

MULTISEED FARMING TECHNIQUE: A PANACEA FOR FOOD INSECURITY AMONG TRIBES IN KERALA

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Abstract

This paper analyses the impact and implications of the traditional multiseed farming technique (MSFT) among tribes on their food security in the Attappady block of Kerala State. Using the definition of food security by the United States Department of Agriculture, the study corroborated that the problem of 'Very Low Food Security' is persistent among such tribes not engaged in MSFT. The paper makes a strong pitch for the government to overhaul the extant schemes and play the role of a facilitator to enable all tribes to engage in MSFT which is a panacea towards accomplishing food security among them.

Keywords: Multiseed Farming Technique, MSFT, Food Security, Tribes, Kerala.

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Introduction

The term 'Food Security' is a multidimensional term. The availability, accessibility, stability of accessibility and utilisation of food together constitute the pillar of food security. According to Food and Agricultural Organisation (2002), food security is a situation where all people have access to food which is not only sufficient but safe and nutritious also guaranteeing healthy and active life. A variant of food security, viz. 'household food insecurity' is chronic and transitory. Chronic food insecurity takes the form of an acute crisis of food as a result of the incapability of households to obtain food from outside. Contrariwise, transitory food insecurity is a short-term decrease in having food among households owing to reasons such as fluctuating food prices or leakages in income or production (Khatri Chatri & Maharjan, 2006)). In India, the public distribution system is the cornerstone through which food security is mainly anchoring around (Nair K. T., 2008). Compared to laymen in the country, it is the tribes who are vexed with malnutrition and poverty (Sinha A. K., 2014). However, the risks associated with malnutrition could be checked by policies on education and food policies (Wekerle, 2004)

Food insecurity is construed to be a challenge to nutrition conditions, and achievement of minimum quality of life and good health. Obtaining concrete data on food security is a formidable challenge for many countries, including India (Gol, 2019). Calorie adequacy is found to be a generally used indicator of food security, although there is no foolproof indicator measuring food security (Maxwell, 1996; Chung et al., 1997). A study conducted by Faber et al. (2009) among South African populations found that there was a positive relation between low dietary diversity and high food shortage. Abimbola and Kayode (2013) studied the lack of food security among Nigerian households and maintained that majority of them were out of the bracket of food security despite the institutional interventions of the governments. Phillips and Taylor (1990) found that a meagre diet would breed food insecurity either for the time being or throughout a year and that it is likely in future too.

Gupta et al. (2015) also found that food-insecure households depended on less expensive foods and rolled back their food consumption, unlike women who relied heavily on purchasing food on credit. A comparison across gender shows that women bear the brunt of food insecurity than that of men. For example, a study conducted among children in Brazil found that females were 2.21 times more food insecure than males (de Souza Bittencourt et al., 2013). As part of measuring food insecurity among adolescents in Southwest Ethiopia, a comprehensive study was carried out and it was concluded that female was considered a potent independent predictor of food insecurity (Belachew et al., 2012). WHO (2022) shockingly revealed that the gender gap in food insecurity rose to 31.9 per cent of women in the world in 2021 who were severely or moderately food insecure in comparison with 27.6 per cent of men in 2020. Cafiero et al. (2018) held the view that Food Insecurity Experience Scale (FIES) dwelled on individual contexts, socio-economic living conditions and food consumption patterns. IMF (2022) lamented that on account of acute food insecurity, 345 million people in the world are in severe danger and about 828 million are forced to go to bed hungry every night. FAO (2021) revealed that 148 million people became additionally and severely food insecure owing to COVID-19 situation. Food insecurity is an ominous threat to public health and society at large and individuals can't be spared from it (Gundersen, 2015). World Food Programme (2023) reported that in Lebanon, 46 per cent of households are food insecure and 88 per cent of Syrian refugees are extremely poor. McKay et al. (2019) investigated and found that the extent of food insecurity in Australia ranged from 2 per cent to 90 per cent. Various socio-economic factors are entwined with food insecurity having divergent aspects such as increased ruralisation, abject penury and rising population. (Furness et al., 2004; Gundersen & Gruber, 2001; Hossain, Naher & Shahabuddin, 2005). Households, regardless of food security, relied on less expensive foods due to the rampant distribution of cheap grains for tapering off hunger in poor countries (Banerjee & Duflo, 2011). Sujata (1998) recommended that

tribal development strategies should focus more on 'humans' and added that the primitive approach of treating health issues of tribes in a compartmentalised manner would be a flawed exercise as far as the improvement of tribal health is concerned. Rao et al. (2006) reported that development projects in Andhra Pradesh did no good to tribes; instead, it only helped aggravate their displacement. Accordingly, successive interventions and strategies for the betterment of tribes should go a step further beyond land and thrust on fulfilling sustainable livelihood, vibrant human capital, adequate employment generation, sound infrastructure and food security.

