

## Adoption level of ginger growers on the recommended technologies at lower Dibang valley district of Arunachal Pradesh

<sup>1</sup>.Kembu Miso, <sup>2</sup>Mary N. Odyuo, <sup>3</sup>J. Longkumer,

<sup>1</sup>. Research Scholar, <sup>2</sup> Assistant Professor, <sup>3</sup> Professor

<sup>1,3</sup>Department of Agricultural Extension, SASRD: Nagaland University.

<sup>2</sup>Department of RDP, SASRD: NU. 797106.

Email - <sup>1</sup>odyuo.mary@gmail.com, <sup>2</sup>maryodyuo@nagalanduniversity.ac.in, <sup>3</sup>jlongkumer@gmail.com

**ABSTRACT** This paper emphasizes the adoption level of ginger growers towards the recommended practices of Ginger in the state of Arunachal Pradesh, India. In the present study, adoption refers to the level of adoption of recommended ginger cultivation practices by the ginger growers. A total of 16 questions were framed to measure the level of adoption based on the package of practices recommended by the Department of Horticulture, Arunachal Pradesh, covering all the aspects i.e. climate, soil, sowing time, seed rate, propagation, land preparation, spacing, seed treatment, cultivars, manuring and fertilization, irrigation, mulching, weeding, inter cultivation, inter cropping, crop rotation, disease, disease management, pest, pest management, cultural management of disease, harvesting, processing and storage. The response given by the respondents were categorized as 'full adoption', 'partial adoption' and 'non adoption'. The score for the responses were given as 0, 1 and 2 respectively. The summation of scores of the correct answer for a particular respondent indicates his adoption level about improved cultivation practices of ginger. In the present study, the socio-economic characteristics of the respondents were considered as Independent variables and the level of Knowledge as the dependent variable. Through this study, it was further concluded that the adoption level of the respondents about different aspects of recommended ginger cultivation practices in the study area was medium level.

**Key words:** Knowledge, Recommended practices, Dependent, Independent.

### 1. INTRODUCTION:

Arunachal Pradesh is one of the 29 states of India which covers an area of 83,743 square kilometers. It borders the states of Assam and Nagaland in the south, and share international borders with Bhutan in the west, Myanmar in the east and China in the north. Arunachal's agro-climatic conditions favour agriculture, horticulture and forestry, offering immense potential in the areas. Agriculture is the main occupation of the people nearly 70 per cent of the population is engaged in agriculture and allied sector. Ginger being one of the most important spice crops in the state, grown in district like Lower Dibang Valley, Lohit, East siang, West Siang, Changlang and rest of the other part of the state. Therefore, Arunachal Pradesh was purposively selected for the study. Major portion of land of Arunachal Pradesh falls under mountains and hills with an elevation between 60 meters and 7300 meters. They largely come under the Himalayan and Patkai mountains range. The state total cultivable land under jhum/shifting cultivation was 1.10 lakh hectares and under permanent cultivation was only 0.90 lakh hectares. Most of the cultivable areas are under rain fed. The state receives heavy to moderate rainfall and its rivers and streams get plenty of water throughout the year. Average rainfall varies from 164mm to 5600mm (<sup>1</sup>Verma, 2013). In Arunachal Pradesh, Basar Local is very much popular due to high yield and its adaptability to the area (<sup>2</sup>Yadav *et al* 2004). There are 21 districts in Arunachal Pradesh. Among which Lower Dibang Valley District was selected for the study, because ginger is one of the most important commercial crops of the district and it is the largest producer of ginger in the state. Agro-climatic conditions are conducive for ginger cultivation. Therefore, the Lower Dibang Valley District was purposively selected for the study. Lower Dibang Valley district is the largest grower of ginger with respect to both production and productivity in Arunachal Pradesh. During the year 2015-2016 the ginger production in Lower Dibang Valley was 24,928 MT with the productivity of 82 quintal per hectare covering an area of 3040 hectare. And in 2016-2017 the production was 27,450 MT with the productivity of 90 quintal per hectare covering an area of 3050 hectare (Office of the Deputy Director of Agriculture, Lower Dibang Valley, Arunachal Pradesh).

