

**Applying the Method of Paired Comparison
Technique to Determine the Most Critical Issue
Associated with the Livelihood Security of the
Tribal Farmers of Meghalaya**

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ABSTRACT

Ensuring livelihood security of the tribal farmers of Meghalaya has been the main focus of the policy makers. To accelerate the process, it is necessary to identify the most serious issue encountered by the farmers of the region. This paper presents a list of agricultural issues associated with the livelihood security of the farmers. Using survey data from beneficiary farmers of Tribal Sub-Plan (TSP) project of College of Post Graduate Studies in Agricultural Sciences (CPGSAS), Umiam, Meghalaya and College of Home Science (CoHSc), Tura, Meghalaya, Central Agricultural University, Imphal [CAU(I)], the method of paired comparison is applied to prioritize the list of issues. The data was collected in the year 2018 from 390 beneficiary farmers from Ri-Bhoi district and West Garo Hill of Meghalaya state. The result indicates that crop diseases and pest infestation was the most critical issue. Both present and future policy maker need to intervene according to the need base situation of the farmer to ensure their livelihood security.

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Keywords: Livelihood security, Tribal Sub-Plan, Paired Comparison and Prioritize

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1. INTRODUCTION

Meghalaya is one of the seven sister states of North East India which has Shillong as its capital. The state lies at a latitude of 25° 07'N to 25° 41'N and longitude of 91°21'E to 92°09'E. Geographically, Meghalaya is bestowed with hilly terrain and some valleys, where a diverse ethnic group of people dwells. The state has a total population of 29.67 lakh out of which 86.15 per cent are schedule tribes (2555861) [1]. The intricate, diverse and risk prone agriculture is the peculiar characteristic of the livelihood of tribal farmers in the region. The type of agricultural practices in the region includes both settled cultivation and shifting (slash and burn, or *jhum*) cultivation. The principal crops grown are rice (*Oryza sativa*), maize (*Zea mays*), potato (*Solanum tuberosum* Linn.), ginger (*Zingiber officinale* Rosc.), turmeric (*Cucurma domestica* Valetton), arecanut (*Areca catechu*) etc. and several vegetable crops. Typical fruit crop of the region includes pineapple (*Ananas comosus*), Khasi mandarin (*Citrus reticulata*), banana etc. The natural forest also serves a purpose for the support of various flora and fauna found in the region. This in turn provide nutritious food and income opportunities for the livelihood of the people in the state. The region is famous for its rich organic land, abundant rainfall, and favorable climate which significantly contribute towards enhancing food and nutrition security, thereby, increasing the potential to improve farm income. Unfortunately, the growth potential of hill agriculture has remained under-exploited. The reason owing to lack of system-specific production technologies, poor infrastructure and underdeveloped institutions, notwithstanding the structural constraints imposed by difficult terrains, inaccessible habitations, diverse sociocultural and agricultural typologies, and

36 small, scattered and fragmented land holdings [2]. The people also face uncertain
37 agricultural productivity. This is due to vulnerability to flood, drought, soil erosion and heavy
38 siltation, lack of market opportunities and remoteness and isolation. Some other factors for
39 low agricultural productivity also include, low usage of the growth augmenting inputs such as
40 irrigation, HYV seeds, chemical fertilizers, pesticides, positive measures, etc. [3].

41 There is an array of challenges faced by our farmers. The constraint such as dependence on
42 monsoon, vulnerable to insufficient knowledge and high cost of agricultural inputs topped the
43 list of constraints with a Rank Based Quotient (RBQ) value of 86.43, 72.86 and 72.98
44 regarding agro-ecological constraints, technical constraints and socio-economic constraints
45 faced by the farmers [4]. In another study unavailability of inputs, non-availability of labour,
46 high cost of inputs, perishable nature of products, attack by pest had outdone the list of
47 constraints regarding technical constraints, labour constraints, economic constraints,
48 marketing constraints and environmental constraints with a Garrett score of 65.33, 51.93,
49 54.23, 58.125 and 64.1 [5].