Food Insecurity among Tribes in Attappady

As per Census 2011, the ST population of Kerala was 4,84,839 lakh, comprising 2, 46,636 lakh females and 2,38,203 lakh males. Scheduled Tribes in Kerala State are generally known as 'Adivasis' which means primitive residents or indigenous people. Majority of the tribal population of Kerala are living in the remote forest areas of Western Ghats, bordering Tamil Nadu and Karnataka. Scheduled Tribes in Kerala include 36 categories whereas Attappady has three tribal communities - Irular, Mudugar and Kurumbar. Generally speaking, their health, educational and employment status are backward compared to the State level statistics. Even though the highest per cent of Scheduled Tribes in Kerala is recorded in Wayanad district, Attappady is the only tribal taluk in Kerala with the highest concentration of tribal population. Kunhaman (1985) addressed the issue of imposing restrictions on shifting cultivation practice among Attappady tribes in the 1960s. The slash-and-burn practice in harmony with nature was practised at Attappady which, however, received a setback when there was a pressing need to demarcate land for hamlets resulting in the malady of food insecurity. Edison and Devi (2019) remarked that the production of traditional foods like millets became non-functional ever since shifting cultivation disappeared, which also paved the way for tribal food security at Attappady. Shincy (2012) studied the livelihood issues of the Irula tribe

at Attappady and remarked that 54 per cent of them had little idea of food and nutritional security. It is equally regrettable to note that the UNICEF Report (2013) about 39 deaths happened in Attappady tribal block. Though pregnant women and children below the age of six are having access to nutritious meal a day under the community kitchen programme, there was no effective mechanism to address the issue of anaemia among school-going tribal children. The Times of India (2013) unveiled a chilling estimate of 58 malnutrition deaths in 20 months in the Attappady tribal block. Ekbal Committee (2013) came out with untold miseries and privations among tribes in Attappady, which lent credence to the premature death of more than 60 tribal infants/ children on account of multifarious factors such as inadequate public distribution system, the unavailability of alternate nutritious food, disappearance of indigenous food items and loss of job in the labour market, entrapping them into rampant starvation coupled with increased proportion of malnutrition and redundant health problems. UNICEF (2015) reported that malnutrition gripping Attappady region is mainly owing to the presence of factors like food insecurity and poverty.

From the above, it can be discerned that the prevalence of tribal food insecurity at Attappady is indeed alarming and has increased the risk of malnutrition, stunting, wasting, infant mortality and starvation.

Statement of the Problem

Kerala has, for many years, been a food deficit State. Kerala became increasingly dependent on neighbouring States like Tamil Nadu and Karnataka for meeting the essential dietary requirements. Kerala continued as a food deficit State due to the unimpressive performance of commodity-producing sectors. This food deficiency and subsequent hidden hunger manifested itself first but destroyed the socio-economic lives of the particularly vulnerable sections of society, i.e. tribes. In Kerala, the most distraught tribes are found in Attappady in

Palakkad district of Kerala and land alienation brought about unscientific changes in their cropping patterns and consequent health problems among tribes (Prasad, 2019). Bijoy (1999) held that it was perhaps in Kerala that Adivasis (tribes) put up with the highest degree of alienation of land. In addition, one of the most severe issues among tribes in Attappady is food insecurity and the resultant chronic poverty. Tribes are habituated to having only two meals a day only. Regrettably, this practice is found rampant among pregnant and lactating mothers, which triggers off the problem of food insecurity, and thereby impacting the on the future generation in the form of stunting, wasting and infant mortality. Even though interventionist strategies of government such as FWP, free ration, MGNREGA, Community Kitchen and the like are in plenty, neither demonstrable results nor durable solutions have been arrived at. Whatever efforts made so far proved to be an exercise in futility. Prasad (2016) concluded that drastic changes in the cropping pattern at Attappady brought in health issues and resultant food insecurity among tribes. It is unfortunate that government interventions in Attappady did not succeed in ensuring that the benefits were spread equitably (Sujathan, 2019). Manikandan (2014) remarked that the failure of Attappady Hill Area Development Society, institutional delay and apathy in implementing the law paved the way for meagre livelihood security and food security among tribes. So, the need of the hour is an alternative approach to stem the tide of food insecurity among them. The extant study is poised to investigate the issue of food insecurity among the three major tribal communities, viz. Irular, Mudugar, and Kurumbar residing in Agali Panchayat in the Attappady, the only tribal taluk in Kerala. Although much analytical insight is available in earlier studies, the multi-factorial nature of household food security remains difficult to measure. Carlson et al. (2019) opined that it is a difficult exercise to target the BPL so far as food interventions are concerned. The lack of low-cost and accurate assessment tools has paved the way for the use of several indirect determinants to measure food insecurity, including monthly household expenditures, family income, feeding

patterns, family consumption model, energy sufficiency income, food intake, and nutritional status (Abbasi et al., 2016). However, evaluation using these indirect indicators may lack specificity and may lead to unreliable assessments of the food insecurity experience (Abbasi et al., 2016). The purpose of this study was, therefore, to examine and measure the extent of food insecurity among such tribes who are engaged in Multiseed Farming Technique (MSFT) and not practising it at Attappady. No seminal study on the alternative farming technique and its resultant effect on food security among the tribes in Kerala has so far been conducted, which underscores the rationale for the present study.