Ginger (*Zingiber officinale* Rosc.) is a perennial herb and one of the earliest known oriental spices and is being cultivated in India both as a fresh vegetable and as a dried spice since time immemorial. It is a tropical species native to Southeast Asia, belonging to the family *Zingiberaceae*. Ginger has a long and well documented history of both culinary and medicinal use throughout world history, especially in Chinese, Indian and Japanese medicinal care. Among the spices crops, ginger is one of the important cash crops. The modified stem rhizome is used worldwide as spices for flavouring in a number of foods and food-products and also used in medicines (<sup>3</sup>Lawrence, 1984). hectares with total production and productivity of 1,109 million tons and 6.76 million tons per hectare, respectively (<sup>4</sup>National Horticulture

Board, 2016). The crop exhibited an annual growth rate of 4.6 per cent in area, 7.4 per cent in production and 2.7 per cent in productivity in India. While the United Kingdom, United States and Saudi Arabia are the largest importer of dry ginger (<sup>5</sup>Painkra, 2016).

**2. OBJECTIVE OF THE STUDY:** Adoption level of the respondents about the recommended practices of ginger cultivation

**3. MATERIALS and METHOD:**

**3.1. Sources of data collection:**

In the present study, both primary and secondary sources were utilized for data collection. Primary data were collected from the respondents for the investigation with the help of structured interview schedule and group discussions. Secondary information was collected from the relevant books, journals, internet sources etc.

**3.2. Sampling Design:**

The present study is limited to Lower Dibang Valley District of Arunachal Pradesh. The sampling technique used in this study is purposive sampling. Out of 3 Community/Rural Development (CD/RD) Blocks, 2 were selected for the present study, namely, Roing CD block and Dambuk CD block. From the 2 CD Blocks, 8 villages, 4 from each CD Blocks were selected, namely, Koronu, Injonu, Denlo and Kesoli from Roing CD block and, Sirang, Publong, Rime and Bizzari from Dambuk CD block. A total of 120 ginger growers/respondents were purposively selected. The sample sizes of every village were maintained at 15 respondents respectively for this study.

**3.3. Hypothesis formulation:**

Hypothesis is a proposition or principal which is assumed in order to draw logical or empirical consequences, and by this method to test its accord with facts which are known or may be determined (<sup>6</sup>Ray and Deka, 2000). Keeping in view the importance of factors selected with reference to the objectives of the present study the following hypothesis were formed.

H<sub>0</sub>2: There is no association between various socio-economic factors and the level of adoption.

H<sub>a</sub>2: There is association between various socio-economic factors and the level of adoption.

A set of data relating to knowledge level of farmers about the recommended practices of ginger cultivation have been analysed and presented in Table 1 for determining the reality.

**Adoption level of the respondents about the recommended practices of ginger cultivation:** In the present study, adoption refers to the level of adoption of recommended ginger cultivation practices by the ginger growers. By referring to the package of practices recommended by the Department of Horticulture, Arunachal Pradesh, covering all the aspects i.e. climate, soil, sowing time, seed rate, propagation, land preparation, spacing, seed treatment, cultivars, manuring and fertilization, irrigation, mulching, weeding, inter cultivation, inter cropping, crop rotation, disease, disease management, pest, pest management, cultural management of disease, harvesting, processing and storage. A total of 16 questions were framed to measure level of adoption. The response given by the respondents were categorized as ‘full adoption’, ‘partial adoption’ and ‘non adoption’. The score for the responses were given as 0, 1 and 2 respectively. Adoption index was developed to measure the adoption level of the ginger growers. The maximum possible score that a respondent could obtain was 22 and minimum possible score was 0. The summation of scores of the correct answer for a particular respondent indicates his adoption level about improved cultivation practices of ginger.

**Extent of Adoption level of the respondents (Ginger Growers) about the recommended practices of ginger cultivation:** Adoption is a decision to make full use of an innovation as the best course of action available. In this study adoption level refers to the level of adoption of recommended ginger cultivation practices by the ginger growers.

**Table 1. Distribution of the respondents based on extent of adoption**

N=120

Sl. No.	Practices	Extent of Adoption					
		Fully		Partially		Never	
1	Adoption of recommended cultivars as per climatic condition.	0	0	27	22.5	93	77.5
2	Following recommended propagation methods.	64	53.33	56	46.67	0	0
3	Maintaining recommended time of planting.	49	40.83	71	59.17	0	0
4	Maintaining recommended spacing.	13	10.83	33	27.5	74	61.67
5	Adoption of seed treatment	0	0	0	0	120	100
6	Adoption of manuring and fertilization.	0	0	0	0	120	100

7	Adoption of recommended inter cultural operation practices.	42	35	63	52.5	15	12.5
8	Following mulching.	51	42.5	69	57.5	0	0
9	Following weeding.	68	56.67	52	43.33	0	0
10	Adoption of recommended crop rotation.	4	3.33	33	27.5	83	69.17
11	Adoption of recommended disease management.	0	0	12	10	108	90
12	Adoption of recommended insect management.	0	0	0	0	120	100
13	Practicing cultural methods of disease management.	120	100	0	0	0	0
14	Following recommended time of harvesting.	8	6.67	112	93.33	0	0
15	Following recommended methods of ginger processing.	0	0	68	56.67	52	43.33
16	Following recommended methods of storage.	0	0	12	10	108	90

Table 1 shows the level of adoption of the recommended practices in ginger cultivation and the following points explain the interferences drawn from the findings regarding adoption.