50 Therefore, assistance have been provided through various schemes and programmes to
51 aware and harness the various natural opportunities available in the region. The
52 Government of India and other external agency have made efforts to include the tribal
53 people in growth process. One such effort is the Tribal Sub-Plan (TSP) project of College of
54 Post Graduate Studies in Agricultural Sciences (CPGSAS), Umiam and College of Home
55 Science (CoHSc), Tura, Central Agricultural University, Imphal [CAU (I)], Meghalaya funded
56 by ICAR, New Delhi which was officially launched in the year 2017. The broad objective of
57 the sub-plan is to enhance livelihood and socio-economic conditions of the tribal farmers of
58 North East Hill (NEH) states. Nevertheless, to boost productivity in future, it is essential to
59 identify the issues faced by farmers irrespective of the different interventions. The farmers
60 will not be able to effectively contribute in the agricultural development of the nation and
61 improve their standard unless the challenges they confronted are talked well.
62 The present paper discusses about some of the issues faced by the tribal farmers of
63 Meghalaya. The main objective of the paper is to prioritize the issues with the help of paired
64 comparison method.

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66 **2. MATERIAL AND METHODS**

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68 The study was conducted in Meghalaya where the TSP project of CAU(I) was endorsed in
69 CPGSAS, Umiam and CoHSc, Tura, CAU(I). The project encompassed two districts namely
70 Ri-Bhoi and West Garo Hill (WGH) districts of Meghalaya. It was operated in 10 villages
71 which was selected based on the baseline survey and PRA exercises done. Five
72 agriculturally important villages each were selected from Umsning Community and Rural
73 Development Block (CRDB) of Ri-Bhoi district and Rongram CRDB of WGH district for the
74 project. The names of the ten villages of the two districts are as follows: (i) Palwi, (ii) Mawlein
75 Mawkhan, (iii) Liarkhla, (iv) Sumer No. 4 and (v) Khweng of CRDB Umsning, Ri-bhoi district
76 under CPGSAS, and (i) Rangwalkamgre, (ii) Dumitdikgre, (iii) Galwang Chidekgre, (iv)
77 Edenbari and (v) Sanchonggre of CRDB Rongram, WGH district under CoHSc. Complete
78 enumeration of respondents/beneficiaries of TSP project of CAU, Imphal in the entire ten
79 villages under different commodities/facilities was executed for the present study giving rise
80 to a total of 390 beneficiary farmers (270 from Ribhoi district and 120 from WGH district).
81 The list of issues regarding livelihood security of the tribal farmers to be prioritized were
82 enlisted from beneficiary farmers, agricultural experts and literature review. Further all the
83 identified issues were finalized based on a pilot study. Based on the pilot study a total of 7
84 issues were identified (Table I).

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86 **Table I: List of Agricultural issues associated with the livelihood security of the**
 87 **farmers**
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Cost and timely availability of inputs	High cost of input including seed, planting material, fertilizer, fuels at the right time etc. [5,6]
Post-harvest management	Lack of storage facilities, perishable nature of product, post-harvest loses etc. [7,5,6]
Limited availability of skill training	Poor access to extension workers, lack of knowledge, poor extension services, lack of technical guidance etc. [6,8,9].
Climate risk and uncertainty	Crop reduction due to floods, drought and hailstones, unavailability of natural water bodies, fluctuating weather condition etc. [5,6].
Crop diseases and pest infestation	Heavy incidence of diseases, pest attack [5].
Marketing problems	Poor access to market, price fluctuation of outputs, lack of good market price, lack of transport facility, middle man malpractices etc [6,10].
Livestock management	Frequently sick, infertility problems, lack of feeds, high rate of mortality, low productivity of livestock etc. [11].