Methodology

Tribal communities in Attappady are distinct in their unique system of cultivation, viz. Multiseed Farming Technique (MSFT). This innovative style of cultivation guarantees the availability of food round the clock so that they do not have to remain in poverty. This indigenous tribal food technology ensures accessibility to food so that they are not starved to death. However, a cursory look at the studies referred above shows that tribes in Attappady die of hidden hunger, malnutrition, etc., and it is understood that fallout of food insecurity can cause hunger. This is symptomatic of some serious issues associated with the execution of MSFT. The study proceeds furthermore by classifying and collating such tribes having MSFT and not having MSFT and examines whether the extent of food insecurity is confined to the tribes not adopting MSFT. The study has relied on both primary and secondary data. The primary data was collected from 200 sample households using a simple random sampling technique. That is to say, on the lottery method, four wards were identified from Agali Gram Panchayat of Attappady Block, viz. Kottathara, Jellipara, Kallamala and Thavalam. The Project Officer, ITDP, Agricultural officers, NGOs and ward members were consulted with regard to identifying farmers engaged and not engaged in MSFT. Accordingly, farmers engaged and not engaged in MSFT were selected at random

from these four wards. In wards 1 and 2, the number of MSFT farmers and non-MSFT farmers were found to be 79 and 43, respectively. Similarly, in wards 3 and 4, 84 and 65 farmers were seen to be MSFT farmers and non-MSFT farmers, respectively, and thereby totalling 271 as the total sample size. Of this, 71 were excluded due to unreliable information, missing value and skewed data, and hence the total sample size is finalised to 200.

The study used Ordered Logit Regression Model to find out the impact of MSFT on the food security status of tribal households and incorporated group discussion among tribes headed by 'mooppan' (tribal head) to ascertain the nuances associated with MSFT. The latest methodology of defining food security by the United States Department of Agriculture (USDA) has been

resorted to in this study. The USDA measured food security into four levels - Very Low Food Security, Low Food Security, Marginal Food Security and High Food Security. While the first one states several symptoms of disrupted eating patterns and reduced food intake, the second indicates reduced quality, variety and desirability of diet. The third shows a few reported indications regarding anxiety over the shortage of food and the fourth one implies no issue with access to food security. The study hypothesises that engagement in multiseed farming significantly contributes to food security among tribal people in Attappady. To test this hypothesis, the following regression equation is estimated by using additional independent variables such as education, employment, land ownership, income, knowledge of food security and engagement in the multiseed farming process. The fundamental form of the model is

$$Fs = \beta_0 + Ed\beta_1 + Em\beta_2 + Ol\beta_3 + Y\beta_4 + Kf\beta_5 + Ms\beta_6 + \mu_i$$

Where

Fs= Food security, β_0 = constant; β_1 , β_2 , β_3 , β_4 , β_5 , β_6 are the regression coefficients with respect to independent variables and μ_i is the stochastic error term, Ed=education, Em = employment, Ol= land ownership, Y= income, Kf= knowledge of food security, Ms=Engagement in multiseed farming and μ_i = error of the estimate. β_5 and β_6 will tell us the impact of multiseed farming process on food security. The model is estimated by using the maximum likelihood method.

Multiseed Farming Technique

Under this system, ten varieties of seeds having divergent harvesting times are simultaneously sown in May in sun-exposed areas. This is a farming strategy followed by three categories of tribes, viz. Irular, Mudugar and Kurumbar in Attappady to assure round-the-clock availability and accessibility of food among them. The seeds comprise Keera (amaranth), Vellari (cucumber), Kaduku (mustard), Cholan (corn), Mathan (pumpkin), Kumbalam (white gourd), Mulak (green chilli), Kora (ragi), Chama (beetle grass), and Thuvvara (pigeon pea). This indigenous tribal agricultural practice is in harmony with nature,