**Adoption of recommended cultivars as per climatic condition:** According to findings 22.5 per cent of the respondents had adopted the recommended cultivars as per climatic conditions “partially” followed by 77.5 per cent had “never” adopted the practice. From the Table it is clearly seen that majority of the farmers 77.5 per cent had “never” adopted the cultivars as per climatic condition because they were cultivating ginger according to the value of ginger in the market irrespective of the varieties most suited in the areas.

**Following recommended propagation methods** It was found that 46.67 per cent of the respondents had adopted the recommended propagation methods “partially” because they were not maintaining the bits size required for propagation followed by 53.33 per cent of the respondents had adopted the recommended propagation methods “fully”.

**Maintaining recommended time of planting** The study revealed that 59.17 per cent of the respondents had adopted the proper time of planting “partially” because although they know the planting season but they could not plant on the time it is due to lack of credit as well as tractors which they could not afford followed by “fully” with 40.83 per cent.

**Maintaining recommended spacing:** It was found that 27.5 per cent of the respondents had adopted the plant to plant spacing “partially” because they apprehend that closed spacing would prevent the crop loss in such a way that if one plant caught infect then it could be pulled out before disease infestation. Table also shows that 10.83 per cent of the respondents who had adopted the recommended spacing “fully”. The Table further revealed that 61.67 per cent had “never adopted the recommended spacing. It is because of lack of awareness about the spacing and topographical factors, as some of the study area were under the hilly regions which limits the practice of proper spacing.

**Adoption of seed treatment:** It was found that 100 per cent of the respondents had never adopted seed treatment because they do not have knowledge about seed treatment. Therefore, there is a need for training in the study areas related to seed treatment and concerned department in the study areas should make the way for better productivity.

**Manuring and fertilization:** It was found that 100 per cent of the respondents had “never” adopted manuring and fertilization. The reason for non adoption were they believed their soil is nutrient rich and does not need any supplement and also they lack the knowledge of manuring and fertilization.

**Adoption of recommended inter cultural operation:** The Table shows that 52.5 per cent of the respondents had adopted the inter cultivation practices “partially”, while 35 per cent of the respondents had adopted the inter cultivation practices “fully”. The Table further revealed that 12.5 per cent of the respondents had “never” adopted the inter cultivation, the reason for non adoption may be because of lack of credit and labour and also topography of the area which make it quite unfeasible to carry out such practices.

**Following mulching:** Table shows that 57.5 per cent of the respondents had adopted the mulching “partially” it is because of lack of mulching materials like rice straw, mustard straw, bug wheat straw and maize straw etc. followed by 42.5 per cent of the respondents who had adopted the mulching “fully”.

**Following weeding:** The Table revealed that 43.33 per cent of the respondents had adopted the weeding practices “partially” because now a day’s most of the farmers preferred herbicide application instead of second hand weeding, while 56.67 per cent of the respondents had adopted the weeding practices “fully”. From the Table we can conclude that majority of the respondents had adopted the weeding.

**Adoption of recommended crop rotation practices :** The Table shows that 17.5 per cent of the respondents had adopted the crop rotation “partially” because they felt the nutrient in the soil were taken by ginger and if they grow another crop on it they might not get good production. The Table further shows that 82.5 per cent of the respondents had “never” adopted the crop rotation. The reason for non adoption of crop rotation was because of lack of knowledge. From the above Table we can conclude that the majority of the farmers had never adopted the crop rotation.

**Adoption of recommended disease management:** The Table shows that 10 per cent of the respondents had adopted the disease management “partially” because they do not want to apply chemicals in their field; they only select the rhizomes which is disease free, while 90 per cent of the respondents had “never” adopted the recommended disease management. From the Table we can conclude that majority of the farmers had never adopted the disease management, it is because of lack of knowledge about the pesticide dose required and lack of agri-clinics in the study areas.

**Adoption of recommended insect management:** The Table shows that 100 per cent of the respondents had “never” adopted insect management. The reason for non adoption of insect management was because the farmers do not have knowledge about insecticide dosage required.

**Practicing cultural method of disease management:** The Table shows that 100 per cent of the respondents had adopted cultural method of disease management “fully” because they were having knowledge that infected clumps should be pulled out from the fields and selection of disease free rhizomes should be used for planting material.