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90 To determine the relative importance of these qualities, a paired-comparisons approach was
 91 used [12]. Thurstone developed the law of comparative judgement for ordering of stimuli
 92 along a psychological continuum [13]. In this method, pairs of stimuli in all possible
 93 combination are presented to the respondents and are asked to select one stimulus which is
 94 judged as more favorable over the other from each pair. The number of possible pairs which
 95 may be obtained is given by the formula below:

$$\frac{n(n-1)}{2}$$

96 Where n denotes the number of stimuli

97 As more number of pairs may confuse the respondents and increase the probability of error
 98 in judgement, the number of stimuli should be optimum i,e neither too many or too few [14].
 99 Thus, the number of issues in the study is 7 which gave a total of 21 possible pairs. A pre-
 100 tested questionnaire was presented to the beneficiary farmers in which they were forced to
 101 choose one out of a pair which they valued the most. To eliminate response bias both the

102 issues in each pair and the pair themselves are arranged randomly. The responses were
 103 tabulated in a frequency matrix consisting of the corresponding frequencies in which the
 104 column issue is judged more favorable than the row issue. This table gave rise to another
 105 matrix where the proportion of the frequencies were entered. The column sum of the cells
 106 was calculated. This matrix is again rearranged with the stimuli having the smallest column
 107 sum at the left and that with the highest at the right. The Z-score of each cell entries was
 108 obtained from the table of normal deviates giving rise to a Z-matrix. The corresponding
 109 column sum of the Z-score is found out after which mean Z-score is calculated. Adding the
 110 largest negative deviation of the mean Z-scores to each of the mean Z-score value, the
 111 scale value was obtained. A rank ordering of the relative values of the issues were
 112 generated from this scale values. A scale value of 0 indicates an arbitrary zero point or the
 113 reference point.

114 115 **3. RESULTS AND DISCUSSION**

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 117 A total of 370 beneficiary farmers, 270 from Ri-Bhoi districts and 120 from WGH district of
 118 Meghalaya completed the survey. Of the total beneficiary farmers, 216 (55.38%) were
 119 females and 174 (44.62%) were males (Table II). This clearly indicates that high participation
 120 of women in agriculture in the region

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 122 **Table II Distribution of beneficiary farmers under TSP**

123 Gender	Ri-Bhoi District	WGH District	Total
Male	126	48	174 (44.62)
Female	144	72	216 (55.38)
Total	270	120	390 (100.00)

124 *Figure in the parenthesis indicate percentage*

125 In the present study, paired comparison analysis was used to identify and rank the issues
 126 faced by the farmers. The overall scale value and the ranking of each issue by each
 127 beneficiary farmer group are listed in Table III. The data revealed that crop diseases and
 128 pest infestation topped overall (Scale value 2.034) as well as in both the districts (Scale
 129 value 2.018 Ri-Bhoi district and 2.671 WGH district) based on list of agricultural issues faced
 130 by the farmers. While the least important issue among the seven issues was post-harvest
 131 management overall as well as in both the district. Overall the following issues, cost and
 132 timely availability of inputs, climate risk and uncertainty, limited availability of skill training,
 133 livestock management is found between the two extreme issues.

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137 **Table III Scale values and ranking of lists of agricultural issues**

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Issues	Scale value			Ranking		
	Ri-Bhoi	WGH	Overall	Ri-Bhoi	WGH	Overall
Cost and timely availability of inputs	1.240	1.209	1.070	2	4	2
Post-harvest management	0.000	0.000	0.000	7	7	7
Limited availability of skill training	0.555	0.697	0.454	5	6	5
Climate risk and uncertainty	0.991	1.380	0.951	3	3	4
Crop diseases and pest infestation	2.018	2.671	2.034	1	1	1
Marketing problems	0.760	2.096	0.964	4	2	3
Livestock management	0.135	0.723	0.134	6	5	6