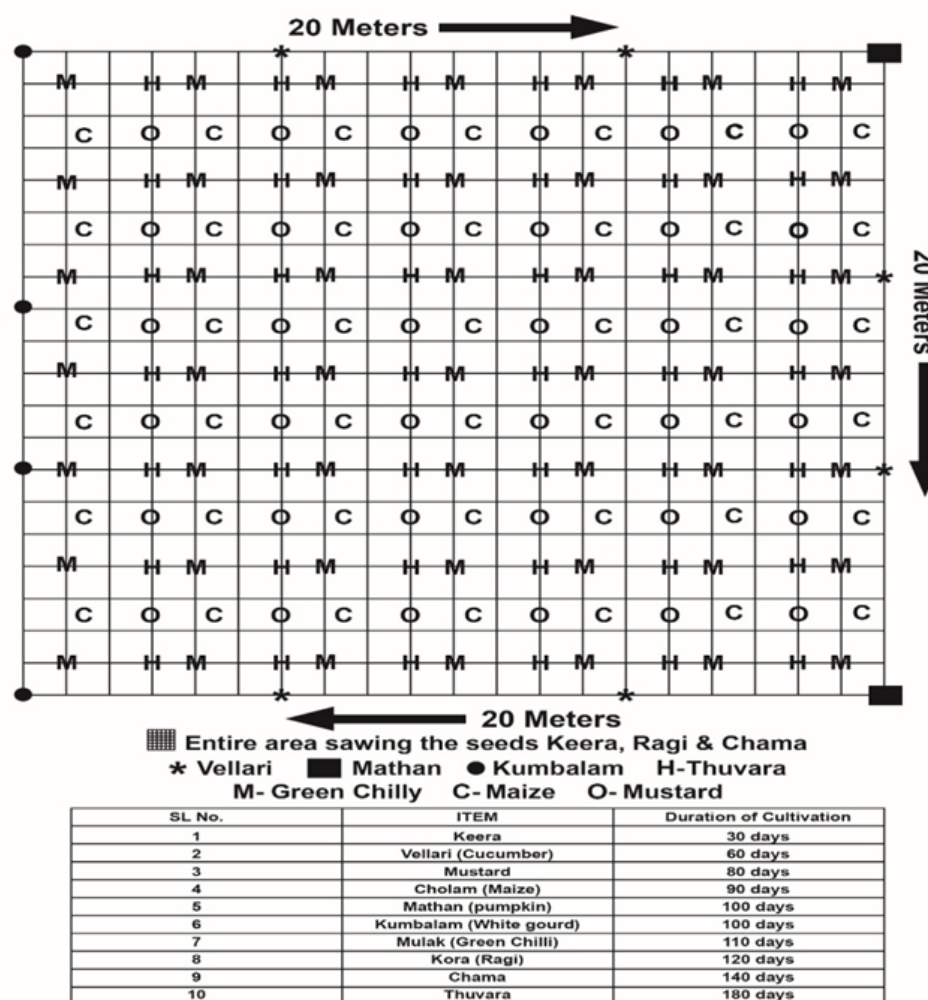
minimising risks, guaranteeing nutritional requirements and zero cost. During early summer, small bushes, branches and fallen leaves are set on fire. In this thin layer of ash, these seeds are sown and mulched, by ensuring sufficient spacing between seeds. Spacing has twin advantages - sufficient spacing improves the immune system, and such plants grow healthier compared those grown together. Farm animals fertilise the seeds with manure too. After three years, the site of farming changes and tribes dislocate themselves leaving the land barren and return later. The Chama and Thuvvara plants protect others from strong winds. Marigolds are also planted because they are companion plants and will, therefore, deter

beetles, leaf hoppers, hornworms, etc. Interestingly, the strong scent of marigolds diverts the pests and predators. At times, branches are cut in between to avert the profusion of foliage. The biggest advantage of a mixed farming system among tribes is that it does not require ploughing either by bullocks or machines because the soil in this tribal belt has been traditionally fertile and tribes believe that ploughing hurts mother earth.

This traditional farming system is, therefore, a buffer against hunger and malnutrition. The different harvesting period of crops in one season prepares the ground for a perpetual cycle of food security. Harvesting of crops is usually celebrated among tribes at Attappady with much fanfare and this ceremonial festival is called Thodu (Oorumooppan, Kallamala)

Table 1

Distribution of Simultaneous Sowing of Ten Seeds



Source: Compiled by the researchers.

Table 1 shows the geographical distribution of 10 seeds simultaneously sown on 10 cents. It can be ascertained that the harvest of Keera is 30 days after the first sowing. Regarding cucumber, 60 days are needed and so goes various seeds. In the case of Thuvara, six months are taken for harvest. Millets like Chama and Thuvara are stored by the tribes in advance for the next year. It is, therefore, obvious that this culture of multiseed farming assures perennial food security for the tribes.

Results and Discussions

This section mainly deals with the demographic features of tribes, food security status of tribes, comparison between demographic peculiarities of tribes vis-s-vis their food security, relation between income and food security and the effect of MSFT on food security among tribes.