**Following recommended time of harvesting:** The Table shows that 93.33 per cent of the respondents had adopted recommended time of harvesting “partially” as most of them keep produce in the field itself and they waited for price to improve. Table also shows that 6.67 per cent of the respondents had adopted harvesting “fully”.

**Following recommended methods of ginger processing:** The Table shows that 56.67 per cent of the respondents had adopted recommended methods of ginger processing “partially” because they were following the traditional method of processing where they usually do not boil the ginger before peeling and slicing. The Table further revealed that 43.33 per cent had “never” adopted ginger processing. The reason for non adoption of ginger processing was because they grow ginger mainly for selling in the market rather than processing it.

**Following recommended methods of storage:** The Table revealed that 10 per cent had adopted recommended methods of storage “partially” because they do not have proper storage facility. The Table also revealed that 90 per cent of the respondents had “never” adopted the recommended storage practices. The reason for non adoption of storage practices were due to lack of knowledge about storage methods or could be because of lack of credit as it required investment to construct the house.

**Overall adoption level of respondents:**

**Table 2. Distribution of the respondents based on the overall adoption level**

N=120

Sl. No.	Category	Frequency	Percentage	Mean	SD
1	Low (<40)	19	15.83	49	9
2	Medium (40-58)	85	70.83		
3	High (>58)	16	13.33		

To measure the adoption level of the respondents, adoption index was calculated as Total score obtained in adoption level/Total achievable score in adoption level. The category was made low, medium and high based on mean and standard deviation. Based on categorization Table 1.1.2 shows that 70.83 per cent of the respondents were under the category of medium adoption level forming the major segment followed by 15.83 per cent of the respondents were under the low level of adoption. Table also revealed that 13.33 per cent of the respondents were under high level of adoption. The overall index of the respondents about different aspects of recommended ginger cultivation practices in the study area was 49 per cent, thus it can be concluded that the adoption level of the respondents was medium about different aspects of recommended ginger cultivation practices in the study area.

**Correlation between independent variables and dependent variables**

**Table 3. Correlation between the independent variables and adoption index**

N = 120

Sl. No.	Variables	Coefficient correlation
1	Age	-0.01982 NS
2	Sex	0.166132 *
3	Family size	-0.0780003 NS
4	Income from ginger	0.114296596 NS

5	Area under ginger cultivation	0.158426919 *
6	Education	-0.012245 NS
7	Experience	0.04104753 NS
8	Mass media	0.182238462 *
9	Personal localite	-0.116047333 NS
10	Extension contact	0.417653015 **

\*Significant at 5 per cent; \*\*Significant at 1 per cent; NS-Not significant

The findings presented in the Table reveals the correlation analysis between the various independent variables and the adoption level of the ginger growers. The correlation value between the age and the adoption level of the respondents is -0.01982. The result is not statistically significant and thus it can be concluded that age does not have any relation with the adoption level of the respondents regarding the recommended practices of ginger cultivation. The correlation value between the sex and the adoption level of the respondents is 0.166132. The result is statistically significant at 5 per cent. Therefore, it can be concluded that sex have positive relation with the adoption level regarding the recommended practices of ginger cultivation. The correlation value between the family size and the adoption level of the respondents is -0.0780003. The result is not statistically significant and thus it can be concluded that family size does not have any relation with the adoption level of the respondents regarding the recommended practices of ginger cultivation. The correlation value between the income from ginger and the adoption level of the respondents is 0.114296596. The result is statistically not significant. Thus it can be concluded that income from ginger does not have any positive relation with adoption level regarding the recommended ginger cultivation. The correlation value between the area under ginger cultivation and the adoption level of the respondents is 0.158426919. The result is statistically significant at 5 per cent. Thus it can be concluded that area under ginger cultivation have positive relation with adoption level of the respondents regarding the recommended ginger cultivation. The correlation value between education and the adoption level of the respondents is -0.012245. Thus it is statistically not significant and therefore it can be concluded that education does not have positive relation with adoption level of the respondents with context to recommended ginger cultivation. The correlation value between the experience and the adoption level of the respondents is 0.04104753. Thus it is statistically not significant and therefore it can be concluded that experience of the respondents does not have positive relation with adoption level of the respondents with context to recommended ginger cultivation. The correlation value between mass media and the adoption level of the respondents is 0.182238462. The result is statistically significant at 5 per cent. Therefore we can conclude that mass media have positive relation with adoption level of the respondents with context to recommended ginger cultivation. The correlation value between personal localite and the adoption level of the respondents is -0.116047333. The result is statistically not significant; therefore we can concluded that personal locality does not have positive relation with adoption level of the respondents with context to recommended ginger cultivation. The correlation value between extension contact and the adoption level of the respondents is 0.417653015. The result is statistically significant at 1 per cent. Therefore we can conclude that the extension contact have positive relation with adoption level of the respondents regarding the recommended practices of ginger cultivation. It is clearly seen in the Table that the independent variables viz., sex, area under ginger cultivation, mass media and extension contact have positive and significant association with the adoption level of the respondents. Therefore the null hypothesis is rejected.