139 It is important to understand the issues faced by the farmers in order to boost their standard
140 of living and also to give suggestions to the policy makers. The ranking of such problems
141 faced by the farmers can give us a direction to plan our policy for the improvement of our
142 farmers. Here paired comparison technique was used to identify and rank the issues faced
143 by the farmers. The main advantage of this method over other method is that respondents
144 are able to make a decision after comparing the stimuli in all the possible pairs and
145 therefore, the last decision is thought to be of informed judgement.
146 Foreseeably, it was discovered that crop diseases and pest infestation was the most critical
147 issue faced by the beneficiary tribal farmers of Meghalaya under TSP as reported in earlier
148 studies also. This gave rise to concern among the farming community that the problem of
149 crop diseases and pest infestation was prevalent and is still continuing. We have been able
150 to explicitly demonstrate that the major issue that hinders to agricultural productivity and
151 hence the livelihood of farmer is because of the heavy incidence of diseases and attack by
152 pest. There is a strong desire among the beneficiary farmers in the study area to control the
153 incidence of diseases and pest. The beneficiary farmers have reported low yield of produce
154 crops. The farmers have stated the case of ginger rhizome rot disease in the study area due
155 to which they are unable to get good output.
156 It is perhaps not so surprising that cost and timely availability of inputs stood second rank
157 overall. No doubt under TSP, inputs are being provided free of cost but time is the another
158 most important factor. Sometimes the inputs such as seeds are provided when the season
159 for planting is almost over. On the other hand, while the farmers are busy attending their
160 crops, they have limited time and resources to visit towns for purchase of inputs. The
161 farmers manage to obtain inputs from nearby local area which may or may not give good
162 output.
163 Further, marketing problems is the next most serious issue. Undoubtedly, the farmers in the
164 region were facing the problems of access to market, lack of marketing facilities, lack of

165 regulated markets, etc. Indisputably, climate risk and uncertainty ranked fourth position. The
166 region witnessed frequent climatic hazards such as hailstones. Such hailstones not only
167 destroy the crops but also bring loss to the property of the farmers [15]. This was followed by
168 limited availability of skill training. In some cases, the beneficiary farmers were unable to
169 utilize the vermicompost unit due to lack of their knowledge in vermicomposting. In the next
170 position, the livestock management issue was found. Most of the beneficiary farmers were
171 having piggery unit and backyard poultry unit. Since livestock rearing is an old age practice
172 followed in the region, the people of the region faced less problems. Though problem such
173 as foot and mouth disease of cattle, pregnancy of piglets, etc exist in less numbers. Last but
174 not the least, post-harvest management issue is found. Similar results have been reported in
175 earlier studies [6,8,7]. Identifying such issues and their importance provides a basis for a
176 comprehensive evaluation. This will help to intervene in the most need based area
177 accordingly. Having a background knowledge of such issues will provide a basis while
178 intervening any type of programme in the specific region by policy makers to upgrade the
179 socio-economic status of the farmers.

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181 **4. CONCLUSION**

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183 In the study, we presented the application of the method of paired comparison for prioritizing
184 the issues of farmers. The prime advantage of this method over other methods is that it
185 forces the respondents to select the most important issue out of the given pairs. Like every
186 other method it also has a disadvantage of limiting to an optimum number of stimuli as a
187 greater number of stimuli will result in higher combination of possible pairs. Thus, the
188 present study is confined to seven stimuli which give rise to 21 possible pairs. The stimuli
189 are 1) Cost and timely availability of inputs, 2) Post-harvest management, 3) Limited
190 availability of skill training 4) Climate risk and uncertainty, 5) Crop diseases and pest
191 infestation 6) Marketing problems and 7) Livestock management. The result showed that
192 overall crop diseases and pest infestation ranked the most serious problems followed by
193 cost and timely availability of inputs, marketing problems, climate risk and uncertainty,
194 limited availability of skill training, livestock management and post-harvest management.
195 Thus, the result provides an opportunity for the existing programmes to consider and
196 intervene towards the most important issue faced by the farmers in the region. This not only
197 serve importance to existing programmes but also provides a background for policy makers
198 for future interventions. The prime focus on the most need based issue and so on will help
199 develop the agrarian economy in a positive direction and at a faster pace.

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