Table 2

Demographic Features of the Tribes

Variable	Category	Frequency	Percentage
Tribal category	Irular	172	86.0
	Mudugar	20	10.0
	Kurumbar	8	4.0
Gender	Male	177	88.5
	Female	23	11.5
Age	Between 20-29	16	08
	Between 30-39	19	9
	Between 40-49	43	22
	Between 50-59	104	52
	Between 60-69	18	9
Marital status	Married	178	89
	Unmarried	11	5
	Widowed	08	4
	Divorced	03	2
Average number of dependents in the family		554	
Education	Above Upper Primary	54	27.0
	Upper Primary	76	38.0
	Lower Primary	43	21.5
	Illiterate	27	13.5
Employment	No employment	7	3.5
	Agriculture farming	72	36.0
	Animal husbandry	50	25.0
	Self-employed	53	26.5
	Government job	18	9.0

Contd...

Variable	Category	Frequency	Percentage
Ownership of land	Own land	160	80.0
	Lease land	21	10.5
	No land	19	9.5
Information about MSFT	NA	14	7.0
	Hereditary	100	50.0
	Neighbour	86	43.0
Engagement in multiseed farming	Yes	100	50.0
	No	100	50.0
Income (mean)		4719	S.D(3744)

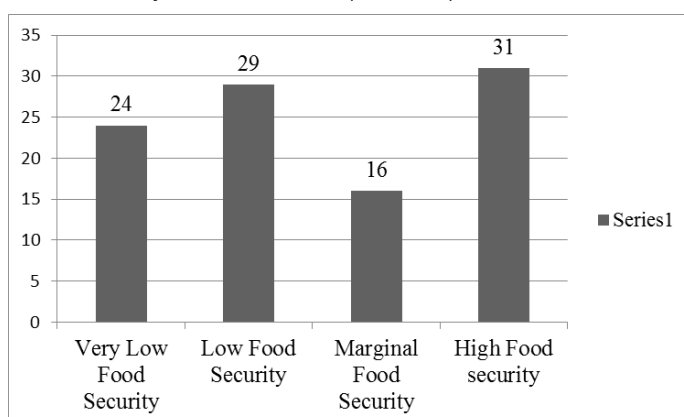
Source: Primary data.

It is evident from Table 2 that Irular constituted the largest percentage of respondents (86 per cent) followed by Mudugar (10 per cent) and Kurumbar (4 per cent). While gender-wise classification shows that males (177) outnumbered females (23), those in the age group 50-59 years constituted the largest percentage (52 per cent). Majority of the respondents are married also (89 per cent). The number of dependents in the family also did not seem to be overcrowded (554). Regarding educational status among respondents, it is learnt that 38 per cent belonged to upper primary followed by above upper primary (27 per cent) lower primary (22 per cent) and illiterate (14 per cent). As regards employment, it is found that the largest percentage of respondents (36 per cent) is engaged in agricultural farming accompanied by self-

employment (27 per cent), animal husbandry (25 per cent), government jobs (9 per cent) and finally no employment (3.5 per cent). No wonder, most of the tribes are engaged in their traditional occupation, viz. agriculture. As much as 80 per cent of tribal respondents held their land, whereas hardly 10 per cent did not have any land. Nearly 11 per cent are found to have leased land. When asked about the source of information about MSFT among tribes, half of the respondents said they acquired information through generation. While 43 per cent of tribes gained knowledge from neighbours, 7 per cent are not having any information on MSFT. Similarly, half of the respondents are engaged in multiseed farming whereas half are not found engaged.

Figure 1

Food Security Status of Tribes (Per Cent)



Source: Primary data.

It is palpable from Figure 1 that tribes having 'high food security' constitute 31 per cent only. Rest of the tribes (69 per cent) range from 'very low' food security to 'marginal' food security. This

distinctively exposes the gravity of the situation. A disaggregated analysis of the extent of food security with respect to their demographic features is given in Table 3.

Table 3

Comparison between Demographic Features and Food Security Status of the Respondents

	Category	Very low Food Security	Low Food Security	Marginal Food Security	High Food Security	Total
Tribal category	Irular	25.0%	27.9%	16.3%	30.8%	100.0%
	Mudugar	10.0%	40.0%	20.0%	30.0%	100.0%
	Kurumbar	37.5%	25.0%	0	37.5%	100.0%
Education	Above Upper Primary	13.0%	25.9%	22.2%	38.9%	100.0%
	Upper Primary	22.4%	31.6%	19.7%	26.3%	100.0%
	Lower Primary	20.9%	32.6%	9.3%	37.2%	100.0%
	Illiterate	55.6%	22.2%	3.7%	18.5%	100.0%
Employment	Government job	0	14.3%	57.1%	28.6%	100.0%
	Self-employed	11.1%	13.9%	27.8%	47.2%	100.0%
	Animal husbandry	16.0%	42.0%	16.0%	26.0%	100.0%
	Agriculture farming	35.8%	41.5%	0	22.6%	100.0%
	No employment	72.2%	22.2%	0	5.6%	100.0%
Land ownership	Own land	21.2%	26.9%	16.2%	35.6%	100.0%
	Lease land	19.0%	28.6%	28.6%	23.8%	100.0%
	No land	52.6%	47.4%	0	0	100.0%
Information about multiseed farming	NA	21.4%		42.9%	35.7%	100.0%
	Hereditary	3.5%	3.5%	27.9%	65.1%	100.0%
	Neighbour	42.0%	55.0%	2.0%	1.0%	100.0%
Engagement in multiseed farming	Yes	6.0%	3.0%	30.0%	61.0%	100.0%
	No	42.0%	55.0%	2.0%	1.0%	100.0%

Source: Primary data.

