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## Knowledge test to measure knowledge of dry farmers on sustainable dry farming

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### Abstract

In behavioural sciences, special tools are essential to measure the qualitative variables. The knowledge test is one such special tool which is capable of quantify the (qualitative variable) knowledge of an individual on a particular concept for which it is developed. This test was developed to measure the knowledge level of dry farmers on 'sustainable dry farming'. The standardised knowledge test contains 24 test items. In which 4 were multiple choice questions and remaining 20 were the questions with 'yes' or 'no' responses. The higher test score indicates higher level of knowledge and vice-versa. This test may be useful to measure the knowledge level of dry farmers on sustainable dry farming in the future research works.

**Keywords:** Sustainable dry farming, knowledge test, qualitative variable and dry farmers

### Introduction

As the problems of hunger India started to disappear due to the production levels achieved through green revolution, the new era struggles started to appear as a consequence of the over adoption of the chemical inputs (Rahman, 2015) [3]. The sustainability in farming began to gain the key position as the health of the resources began to move towards the critical conditions. Hence the sustainable agriculture appeared as a key area that demands the concentration. Dry farming is not negligible either in terms of its vast area or in terms of its contribution to the agricultural production (Reddy and Reddy, 2015) [4]. Hence to make sure the practical level implementation of this sustainable utilization of the degrading resources, the reach of this concept to peasants is essential. Hence to understand the level of reach and the level of understanding that dry farmers had on sustainable dry farming, the knowledge test is the tool to achieve the quantification of this qualitative parameter. Hence to measure the level of knowledge of respondents on sustainable dry farming, this test has been developed and the methodology is as follows.

### Methodology

The knowledge test was developed to measure the knowledge level of dry farmers on sustainable dry farming. Went through the following steps, while developing the test to measure farmers' knowledge on sustainable dry farming.

### Identification of the components and sub-components

Test concepts regarding sustainable dry farming were noticed and selected by rigorous review of different literature and by considering the valuable suggestions from the experts. All the concepts regarding 'sustainable dry farming' were considered. To cover the entire concept completely, all the components and sub components were referred in detail. The questions were identified for each component i.e., 'soil conservation', 'crop diversity', 'nutrient management', 'pest management', 'water quality and water conservation' and 'agro-forestry'. In total 87 questions of different concepts of sustainable dry farming were developed as given in the Table 2. The judges rating was taken to each item regarding their relevancy. The google forms was used as an online platform to collect the responses from judges all over the country. The judges were 'assistant professors', 'subject matter specialists' and 'scientists' of agronomy from the different agricultural universities, Krishi Vigyan Kendras (KVKs) and research institutions in the country. The mail ids were collected from different sources and the questionnaires were sent to 109 judges. In the span of three months, with many reminders (through mail and phone calls), finally we were able to receive 25 completely filled

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questionnaires. Later different calculations were carried out as follows.

**Relevancy weightage**

For all 87 questions of different concepts, which covered all six components of sustainable dry farming, mean relevancy scores were calculated by using the formula given below.

$$\text{Mean Relevancy Score (MRS)} = \frac{(\text{HR} \times 5 + \text{MR} \times 4 + \text{R} \times 3 + \text{IR} \times 2 + \text{MIR} \times 1)}{\text{Total no. of judges}}$$

Where,

- HR= Highly Relevant
- MR= More Relevant
- R= Relevant
- IR= Irrelevant
- MIR= Most Irrelevant

After completion of the calculations, 43 questions having mean relevancy score more than 4.3 were retained (Table 2). Further calculations were done with those developed test items from the selected questions as follows

**Development of items and item analysis**

The test items were developed from those selected 43 questions of different concepts. All the necessary care was taken while developing the test items as per the suggestion of Likert (1932)<sup>[2]</sup> and Edward (1957)<sup>[1]</sup>. Further the constructed knowledge test was given to 30 farmers in the non-sampled area. Responses given by those 30 dry farmers were collected and the same responses were used for the further item analysis.