#### 4. CONCLUSION AND RECOMMENDATION:

Through this study it was found that 22.5 per cent of the respondents had adopted the recommended cultivars as per climatic conditions “partially” followed by 77.5 per cent had “never” adopted the practice. From the study it is clearly seen that majority of the farmers 77.5 per cent had “never” adopted the cultivars as per climatic condition. It was found that 46.67 per cent of the respondents had adopted the recommended propagation methods “partially” because they were not maintaining the bits size required for propagation followed by 53.33 per cent of the respondents had adopted the recommended propagation methods “fully”. The study revealed that 59.17 per cent of the respondents had adopted the proper time of planting “partially” because although they know the planting season but they could not plant on the time it is due to lack of credit as well as tractor which they could not afford followed by “fully” with 40.83 per cent. It was found that 27.5 per cent of the respondents had adopted the plant to plant spacing “partially” because they apprehend that closed spacing would prevent the crop loss in such a way that if one plant caught infect then it could be pulled out before disease infestation. Study also shows that 10.83 per cent of the respondents who had adopted the recommended spacing “fully”. It further reveals that 61.67 per cent had “never” adopted the recommended spacing. It is because of lack of awareness about the spacing and topographical factors, as some of the study area were under the hilly regions which limits the practice of proper spacing. It was found that 100 per cent of the respondents had never adopted seed treatment because they do not have knowledge about seed treatment.

It was found that 100 per cent of the respondents had never adopted manuring and fertilization.

It showed that 57.5 per cent of the respondents had adopted the mulching “partially” it is because of lack of mulching materials like rice straw, mustard straw, bug wheat straw and maize straw etc. followed by 42.5 per cent of the respondents who had adopted the mulching “fully”. Study revealed that 43.33 per cent of the respondents had adopted the weeding practices “partially” because now a day’s most of the farmers preferred herbicide application instead of second hand weeding, while 56.67 per cent of the respondents had adopted the weeding practices “fully”. The study showed that 52.5 per cent of the respondents had adopted the inter cultivation practices “partially”, while 35 per cent of the respondents had adopted the inter cultivation practices “fully”. The study further revealed that 12.5 per cent of the respondents had “never” adopted the inter cultivation. Study showed that 17.5 per cent of the respondents had adopted the crop rotation partially because they felt the nutrient in the soil were taken by ginger and if they grow another crop on it they might not get good production. It further shows that 82.5 per cent of the respondents had never adopted the crop rotation. The study showed that 10 per cent of the respondents had adopted the disease management “partially” because they do not want to apply chemicals in their field; they only select the rhizomes which is disease free, while 90 per cent of the respondents had “never” adopted the recommended disease management. The study showed that 100 per cent of the respondents had “never” adopted pest management. The reason for non adoption of pest management was because the farmers do not have knowledge about insecticide and pesticide dose required. The study showed that 100 per cent of the respondents had adopted cultural method of disease management “fully” because they were having knowledge that infected clumps should be pulled out from the fields and selection of disease free rhizomes should be used for planting material.

The study showed that 93.33 per cent of the respondents had adopted recommended time of harvesting “partially” as most of them keep produce in the field itself and they waited for price to improve. It also shows that 6.67 per cent of the respondents had adopted harvesting “fully”. Study showed that 56.67 per cent of the respondents had adopted recommended methods of ginger processing “partially” because they were following the traditional method of processing where they usually do not boiled the ginger before peeling and slicing. It further reveals that 43.33 per cent had never adopted ginger processing. Study revealed that 10 per cent had adopted recommended methods of storage “partially” because they do not have proper storage facility. It also reveals that 90 per cent of the respondents had never adopted the recommended storage practices. It was found that 70.83 per cent of the respondents were under the category of medium adoption level forming the major segment followed by 15.83 per cent of the respondents were under the low level of adoption. It also revealed that 13.33 per cent of the respondents were under high level of adoption. The overall index of the respondents about different aspects of recommended ginger cultivation practices in the study area was 49 per cent, thus it can be concluded that the adoption level of the respondents was medium about different aspects of recommended ginger cultivation practices in the study area.

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