Table 3 reveals that while the Mudugar community registered low food security (40 per cent) Kurumbar community witnessed high and very low food security simultaneously. All three communities suffered from 'very low food security' and 'low food security.' With regard to food security status across educational qualifications, it is found that the higher the education, the lesser the

'marginal and high food security.' The 'illiterate' tribes are the worst sufferers as 56 per cent of them are caught up in the cobweb of 'very low food security.' Similarly, access to food security based on employment shows that those who possess government jobs have 'marginal and high food security' as much as 87 per cent. The jobless tribes (84 per cent) suffered from serious 'very low food

security and food security.' Those who are engaged in works related to animal husbandry have more food insecurity problems compared to the 'self-employment' genre. The food security status also differs across the possession of land among the respondents. Those having 'own land' have more 'marginal and high' food security (52 per cent) than landless tribes having neither 'marginal' nor 'high' food security. This has to be viewed with seriousness as it is corroborated that land is a deciding factor in food insecurity.

The 2030 agenda of the United Nations holds that the moot reason for the prevalence of food insecurity among indigenous people is the lack of the right to land. When inquired about the source from which knowledge of MSFT was passed, it was

deduced that the 'hereditary' factor played a more vital role (95 per cent) than that of the 'neighbourhood' factor (3 per cent) in determining access to food security. The far-reaching importance of engagement in multiseed farming comes to the fore when we analyse the extent of food security across tribal communities. It is found that 91 per cent of the tribes engaged in multiseed farming did not suffer from 'very low food security and low food security' status. The condition is contrary and shocking in the case of those not engaged in multiseed farming as 97 per cent of tribal respondents are wrestled with 'very low food security and low food security.' The alienation from their traditional lifestyle brought about modern food habits with unhealthy diets and intake (Devi & Edison, 2019).

Table 4

Comparison between Income and Food Security Status of the Respondents

Food security status	Very low Food Security	Low Food Security	Marginal Food Security	High Food Security	Sample mean income
Mean income	2377.08 (2664.362)	5631.90 (4874.258)	4261.88 (1738.871)	5914.03 (3142.007)	4719.00 (3744.770)

Source: Primary data.

Table 4 reveals an inverse relationship between food security and income. Mean income is found highest among such households having high food

security (Rs. 5914). The lesser the income, the lesser the food security among tribal households. Descriptive statistics are summarised in Table 5.

Table 5

Descriptive Statistics of the Variables

S. No.	Variables	Mean	Standard Deviation
1	Food security status	2.54	1.16412
2	Education	.36	.4812045
3	Employment	.36	.4812045
4	Land ownership	.8	.4010038
5	Log income	8.19	.6973748
6	Information on Multiseed	.93	.2557873
7	Multispeed farming	.5	.5012547

Source: Primary data.

The mean and standard deviation of important variables used in the study are given in Table 5.

Table 6*Ordered Logit Regression Results*

Dependent Variable		Food security status						
S.No.		Coefficient	Odd ratio	Std. Err.	Z	P>z	[95% Conf. Interval]	
Education								
1	(dummy variable: 1=below primary;0=above primary)	.6622	1.93	.3242397	2.04**	0.041	.02677	1.2977
Employment(dummy variable: 1=agriculture is primary occupation; 0=others)								
2		.05113	1.052	.3546507	0.14	0.885	-.64397	.746233
Ownership of Land (dummy variable: 1= own land;0=others)								
3		.7270	2.06	.373164	1.95**	0.051	-.00438	1.4583
4	Log Income	1.305	3.68	.2464081	5.30 ***	0.000	.822513	1.788
5	Knowledge of multiseed farming	1.775	5.90	.6112966	2.90 ***	0.004	.5769078	2.9731
Multiseed farming								
6	(dummy variable:1= cultivating multispeed farming;0=not cultivating)	5.003	148.88	.5442683	9.19***	0.000	3.936461	6.0699
	/cut1 l	13.02		2.227239			8.658778	17.389
	/cut2 l	16.11		2.36123			11.48261	20.738
	/cut3 l	18.06		2.423832			13.3115	22.81
Log likelihood=-166.38								
LR chi2(6) = 210.33								
Pseudo R2 = 0.3873								

Source: Primary data.