**Results**

**Item difficulty index (p value)**

Item difficulty indexes were calculated to each test item with the help of responses taken from the respondents of non-sampled area. The total correct responses and incorrect responses for each test item were calculated. The item difficulty indexes were calculated for each item by using the formula given below

$$\text{Item difficulty index} = \frac{\text{Correct responses}}{\text{Total responses}} \times 100$$

Based on the calculated difficulty indexes for each test item (Table 3), 24 test items with difficulty index value less than 80 and more than 20 were selected. Further calculations with selected test items were as follows

**Item discrimination index (t value)**

Discrimination index was calculated to each screened test item with the help of difficulty index. The obtained scores of respondents for each test item were kept in descending order. Then, the top 25 per cent and the bottom 25 percent values were considered for calculation of t test. The two sample independent t test was administered to get discrimination index values (t values) with the help of Microsoft excel. As the t value equal to 1.75 and more showed good discrimination capacity of an item, all the selected 24 test items were proved to have good discriminating capability between known and unknown groups by having t value more

than 1.75 (Table 3). The t values were calculated by using the formula given below

$$t = \frac{\bar{X}_H - \bar{X}_L}{\sqrt{\frac{(\sum \bar{X}_H^2 - \frac{(\sum \bar{X}_H)^2}{n}) \times (\sum \bar{X}_L^2 - \frac{(\sum \bar{X}_L)^2}{n})}{n(n-1)}}$$

Where,

- $\bar{X}_H$ = Individual scores in the high group
- $\bar{X}_L$ = Individual scores in the low group
- n = Number of respondents

**Testing validity of the knowledge test**

Content validity of this knowledge test was confirmed as all test items were developed by means of the content taken by proper review of literature. The relevancy of the selected and included content was confirmed by taking experts' rating. Hence all included content in this test was proved to be valid.

**Testing reliability of the knowledge test (split half reliability)**

Split half method was implemented to test the reliability of the constructed knowledge test. The responses were taken from 30 dry farmers in the non-sampled area. They were divided into two group viz., 15 even and 15 odd. The test scores were calculated to each respondent and the correlation was carried out between the test scores of two groups. The correlation coefficient value obtained was 0.83 and it was more than the standard value 0.70. Hence the test constructed was found to be reliable to measure knowledge of respondents on sustainable dry farming.

**Scoring method of the standardized knowledge test**

The test contains 24 test items which covers all six components of sustainability w.r.t. dry farming condition viz., (i) soil conservation, (ii) crop diversity, (iii) nutrient management (iv) pest management (includes pest & disease management and weed management), (v) water quality and water conservation, (vi) agro-forestry. Out of 24 test items, 4 were multiple choice questions for which, scores 1 and 0 were assigned to each correct and incorrect responses respectively. Remaining 20 test items were with 'yes' or 'no' responses for which, scores 1 and 0 were assigned respectively. The highest and lowest possible scores that could be obtained from this knowledge test were 24 and 0 respectively. The highest and lowest scores got were 24 and 7 respectively. The classification of the respondents were made with the help of class intervals method as presented in the Table 1.

**Table 1:** Distribution of dry farmers in accordance with their level of knowledge on sustainable dry farming

Sl. No.	Category	Class interval (scores)
1	Low	< 13
2	Medium	13 - 18
3	High	> 18
Lowest score		7
Highest score		24
Range		17

**Table 2:** Mean relevancy scores of different concepts w.r.t. sustainable dry farming

Sl. No.	Different concepts of sustainable dry farming		MRS
<b>I</b>	<b>Soil Conservation</b>		
1	Do you know about contour tillage?	[yes/no]	4.68
2	Do you agree that contour tillage is important in dry farming situation?	[yes/no]	4.56
3	Contour tillage means,	[MCQ]	4.44
4	Do you agree that contour tillage in dry farming situation helps in the following way?		
i	Reduces soil loss from sloppy land up to 50 per cent.	[yes/no]	4.32
ii	Improves status of in-situ water storage of land.	[yes/no]	
iii	Increases the infiltration/percolation of rain water.	[yes/no]	
5	Contour tillage can be solution to the following problem of dry farming condition.	[MCQ]	4.56
6	Do you know about conservation tillage?	[yes/no]	4.64
7	Do you agree that conservation tillage can makes difference over conventional tillage in dry farming situation?	[yes/no]	4.60
8	Conservation tillage means,	[MCQ]	4.08
9	Do you agree that conservation tillage is beneficial in dry farming situation in the following way?		
i	Reduces the labour cost.	[yes/no]	4.28
ii	Reduces soil erosion.	[yes/no]	
iii	Improves the soil moisture.	[yes/no]	
iv	Adds the organic matter content to the soil.	[yes/no]	
10	Do you know about minimum tillage?	[yes/no]	4.40
11	Do you agree that minimum tillage is beneficial in dry farming situation with the following objectives?		
i	Reduce the energy input and labour requirement.	[yes/no]	4.04
ii	Conserve soil moisture & reduce the erosion.	[yes/no]	
iii	Provide optimum seedbed.	[yes/no]	
iv	Keep field compaction ti minimum.	[yes/no]	
12	Do you know about zero tillage?	[yes/no]	4.40
13	Zero tillage is the practice of	[MCQ]	3.96
14	Do you agree that zero tillage is helpful in dry farming situation in the following way?		
i	Improves organic matter content of soil by more organic residues on the soil surface.	[yes/no]	4.32
ii	Increases the water stable aggregates in the soil.	[yes/no]	
iii	Reduced cost on labour.	[yes/no]	
15	Do you know about the following soil conservation techniques?		
i	Contour bunding	[yes/no]	4.24
ii	Graded bunding	[yes/no]	
iii	Vegetative barriers	[yes/no]	
iv	Strip cropping	[yes/no]	
v	Cover cropping	[yes/no]	
16	Do you agree that crust formation in dry farming situation is problematic in following ways?		
i	Restricts the seeds germination.	[yes/no]	4.40
ii	Loss of soil moisture.	[yes/no]	
iii	Prevention of the rain water percolation into the soil.	[yes/no]	
17	17. Do you know about grassed water ways?	[yes/no]	4.00
<b>II</b>	<b>Crop Diversity</b>		
18	Is crop diversity is beneficial in dry farming conditions?	[yes/no]	4.44
19	19. Do you know about the following cropping systems?		
i	Mono cropping.	[yes/no]	4.32
ii	Multiple cropping.	[yes/no]	
iii	Sequential cropping.	[yes/no]	
iv	Inter cropping.	[yes/no]	
v	Double cropping.	[yes/no]	
20	Do you know about crop rotation?	[yes/no]	4.44
21	Is crop rotation is beneficial in dry farming situation in the following ways?		
i	Helpful to control weeds and pests which are specific to particular crop.	[yes/no]	4.52
ii	Improves soil fertility by rotating with legume and pulse crops.	[yes/no]	
22	Do you agree that low plant population is helpful in dry farming situation to come over the soil moisture deficiency?	[yes/no]	4.24
23	Do you know about seed hardening?	[yes/no]	4.28
24	Is seed hardening is necessary in dry farming situation?	[yes/no]	4.28
25	Do you agree that seed hardening is beneficial in the following ways in dry farming situation?		
i	Induces draught tolerance in emerging seedlings.	[yes/no]	4.16
ii	Enables seedlings to survive in early moisture stress.	[yes/no]	
iii	Ensures early germination.	[yes/no]	
iv	Induce better root development.	[yes/no]	
v	Low cost technology.	[yes/no]	
26	Do you know about seed treatment?	[yes/no]	4.08
27	Do agree that seed treatment is helpful as follows in dry farming situation?		
i	Can inoculate bio fertilizers.	[yes/no]	4.20
ii	Can inoculate bio control agents.	[yes/no]	
<b>III</b>	<b>Nutrient Management</b>		

28	Do you know about Integrated Nutrient Management (INM)?	[yes/no]	4.44
29	Do you agree that integrated nutrient supply is sustainable practice in dry farming condition?	[yes/no]	4.68
30	Which are the sources of nutrients in Integrated Nutrient Management?	[MCQ]	4.48
31	Integrated Nutrient Management means,	[MCQ]	4.40
32	Do you agree that organic matter in soil brings remarkable improvements in physical, chemical and biological properties of soil besides addition of nutrients?	[yes/no]	4.44
33	Do you know about the bio fertilizers?	[yes/no]	4.04
34	Do you agree that bio fertilizers are beneficial in dry farming situation in the following ways?		
i	Can increase crop yield and quality	[yes/no]	4.00
ii	Nature-friendly and low cost technology.	[yes/no]	
iii	Can be applied easily by seed treatment and can save labour cost.	[yes/no]	
iv	Can sustain the soil fertility.	[yes/no]	
35	Do you agree that following method of nitrogen application is more beneficial than simply broadcasting in dry farming situation?		
i	Foliar application by spraying.	[yes/no]	4.32
ii	Placing near root zone and covering with soil.	[yes/no]	
iii	Application of neem coated urea.	[yes/no]	
iv	Split application at more than one time (basal dose & top dressing).	[yes/no]	
36	Does more nitrogen applied crops are more susceptible to pests?	[yes/no]	4.20
37	Do you agree that reduced nitrogen application is helpful to overcome the early growing stage moisture stress in dry farming condition?	[yes/no]	4.04
38	Do you agree that it's very important to provide phosphorus and potassium fertilizers in a balanced way to crops along with nitrogen?	[yes/no]	4.60
39	Do you know about green manuring?	[yes/no]	4.16
40	Do you agree that green manuring is beneficial in dry farming condition?	[yes/no]	4.16
41	Green leaf manuring is a practice of,	[MCQ]	4.12
<b>IV</b>	<b>Pest Management</b>		
<b>A</b>	<b>Pest and disease management</b>		
42	Do you know about the Integrated Pest Management (IPM)?	[yes/no]	4.48
43	Is integrated approach of pest managements is sustainable practice in dry farming condition?	[yes/no]	4.20
44	Please tick the components of IPM in from the following list		
i	Cultural methods	[yes/no]	4.20
ii	Physical methods	[yes/no]	
iii	Mechanical methods	[yes/no]	
iv	Biological methods	[yes/no]	
v	Chemical methods	[yes/no]	
45	Which among the following methods of IPM is more harmful when used inappropriately.	[MCQ]	4.16
46	Do you agree that balanced potassium and phosphorus application brings insects and pest resistance in the crops?	[yes/no]	4.36
47	Do you know about the beneficial insects?	[yes/no]	4.16
48	Is it necessary to protect the beneficiary insects (predators and parasites) in dry farming conditions?	[yes/no]	4.20
49	The beneficial insect among following.	[MCQ]	4.12
50	Do you know that over doses of agrochemicals leads to development of resistance by pests?	[yes/no]	4.16
51	Do you know about Integrated Disease Management?	[yes/no]	4.44
52	Is it necessary to control disease which will not affect the yield significantly?	[yes/no]	4.00
<b>B.</b>	<b>Weed management</b>		
53	Weeds affects crop growth by competing for.	[MCQ]	4.68
54	Serious problem prone by weeds in dry farming situation is their competition for.	[MCQ]	4.36
55	Do you agree that the mono cropping leads to depletion of bio-diversity, pest and disease outbreaks?	[yes/no]	4.40
56	Is it necessary to control weeds at all stages of crop growth?	[yes/no]	4.12
57	Do you agree that use of herbicides to control weeds is sustainable practice of weed management?	[yes/no]	4.16
<b>V</b>	<b>Water Quality And Water Conservation</b>		
58	Do you agree that quality and quantity of water matters in farming?	[yes/no]	4.48
59	Do you agree that water is very precious and its conservation, efficient usage in dry farming is important?	[yes/no]	4.68
60	Do you know about mulching?	[yes/no]	4.72
61	Mulching is a practice of,	[MCQ]	4.44
62	Do you agree that mulching is helpful in dry farming situation in the following ways?		
i	Increases infiltration of rain water into the soil.	[yes/no]	4.64
ii	Controls soils erosion.	[yes/no]	
iii	Suppresses weed growth.	[yes/no]	
iv	Controls loss of water from soil surface by preventing evaporation.	[yes/no]	
63	Do you know about the following?		
i	Vertical mulching.	[yes/no]	4.64
ii	Live mulching.	[yes/no]	
iii	Dust mulching.	[yes/no]	
iv	Stover/straw mulching.	[yes/no]	
v	Stubble mulching.	[yes/no]	
vi	Pebble mulching.	[yes/no]	
64	Do you know about farm pond?	[yes/no]	4.60

65	Do you agree that farm pond is helpful in dry farming situation as follows?		
i	To collect and store run off water from farm and outside run off into the farm.	[yes/no]	4.68
ii	To provide protective irrigations to crops at critical stages.	[yes/no]	
iii	To prevent loss of top fertile soil by checking and collecting run off from farm there itself.	[yes/no]	
66	Do you agree that organic matter improves soil moisture holding capacity?	[yes/no]	4.52
67	Do you agree that summer ploughing is helpful in soil moisture conservation?	[yes/no]	4.56
68	Do you know about drip irrigation?	[yes/no]	4.48
69	Do you agree that drip irrigation can be a very efficient and most adoptable under dry farming situation?	[yes/no]	4.40
70	Does bore well can be considered as assured ground water source in dry farming situation?	[yes/no]	4.48
71	Do you agree that sustainable dry farming practices are capable of groundwater recharge by improved infiltration and percolation into soil subsurface in long term?	[yes/no]	4.48
<b>VI</b>	<b>Agro-Forestry</b>		
72	Do you know about agro-forestry?	[yes/no]	4.48
73	Do you agree that agro-forestry is useful in maintenance of biodiversity and sustainability in dry farming situation?	[yes/no]	4.36
74	Do you agree that it's possible to grow crops along with selected forest tree species in a sustainable way in dry farming situation?	[yes/no]	4.32
75	Do you know about the following agro-forestry systems?		
i	Agrisilviculture (crops+trees).	[yes/no]	4.24
ii	Silvipasture (trees+pasture/+animals)	[yes/no]	
iii	Agri-silvi-pastoral system (crops+trees+ pasture).	[yes/no]	
iv	Agri-horticulture (crops+fruit trees).	[yes/no]	
v	Homestead agroforestry (multiple combination of various components).	[yes/no]	
76	Do you know about alley cropping?	[yes/no]	4.36
77	Do you agree that deforestation is becoming more and more serious issue day by day?	[yes/no]	4.40
78	Do you agree that deforestation is affecting balance of ecosystem?	[yes/no]	4.24
79	Over use of agro chemicals leads to.	[MCQ]	4.12
80	Is it possible to do afforestation in waste lands?	[yes/no]	4.20
81	Does following synthetic agrochemicals are environmentally safe to use?		
i	Insecticides.	[yes/no]	3.92
ii	Pesticides.	[yes/no]	
iii	Weedicides.	[yes/no]	
iv	Herbicides.	[yes/no]	
v	Fungicides.	[yes/no]	
vi	Nematicides.	[yes/no]	
vii	Acaricides	[yes/no]	
82	Do you know about botanical pesticides?	[yes/no]	4.08
83	Is it environmentally safe to use botanical bio-chemicals?	[yes/no]	4.20
84	Do you agree that deforestation is one of the reason for pest outbreaks?	[yes/no]	4.00
85	Do you agree that biodiversity has following benefits in dry farming condition?		
i	Recycling of nutrients.	[yes/no]	4.20
ii	Control of microclimate.	[yes/no]	
iii	Regulation of local hydrological processes.	[yes/no]	
iv	Detoxification of waste and toxic chemicals.	[yes/no]	
v	Soil structure improvement.	[yes/no]	
vi	Infiltration and run off soil erosion.	[yes/no]	
vii	Natural pest and disease control.	[yes/no]	
viii	Pollination process	[yes/no]	
86	Do you agree that modern agriculture has evolved as major threat to biodiversity?	[yes/no]	4.28
87	Do you agree that more frequent and intensive drought is an impact of deforestation?	[yes/no]	4.28

**Table 3:** Difficulty index and discrimination indexes of test items of knowledge test on sustainable dry farming

Sl. No.	Test items		Discrimination index (t-value)	Difficulty index (p-value)
1	Do you know about contour tillage?	(yes/no)	2.36	3.33
2	Do you agree that contour tillage is important in dry farming situation?	(yes/no)	2.36	96.67
3	Contour tillage means	(MCQ)	2.14	36.67
4	Do you agree that contour tillage in dry farming situation helps in the following way?			
i	Reduces soil loss from sloppy land up to 50 per cent	(yes/no)	2.36	93.33
ii	Improves status of in-situ water storage of land.	(yes/no)	--	100.00
iii	Increases the infiltration/percolation of rain water.	(yes/no)	2.36	83.33
5	Contour tillage can be solution to the following problem of dry farming condition.	(MCQ)	2.18	80.00
6	Do you know about conservation tillage?	(yes/no)	2.36	3.33
7	Do you agree that conservation tillage can makes difference over conventional tillage in dry farming situation?	(yes/no)	2.36	3.33
8	Do you know about minimum tillage?	(yes/no)	2.36	3.33
9	Do you know about zero tillage?	(yes/no)	2.14	40.00
10	Do you agree that crust formation in dry farming situation is problematic in following ways?			



i	Restricts the seeds germination.	(yes/no)	2.36	86.67
ii	Loss of soil moisture.	(yes/no)	2.18	70.00
iii	Prevention of the rain water percolation into the soil.	(yes/no)	2.14	46.67
11	Is crop diversity is beneficial in dry farming conditions?	(yes/no)	2.36	73.33
12	Do you know about crop rotation?	(yes/no)	2.36	93.33
13	Is crop rotation is beneficial in dry farming situation in the following ways?			
i	Helpful to control weeds and pests which are specific to particular crop.	(yes/no)	2.14	76.67
ii	Improves soil fertility by rotating with legume and pulse crops.	(yes/no)	--	90.00
14	Do you know about Integrated Nutrient Management (INM)?	(yes/no)	2.36	13.33
15	Do you agree that integrated nutrient supply is sustainable practice in dry farming condition?	(yes/no)	2.14	40.00
16	Which are the sources of nutrients in INM?	(MCQ)	2.36	10.00
17	INM means?	(MCQ)	2.36	13.33
18	Do you agree that organic matter in soil brings remarkable improvements in physical, chemical and biological properties of soil besides addition of nutrients?	(yes/no)	--	96.67
19	Do you agree that it's very important to provide phosphorus and potassium fertilizers in a balanced way to crops along with nitrogen?	(yes/no)	2.36	90.00
20	Do you know about the Integrated Pest Management (IPM)?	(yes/no)	2.36	6.67
21	Do you agree that balanced potassium and phosphorus application brings insects and pest resistance in the crops?	(yes/no)	2.18	50.00
22	Do you know about Integrated Disease Management?	(yes/no)	2.36	6.67
23	Weeds affects crop growth by competing for.	(MCQ)	2.14	63.33
24	Serious problem prone by weeds in dry farming situation is their competition for.	(MCQ)	2.16	66.67
25	Do you agree that the mono cropping leads to depletion of bio-diversity, pest and disease outbreaks?	(yes/no)	2.14	50.00
26	Do you agree that quality and quantity of water matters in farming?	(yes/no)	--	100.00
27	Do you agree that water is very precious and its conservation, efficient usage in dry farming is important?	(yes/no)	--	100.00
28	Do you know about mulching?	(yes/no)	2.36	23.33
29	Mulching is a practice of	(MCQ)	2.36	13.33
30	Do you agree that mulching is helpful in dry farming situation in the following ways?			
i	Increases infiltration of rain water into the soil.	(yes/no)	2.14	36.67
ii	Controls soils erosion.	(yes/no)	2.14	83.33
iii	Suppresses weed growth.	(yes/no)	2.14	93.33
iv	Controls loss of water from soil surface by preventing evaporation.	(yes/no)	2.16	50.00
31	Do you know about the following?			
i	Vertical mulching.	(yes/no)	2.36	76.67
ii	Live mulching.	(yes/no)	2.36	13.33
iii	Dust mulching.	(yes/no)	2.18	56.67
iv	Stover/straw mulching.	(yes/no)	2.14	93.33
v	Stubble mulching.	(yes/no)	2.18	33.33
vi	Pebble mulching.	(yes/no)	2.18	43.33
32	Do you know about farm pond?	(yes/no)	--	100.00
33	Do you agree that farm pond is helpful in dry farming situation as follows?			
i	To collect and store run off water from farm and outside run off into the farm.	(yes/no)	--	100.00
ii	To provide protective irrigations to crops at critical stages.	(yes/no)	--	100.00
iii	To prevent loss of top fertile soil by checking and collecting run off from farm there itself.	(yes/no)	2.36	63.33
34	Do you agree that organic matter improves soil moisture holding capacity?	(yes/no)	--	100.00
35	Do you agree that summer ploughing is helpful in soil moisture conservation?	(yes/no)	2.14	58.62
36	Do you know about drip irrigation?	(yes/no)	--	100.00
37	Do you agree that drip irrigation can be a very efficient and most adoptable under dry farming situation?	(yes/no)	--	100.00
38	Does bore well can be considered as assured ground water source in dry farming situation?	(yes/no)	2.36	46.67
39	Do you agree that sustainable dry farming practices are capable of groundwater recharge by improved infiltration and percolation into soil subsurface in long term?	(yes/no)	2.36	90.00
40	Do you know about agro-forestry?	(yes/no)	2.36	60.00
41	Do you agree that agro-forestry is useful in maintenance of biodiversity and sustainability in dry farming situation?	(yes/no)	2.18	53.33
42	Do you know about alley cropping?	(yes/no)	2.36	6.67
43	Do you agree that deforestation is becoming more and more serious issue day by day?	(yes/no)	2.36	90.00

**Table 4:** Standardised knowledge test to measure knowledge on sustainable dry farming

<b>Soil Conservation</b>		
1. Contour tillage means		
a) Ploughing along the contour and across the slope.	b) It's a new technology.	
c) It is same as conventional tillage.	d) None of the above.	
2. Contour tillage can be solution to the following problem of dry farming condition.		
a) Soil erosion.	b) Soil moisture.	
c) Soil fertility.	d) All of the above.	
3. Do you know about zero tillage?		yes/no
<b>Crop Diversity</b>		
4. Is crop diversity is beneficial in dry farming conditions?		yes/no
5. Is crop rotation helpful to control weeds and pests which are specific to particular crop?		yes/no
6. Do you agree that crust formation in dry farming situation leads to loss of soil moisture?		yes/no
7. Do you agree that crust formation in dry farming situation leads to prevention of the rain water percolation into the soil?		yes/no
<b>Nutrient Management</b>		
8. Do you agree that integrated nutrient supply is sustainable practice in dry farming condition?		yes/no
<b>Pest Management</b>		
9. Weeds affects crop growth by competing for.		
a) Soil moisture.	b) Soil nutrients.	
c) Sunlight and air (shading effect).	d) All of the above.	
10. Serious problem prone by weeds in dry farming situation is their competition for.		
a) Soil moisture and nutrients.	b) Air.	
c) Sunlight.	d) None of the above.	
11. Do you agree that balanced potassium and phosphorus application brings insects and pest resistance in the crops?		yes/no
12. Do you agree that the mono cropping leads to depletion of bio-diversity, pest and disease outbreaks?		yes/no
<b>Water Quality And Water Conservation</b>		
13. Do you know about the vertical mulching?		yes/no
14. Do you know about Dust mulching?		yes/no
15. Do you know about Stover/straw mulching?		yes/no
16. Do you know about Stubble mulching?		yes/no
17. Do you agree that farm pond is helpful to prevent loss of top fertile soil by checking and collecting run off from farm there itself?		yes/no
18. Do you agree that summer ploughing is helpful in soil moisture conservation?		yes/no
19. Do you agree that mulching increases infiltration of rain water into the soil?		yes/no
20. Do you know about mulching?		yes/no
21. Do you agree that mulching controls loss of water from soil surface by preventing evaporation?		yes/no
22. Does bore well can be considered as assured ground water source in dry farming situation?		yes/no
<b>Agro-Forestry</b>		
23. Do you know about agro-forestry?		yes/no
24. