belonging to business class and others have higher fertility (2.0 children). Such finding indicates that agricultural work participation of a woman reduces average fertility of a woman, by weakening her reproductive health, (Table 2).

Table 2. Occupation of the Respondent Families (Deori tribe)

	Occupation of the respondent families	Main occupation	Percentage to Total of Row-7	Additional occupation	Percentage to Total of Row-7	No. of children	Percentage to Total of Row-7	Average no. children per household
	Col. (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Agriculture	162	90.00	12	6.67	284	90.73	1.75
2	Service	15	8.33	10	5.56	23	7.35	1.53
3	Business	2	1.11	12	6.67	4	1.28	2.00
4	Daily wage	0	0.00	9	5.00	-	-	-
5	Others	1	0.56	3	1.66	2	0.64	2.00
6	None	---		134*	74.44	-	--	-
7	Total	180	100.00	180	100.00	313	100	1.73

Source: Field survey in upper Assam for the period 2010-12.

Note: *134 respondent families have no additional occupation.

Similar finding has been observed in the cases of samples Mishing women. As much as 88.57% Mishing woman of sample families has found to be primarily involved in agriculture; and with higher breeding rate (2.15) they are the largest (89.60%) provider of children during 2010-2012. Again, the average number of children given birth by a Mishing woman working as daily wage earner and/or involved in other occupations has procreated two children, job holding women and/or women of business families have less than two children on an average. Such finding is implying that some factors other than work participation influence the child reproduction level.

The tribe-wise analysis revealed comparatively a lower fertility in the cases of the Deori tribe that ranges between 1.5 and 1.7; and always higher for Mishing tribes which, range between 2.13 and 2.15.

The usual paradigm that agricultural work participation causes reduction of reproductive health of women is nullified by such field survey data. Out of 390 universe in 380 sample hhs and sample women in reproductive (RPH) ages of 15-49 have been found participating in agricultural farming. Out of these a

meager number (28.68 %) of them have reported suffering from RPH problem as diagnosed by medical practitioner, implying that agricultural work participation does not drastically reduce the RPH condition of women and their fertility.

Conversely, a few tribal women (30%) suffering from severe RPH problem have been found keeping themselves away from agricultural work participation on weaker health ground. Other implication of this is that mainly for deterioration of health caused by exposure to hazards of agricultural involvement; out of 390 women only 2.57% respondents have currently remained uninvolved in agriculture. Thus, there might have some other important causes to refrain the women from agricultural work participation. The main hidden causes identified from field observation are – the landlessness, severe family poverty and dearth of alternative employment opportunity. Because of such diversity, it becomes much difficult to develop an acceptable theorem relating agricultural involvement in one hand and sufferance from reproductive health problems by a woman on the other.

(ii) Farm size and Reproductive behaviour

The general panorama of the Deori tribe is that proportion of married women suffering from reproductive inefficiency has been decreasing with the increase in farm size. Such inverse relationship has also been observed in the cases of Mishing tribe too. Estimation of correlation (r) between average firm size of the

Table 3. Farm size and RPH problem (Deori)

Farm size of the respondent families (in hectare)		No. of respondent families	No. of children given birth by the respondents	Average no. of live birth	No. of women suffering diseases	% of women suffering diseases	No. of women suffering RPH problem	% of women suffering RPH problem
Col. (1)	x	(2)	(3)	(4)	(5)	(6)=(5)/(2)*100	(7)=y	(8)=(7)/(2)*100
< 1.0	0.5	67	119	1.77	34	50.75	18	26.86
1.0—2.0	1.5	69	115	1.66	40	57.97	19	27.54
2.0—3.0	2.5	30	47	1.56	14	46.67	11	36.67
3.0—4.0	3.5	10	21	2.10	06	60.00	02	20.00
4.0—7.0	5.5	4	11	2.75	02	50.00	00	0.00
Total		180	313	1.73	96	53.33	50	27.78

Source: Field survey in upper Assam for the period 2010-12.

$r_{xy} = -0.788$ for Deori tribe

Table 4. Farm size and RPH problem (Mishing)

Farm size of the respondent families (in hectare)		No. of respondent families	No. of children given birth by the respondents	Average no. of live birth	No. of women suffering diseases	% of women suffering diseases	No. of women suffering RPH problem	% of women suffering RPH problem
Col. (1)	x	(2)	(3)	(4)	(5)	(6) = (5) / (2) * 100	(7) = y	(8)
< 1.0	0.5	128	277	2.16	87	67.96	45	35.15
1.0—2.0	1.5	66	139	2.07	29	43.93	15	22.72
2.0—3.0	2.5	13	30	2.14	04	30.76	01	7.69
3.0—4.0	3.5	02	04	2.00	01	50.00	00	0.00
4.0 -7.0	5.5	01	02	2.00	01	100.00	01	100
Total		210	452	2.15	122	58.09	62	29.52

Source: Field survey in upper Assam for the period 2010-12.

$r_{xy} = 0.568$ for Mishing tribe.

respondent families and proportion of women experiencing reproductive health problem comes to be (-) 0.788 for Deori tribe and 0.568 for Mishing tribe as shown in Tables 3 & 4. Such findings are indicating that in the cases of Deori tribe RPH is negatively correlated with the increase in firm size, while in the case Mishing tribe this is positively related with puzzling relations in its internal history.

Economically well off and educationally advanced Deori tribe of the state having bigger farm size usually hire in agricultural labourers in order to run their farm activities. Hence, -r is found between farm size and RPH in the cases of Deori tribe. But the Mishing tribe, as they have been living in remote areas, socio-economically poor and educationally backward, they have been experiencing higher fertility, diverse degree of reproductive health problems, irrespective of average farm size. Similar findings are observed amongst the newly immigrant families which have been experiencing uncontrolled breeding of child.

Families with smaller farm size have been found confronting more reproductive problem of their married women. In so far as, in such families having smaller farm size, inclusive of the female-head all members of the families turn up to render their own physical services in the farm fields mainly due to their failure to mechanize the farm activity and inability to hire in additional labour. Such families partly rely on wage labour and tiny business, whereas, sexual life is the only relaxation of boredoms and anxiety. Respondent families with better economic condition usually hire in extra labourer during paddy seasons and for

other farm activities. As such, field study data relating to Deori and Mishing tribes have shown a tendency to decrease in proportion of women suffering from RPH problems with bigger farm size.

Combined data of both the tribes shows that the proportion of women with RPH problems has been decreasing from 32.30 to 20.00 having average farming land of 0.5 hectare and 5.5 hectare, respectively (Table 5). It points that bigger farm size does not mean involvement of family members in agricultural works for longer hours causing health deterioration of the farm owning family.

Table 5. Farm size and RPH problem (Deori & Mishing)

Farm size of the respondent families (in hectare)		No. of respondent family	Total No. of children given birth by the respondent Women	Average No. of live birth Col. 3/col.2	women suffering diseases		women suffering from RPH problem	
					Nos.	Percentage Col (5/2)*100	Nos.	Percentage Col. (7/2)*100
Col. (1)	x	(2)	(3)	(4)	(5)	(6)	(7) = y	(8)
Below 1.0	0.5	195	396	2.03	121	62.05	63	32.30
1.0—2.0	1.5	135	254	1.88	69	51.11	34	25.18
2.0—3.0	2.5	43	77	1.79	18	41.86	12	27.90
3.0—4.0	3.5	12	25	2.08	07	58.33	02	16.67
4.0—7.0	5.5	05	13	2.60	03	60.00	01	20
Total		390	765	1.96	218	55.89	112	28.71

Source: Field survey in upper Assam for the period 2010-12.

$r_{xy} = -.877$ for both Deori and Mishing Tribes

(iii) Income level, disease prevalence, abortion and fertility

Output factors such as average fertility, average number of abortion undergone, disease prevalence and percentage of women confronting reproductive health complications have been examined in terms of input factor at different levels of income. In the existing socio-economic set up of the economy income level is the major determining parameter of lifestyle, quality of life and maintenance of health status of a family member. The accepted common hypothesis is the higher the family income, the higher is the living standard ensuring better quality of life. Conversely, the lower the family income is, the quality of life and the reproductive health of the concerned family might be poor.

Contradicting such hypothesis the findings of the field survey during 2010-13, have presented a vivid picture of reproductive demography of the tribal woman having different levels of family income. Most of the spouses of the last generation of Deori tribe scarcely thought of limiting the family size. This happens so because, the bigger size of agricultural farm, availability of waste land and high income level have enabled most of the families to afford the cost of child-bearing and child rearing. Such circumstances of the predecessors have led to a rapid population growth of Deori tribe resulting in land scarcity in their tribal belts/blocks. So, the current generation is confronting constraint in expanding the family size coupled with other emerging problems of the socio-economic transition. During the study period 2010-13, a family having even two children is considered as experiencing of **high fertility**. Thus, a nuclear family of the Deori tribe resorts abortion as to limit the fertility within the two child norm, not because of ideals of family size as appealed by the state.

Again, married women of Deori tribe of new generation in reproductive age groups, having lower income below ₹ 3000 per month have a fertility of 2.15 on an average. But, other parameters of RPH such as abortion rate, disease prevalence and reproduction problems are not so high. It is interesting to note that families having higher level of income have a higher fertility.

Majority of the Deori women (48.33%) of present generation under study belong to the income range of ₹ 3000-6000 and 50% of them have aborted and reported suffering from various RPH problems. It indicates that the probability of avoiding disease prevalence and reproductive health degradation largely hinges upon regular and higher level of income.

But, in the cases of Mishing women the level of fertility has not been found to be a function of family income level. In spite of increase in per month family income the average fertility has not gone down to two children norm (Table 6). Of course, women with family income in between ₹ 3000-6000 have suffered most in health problems such as abortion (50%), disease prevalence (62.29%) and RPH complications (66.13%).

The combined analysis too presents similar facts. Due to income constraints some of the rural marginalized families have limited their family size and hence occurrence of reproductive health problem is sporadic. Income constraint that works as indirect compulsion to limit the fertility level of a married couple is a undesirable measure in a welfare state. Hence, views on life, higher age at marriage and single wife which are highly responsible factors in determining the average fertility requires to be specifically addressed to contain the breeding level.

Hence, it may be a wise decision for the state to invest a sizable sum of money for health purposes together with forbidding marrying more than one female, prescribing legal age at marriage above 23 years as to avoid excessive addition

of population to the nation and keeping the population size at the affordable level of health caring. This aspect needs sharp attention of the health department and the state in the situation of fast growing unemployment rate, speedy deterioration of environment and sharp increase in environmental pollution. For, in the state (Assam) alone unemployed labour force per thousand populations is as high as 40 persons; and sex-wise unemployment rate is 35 for males and 61 for female labour force in 2012-13.¹⁵

Secondly, rapid population growth in the state due mainly to illegal immigration from the neighbouring countries has ended up the reserve areas. The rate of decrease of the forest areas in the state is -3.18% and -3.81% in 2009-2011 and 2011-12, respectively.¹⁶ During 1971-81 alone 33.29 lakh during 1981-91 another 37.71 lakh again in 1991-2001 another 38.14 lakh illegal migrants have been settled in forests, waste land and/or char areas in different parts of the state.¹⁷ Such, aberrant increase of the immigrant families have paused a challenge to the self-reliant economy and virgin health sector of the state.

Table 6. Income level / (disease prevalence/ abortion/ fertility/ RPH) Mishing

Level of income	No. of women Respondent	No. of children given birth	Average fertility	abortion	% to total of Col.5	disease prevalence	% to total of Col.7	RPH problem	% to total of Col.9
Col.(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
0-3000	38 (18.10%)	69	1.82	3	21.42	23	18.85	12	19.35
3000-6000	127 (60.48%)	291	2.29	7	50.00	76	62.29	41	66.13
6000-9000	24 (11.43%)	53	2.21	2	14.38	12	9.84	5	8.06
9000-12000	6 (2.86%)	11	1.83	1	7.14	2	1.64	0	0.00
12000 -15000	4 (1.09%)	9	2.25	1	7.14	1	0.82	2	3.23
15000 -40000	11 (5.24%)	19	1.73	0	0.00	8	6.56	2	3.23
All	210	452	2.15	14	100	122	100	62	100

Source: Field survey in upper Assam for the period 2010-12.

15. [www.planassam.info/economic_survey-assam2012-13/chapter%20-%20 XVII.pdf](http://www.planassam.info/economic_survey-assam2012-13/chapter%20-%20XVII.pdf)

*The all India average unemployment rate is 20 only. At all India level Sex wise unemployment rate has been estimated to be 20 males and 23 females per 1000 males and females, respectively.

16. Directorate of Economics and Statistics (2009), *Statistical Hand Book of Assam, 2009*, Govt. of Assam.

17. Hazarika, P. (2009), *Economic Development and Ecological Balance in Assam: Problems and Prospect*, DVS publishers, Guwahati, 2009, pp.7-14

Thirdly, rapid growth of population in the state has led to anthropogenic pollution. The indicators of such water pollution of the rivers of the state are the low Hydrogen Pressure (PH) in water to 6.5, Low Biochemical Oxygen Demand (BOD) and Low Dissolved Oxygen (DO) in the water bodies of the rivers. Mineral components such as Calcium Carbonate (CaCO₃) in the water bodies of the selected rivers has been noted to be too low, water of which has been used as potable water by most of the people living on the banks of such rivers. Deficient of required minerals, but full of harmful chemicals in the water bodies of the rivers have resulted in occurrence of various diseases to people living at the river banks, rather than supplementing to their health.

In order to have further information an analysis of average farm size, average number of children given birth, infant mortality and the proportion of women

Table 7: Average Farm size and Reproductive health (Deori tribe)

District	Average land size per family	Average Farm size per family (x1)	CBR (3 years average) (x2)	Average children born to per woman(x3)	3 years average of IMR(x4)	3 years Average conception per year per 1000 women#(x5)	3 years Average abortion per year per 1000 women#(x6)	No of women with RPH problem(Y)
Col.(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sivasagar	2.07	1.58	31.10	2.03	52.63	244.44	22.22	10
Dibrugarh	1.85	1.46	41.34	1.90	63.49	277.78	33.33	8
Dhemaji	1.20	1.04	60.17	1.73	47.62	388.89	66.67	9
Lakhimpur	1.59	1.31	46.42	1.60	11.11	377.78	11.11	5
Jorhat	2.58	2.31	45.98	1.60	0	288.89	11.11	11
Tinisukia	1.84	1.47	62.41	1.57	59.52	400.00	66.67	7
Total	1.86	1.52	47.90	10.43	37.77	326.63	22.22	50

Source: Field survey in upper Assam for the period 2010-12.

The estimated result in the case of married Deori women has been found to be as follows:

$$Y = -5.898 + 3.294x_1 + 5.290x_3, \dots \dots \dots (i)$$

$$t = (-.666^\#) (1.652^\#) (1.174^\#)$$

$$R^2 = 0.546$$

$$\text{Adjusted } R^2 = 0.243$$

$$F = 1.804^\#$$

(#Not significant at 1 % and 5% level of significance)

experiencing reproductive health problem has been tried with linear regression equation based on the field survey information furnished in Table 7 and 8. Considering RPH problem (Y) of married women as dependent variable, RPH problem (Y) of married women has been regressed upon Average Farm size of the sample families (x_1) and average children born to per woman (x_3).

It implies that average farm size (x_1) and average children born to per women (x_3) do not have any significant impact on reproductive health problem of Deori women.

Table 8. Average Farm size and Reproductive health (Mishing tribe)

District	Average land size per family	Average Farm size per family (x_1)	CBR(3 years average) (x_2)	Average children born to per woman (x_3)	3 years average of IMR (x_4)	3 years Average conception per year per 1000 women (x_5)	3 years Average abortion per year per 1000 women (x_6)	No of women with RPH problem (Y)
Col.(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sivasagar	1.17	0.98	44.71	2.50	83.33	311.11	22.22	9
Dibrugarh	1.37	1.02	30.84	2.56	19.61	233.33	44.44	5
Dhemaji	1.39	1.10	61.72	1.83	55.56	366.67	22.22	13
Lakhimpur	1.29	1.11	70.18	2.73	90.09	422.22	11.11	2
Jorhat	0.71	0.95	45.51	2.00	21.27	311.11	44.44	14
Tinisukia	0.92	0.67	70.16	1.76	48.48	333.33	22.22	9
Golaghat	0.90	0.71	57.43	1.67	52.08	377.78	0	10
Total	1.11	0.93	54.36	2.15	52.34	334.92	23.80	62

Note: (i) Average land size per family (refers to total land holdings of each family).

(ii) Average Farm size per family (refers to cultivable land area per family)

Source: Field survey in upper Assam for the period 2010-12.

Regression coefficients for married Mishing women those who have been found involved in agricultural activity upon their reproductive health give the following result.

$$Y = 21.841 + 10.376x_1 - 10.48x_3 \dots \dots \dots (ii)$$

$$t = (3.316^*) (1.181) (-2.930^*)$$

$$R^2 = 0.707$$

$$\text{Adjusted } R^2 = 0.561$$

$$F = 4.832^*$$

(* Coefficients are significant at 5% level of significance.)

Table 9. Average farm size and reproductive health (Deori & Mishing tribes)

District	Average land size per family	Average farm size per family(x1)	CBR(x2)	Average children born to per woman(x3)	3 years average of IMR(x4)	3 years Average conception per year per 1000 women#(x5)	3 years Average abortion per year per 1000 women##(x6)	% of women with RPH problem(Y)
Col.(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sivasagar	1.62	1.28	37.90	2.26	69.77	277.78	22.22	19
Dibrugarh	1.61	1.24	36.09	2.23	43.86	255.56	38.89	13
Dhemaji	1.29	1.07	60.94	1.78	51.72	377.78	44.44	22
Lakhimpur	1.44	1.21	58.30	2.16	54.72	400.00	11.11	7
Jorhat	1.65	1.63	45.75	1.8	21.27	300.00	27.77	25
Tinisukia	1.38	1.07	66.28	1.66	48.48	366.67	44.44	16
Golaghat	1.48	0.36	28.72	0.83	52.08	377.78	0.00	10
Total	1.49	1.12	51.13	6.29	49.02	333.33	29.05	112

Source: Field survey in upper Assam for the period 2010-12.

Findings show that the average farm size has no significant impact on RPH. However, it has been found that additional children born negatively and significantly affect their reproductive health. For, the regression coefficient of average children born to per Mishing married women (x_3) has been estimated to be -10.48.

The overall observation as reflected by the computation of regression coefficients from the combined table-9 are as follows:

$$Y=13.882+18.836x_1-10.395x_3, \dots \dots \dots (iii)$$

$$t=(1.663^\#) (2.031^\#) (-1.447^\#)$$

$$R^2=0.511$$

$$\text{Adjusted } R^2=0.267$$

$$F=2.090^\#$$

($^\#$ Not significant at 1% and 5% level of significance).

The impact of explanatory variables viz. average farm size and average number of children born to per women upon reproductive health of married women belonging to the Deori and Mishing tribes is not statistically significant either at 1 or 5% level of significance.

The model is not well fitted to the surveyed data as the goodness of fit (R^2) is 0.511. The overall significance of the model is not significant either at 1% and/or 5% levels. For, $F=2.090$. Because of such inconclusive result the field survey data have been once again analyzed using a binary logistic regression model.

Binary Logistic Regression Model

To identify the factors affecting the reproductive health status of tribal women, a binary logistic regression analysis has been performed. Here, sufferance from RPH problem by tribal women has been considered as dummy dependent variable (Y) using 1, if a tribal woman suffers from RPH problem and 0, if a tribal women does not suffer from such problem. The explanatory variables used in the model are:

- No. of live birth ever born by the respondent (LB)
- Abortion experienced (using 1 for yes, 0 for otherwise) (AB)
- Suffering from general health problem (using 1 for yes, 0 otherwise) (DS)
- Use of any method of contraception (scored 1 for users, 0 for non users) (CU)
- Age at marriage of the respondent (MA)
- Main occupation of the respondent’s family (MO)
- Involvement of the respondent in agricultural activities (using 1 for yes, 0 otherwise) (AI)
- Total land of the respondent family (in hectare) (TL)
- Farm size of the respondent family (in hectare) (FS)
- Land under paddy cultivation of the respondent family (in hectare) (PL)

With these variables the following regression model has been framed-

$$RPH_i = \ln\left(\frac{D_i}{1-D_i}\right) = B_0 + B_1(LB)_i + B_2(AB)_i + B_3(DS)_i + \dots + B_{10}(PL)_i + u_i$$

In the equation, D_i is the dummy variable i.e. if the expected value of D_i continues to be P_i which means, if the i^{th} woman suffers from RPH problem then $D_i=1$, and if the i^{th} woman does not suffer from RPH then $D_i=0$. The result of regression analysis has been found as given in the Table 10.

Table 10. Result of Binary Logistic Regression Model

	B	S.E.	Wald	Exp(B)
LB	.183	.110	2.773**	1.201
AB	1.753	.458	14.614*	5.770
DS	1.970	.308	41.008*	7.173
CU	-.428	.258	2.761**	.651
MA	.013	.032	.161	1.013
MO	-.417	.237	3.088	.659
AI	.073	.867	.007	1.076
TL	.144	.306	.221	1.155
FS	-.176	.222	.631	.838
PL	.286	.405	.500	1.331
Constant (B ₀)	-4.891	1.552	9.931*	.008

The logistic model predicts that neither the involvement of a tribal woman in agricultural activity, the agriculture farm size of the family, nor the paddy farm size has any significant correlation with her reproductive health problems. Thus, the hypothesis formulated that participation of a woman in agricultural activity reduces her reproductive health by increasing the fertility to meet the additional supply of labour for agricultural farming has been found to be not true. As such, the hypothesis has been rejected. It implies that there are some other factors which govern the fertility level and the limits of reproduction.

This study reveals that the proximate determinants of reproductive health of a woman are- (i) No. of live birth, (ii) Abortion, and (iii) Disease prevalence, (iv) Use of any method of contraception.

Implications of the estimation are as follows -- for a unit increase in the explanatory variable i.e. number of live birth (**LB**) ever born by a woman, the odds of suffering from reproductive health problem by her increases by 1.201 or 20.1 points per one hundred cases.

Abortion has been found to have a significant impact on the reproductive health of a woman as implied by the Wald analysis. The coefficient of **AB** 1.753 indicates that holding other predictors constant, if a woman undergoes abortion, the log of odds of suffering from RPH problem increases by 1.753 units. Conversely, the exponential of **AB** 5.770 indicates that the women, who have experienced abortion, are more than five (5) times susceptible to suffer from reproductive health problem than that of those who have not aborted.

Similarly, general disease prevalence amongst the sample tribal women has significant positive influence on their reproductive health problem. Holding other

regressors constant, the coefficient of DS 1.970 implies that if a woman suffers from general health disease, the log of odds of suffering RPH problem increases by 1.970 units. In other words, the exponential of DS 7.173 denotes that vulnerability to suffer from various reproductive health problems by a woman who has been currently suffering from general health problem increases by 7.173 units than other women those who have not been suffering from general health diseases, keeping other regressors constant.

Another explanatory dummy variable i.e., Use of any method of contraception (CU) has been found statistically significant at 10% level. The coefficient of CU (-0.428) suggests that the log of odds of suffering from RPH problem decreases by 0.428 units for those women who use any method of contraception as compared to those who do not use such devices. Conversely, the exponential of CU (0.651) refers that controlling other regressors; the sample tribal women who use any contraceptive method have 0.65 times less chances of suffering from RPH problem.

Conclusion

Tribal agricultural families do not have higher fertility. However, reproductive health problems to such women develop either because of abortion, malnutrition and hard labour or due to non-accessibility of modern health care services and poor contraceptive prevalence. The findings indicate that health caring of women in the state, in reproductive ages is at a poor level. The health department has enough scope to do. The study is implying that the spade by spade population growth in the state is mainly due to incessant immigration. Poor health caring in the state is mainly due to population problem which is beyond the affordability and capability of the state health department. In order to have the expected results population growth must be contained and efficiency of the health department needs to be essentially promoted.

Acknowledgement

This paper is a refined part of a major research project funded by the UGC, New Delhi, undertaken by the third author.

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