Note: 1) *** indicates 1 per cent level of significance; ** indicates 5 per cent level of significance; * indicates 10 per cent level of significance

2) Std. Err. is the standard errors of the individual regression coefficients. They are used in both the calculation of the z-test statistic and confidence interval

Table 6 quantified the effect of multiseed farming on food security among tribes with the help of a multivariate analysis. In this analysis, the dependent variable is food security which is an ordinal scale variable (1-4 scale) and the independent variables are education, employment, ownership of land, income, knowledge of multiseed farming and engagement in multiseed farming. Against this backdrop, the most reliable regression model is an Ordered Logit Model where the dependent variable 'food security' is defined on a

finite ordinal scale from 1 to 4. From the Ordered Logit regression model, the coefficients and marginal effects with respect to independent variables were arrived at. The Ordered Logit model's goodness of fit statistics is enunciated in Table 6. The pseudo-R-squared value is 0.38 and Likelihood Ratio (LR) and Chi-Square test shows the overall significance of the model. The analysis showed that the most influential variables affecting food security among tribes are education, ownership of land, income, knowledge of multiseed

farming method and finally engagement in multiseed farming.

The regression results are interpreted based on estimated odds ratios of the Ordered probit model. Odds ratios show the likelihood of achieving food security among tribes. The value of the odds ratio above 1.00 indicates that the estimated likelihood of achieving food security is positive. If it is below 1.00, the estimated likelihood of achieving food security is negative. As far as 'education' is concerned, Table 6 shows that 'education' is positively related to the probability of achieving food security among tribes and it is statistically significant. Education has a significant positive impact on food security among tribes (0.66). Ordered log-odds of having high food security is greater by 0.66 among 'above primary' tribes compared to 'below primary' tribes because education enabled them to have an awareness of food security which helped them to achieve it. Educated tribes have a better understanding of the positive externalities emanating from attaining food security like healthy body, high longevity, high quality of life and well-being. The sign of marginal effect of education is positive for tribes having 'high food security' which means that change in the log probability of having food security increases by 6.9 units with an increase in educational status (Table 7). The sign of the marginal effect is negative for such tribes having 'very low food security' such that a change in the log probability of having 'very low food security' decreases by 7.2 units with an increase in the level of education. However, it may be noted that the value is equally negative for tribes having 'marginal food security' (1.7 units). It implies that all the respondents are not highly qualified. The maximum education among them is 'above upper primary'. So, when the level of education rises, the value of 'very low food security' and 'marginal food security' also rises because the highest education among tribes is 'above upper primary' only. A similar trend is also observed in the case of the variables 'ownership of land' and 'income.' The change in the log probability of 'high food security' rises with increase in the ownership

of land (7.5) and growth in income (1.3). Guaranteed access to income and owning land provide multiple opportunities to attain food security. However, it is negatively related to 'very low food security.' (-7.9 and -1.3). The variable 'employment' is found to be statistically insignificant (0.88) and is, therefore, a poor predictor of food security among tribes.

'Knowledge of multiseed farming' has a significant positive impact on the level of food security among tribes (1.7). It is found that the ordered log odds of food security are higher among tribes by 1.83 who are knowledgeable of multiseed farming. However, tribes having 'very low food security' are inversely related to their knowledge of multiseed farming by 1.76. It is because knowledge of multiseed farming must have left tribes with security, accessibility and guarantee towards food round the clock. The ordered log-odds estimates in Table 7 shows that the 'marginal food security' and 'high food security' are positively related to the engagement in multiseed farming among tribes, which is a very interesting observation with regard to food security across those engaged in multiseed farming. To put it differently, 'very low food security' and 'low food security' are negatively associated with the engagement in multiseed farming. The more the involvement in multiseed farming among tribes, the more their 'marginal food security' and 'high food security'. In other words, participation in multiseed farming is a panacea among tribes to enjoy a perpetual cycle of food security. It must be due to the fact that the produce out of multiseed farming are for social consumption and not for commercial sale. Besides this, the produce are nutrient-rich and its consumption by the tribes reduces their exposure to artificial substances, harmful hormones and chemicals, which in turn, guarantees their food security compared to others who are habituated to having food from outside. Among the selected variables, engagement in multiseed cultivation acts as an important determinant of the food security of tribes as the estimated odds ratios and marginal effects show relatively high values.

Table 7*Marginal Effects (dy/dx) of Food Security Status by Ordered Logit Model*

Dependent Variable		Food security status			
S. No.		Very low Food Security	Low Food Security	Marginal Food Security	High Food Security
1	Education (dummy variable: 1=below primary;0=above primary)	-.0725516 (0.039)	.0203924 (0.087)	-.01752 (0.089)	.069681 (0.040)
2	Employment (dummy variable: 1=agriculture is primary occupation;0=others)	-.0054592 (0.885)	.0014409 (0.885)	-.00123 (0.884)	.005255 (0.886)
3	Land (dummy variable: 1= own land;0=others)	-.0799966 (0.050)	.0203365 (0.087)	-.01550 (0.108)	.075168 (0.049)
4	Log Income	-.1395512 (0.0000)	.0375854 (0.014)	-.03186 (0.011)	.13383 (0.000)
5	Knowledge of multiseed farming	-.1768407 (0.0000)	.0305147 (0.075)	-.03756 (0.063)	.18389 (0.001)
6	Multiseed farming (dummy variable:1=cultivating multispeed farming;0=not cultivating)	-.4187487 (0.0000)	-.361332 (0.000)	.228882 (0.000)	.55119 (0.000)

Source: Primary data.

Note: Marginal effects(dy/dx) show the change in probability when the predictor or independent variable increases by one unit

Concluding Remarks

The article discussed in detail how the indigenous multiseed farming technology of tribes proved to be a saviour for them in order not to be entrapped by the problem of food insecurity. Of all the people, poverty and malnutrition are found mostly among tribes (Sinha, A K, 2014). The study sailed through a brief conceptual explanation of food security, and various studies about food security, especially related to tribal communities, from which the seminal research issue was churned out. The study, thereafter, went a step further by according to a meticulous explanation of the method of multiseed farming among tribes. Most of the tribes are found engaged in the traditional occupation of agriculture. Nearly 80 per

cent of the respondents owned land and no land was found among such tribes whose food security is 'very low.' This showcases that possession of land vehemently influences the extent of food security among tribes. The sacred knowledge of MSFT, as told by 'mooppan' (tribal head) is acquired through generations across three tribal categories. This is symptomatic of the overriding thrust accorded to indigenous cultivation of MSFT. However, the cases of 'illiterate' and 'jobless' tribes are deplorable as they are in the grip of 'very low food security.' Higher food security is taken note of under higher income tribal categories. The variables, viz. education, land ownership, income, knowledge on MSFT and participation in multiseed farming are found to be the most powerful factors

influencing food security among tribes. Finally, with the help of an Ordered Logit Regression, the effect of multiseed farming inter alia, on food security among tribes was empirically investigated and it was found that involvement in multiseed Farming keeps them off 'very low food security.' This is also evidenced by the discussion with 'mannukaran' (head of the soil) and 'mooppan' that MSFT can vouch for a ceaseless chain of food security every year even if institutional mechanism may prove to be a failure in delivering traditional food among them.

The Planning Commission of India has emphasised that 'any attempt to launch further development programmes among Adivasis should take into account the outcomes of a large number of projects already implemented in the State, particularly those that are launched during and after the Fifth Plan Period' (Kerala Development Report, 2008). The UN forum recommends that MDGs should assure fuller participation of indigenous people in the development processes of countries, taking into account their rights and practices of traditional knowledge which is a road to food security. The Permanent Forum on Indigenous Issues (PFII) of the United Nations pitches for scaling up the contribution of indigenous people in all spheres and that they are, instead of being the sheer instruments, to be the valiant partners and right-holders towards sustainable development. The government can do a lot in this regard as far as the tribes of Attappady are concerned. A minimum of one acre of cultivable land is to be distributed among each tribal family for incentivising MSFT. Kishi Vingnan Kendra and Regional Agricultural Research Station under Kerala Agricultural University should roll out a vision document for the future course of action for

the propagation of MSFT. Mooppan council, the doyen among the tribal groups, is to be strengthened to inject awareness among tribes on MSFT which is a guarantee towards accomplishing security on food. A fitting example is the Anawai and Thudukki regions of Pudur Panchayat of Attappady block where the tribes live in interior pockets and do not have nutritional deficiency. It is because the mooppan council has access to traditional food by virtue of MSFT which is being practised vigorously. However, the laxity of Forest Department deters nomadic tribes from exercising their Forest Rights Act which permits them to do MSFT in forests. The notion of tribes that only flowing water is having a life is to be capitalised on by taking earnest steps to restore ponds and rivers like Bavani and Shiruvani which can be tapped for irrigating land where MSFT is being cultivated rather than squandering money for digging borewells. While the Excise Department can discourage tribes from being increasingly susceptible to alcoholism and thereby change their food habit positively, the Department of Agriculture can convert barren land into cultivable land to practice MSFT. The extant Millet Village Scheme of the government should acquire more popularity and the practice of MSFT has to be part and parcel of this programme. The community farming strategy under the auspices of tribes engaged in MSFT can also be implemented on an experimental basis in every tribal hamlet without much difficulty. In short, the need of the hour is a serious intervention of the government as a facilitator not only to overhaul the whole gamut of schemes for the amelioration of tribes but also to popularise the unique MSFT so that not even a single tribe is left out of the bracket and die prematurely.

Author's Contribution:

P. K. Sujathan: Systematic literature review, methodology, statistical analysis and interpretation, and conclusion and policy formulation

Prasad M.G.: Research issue and statement of the problem, conduct of pilot survey, data collection, and conclusion and policy formulation

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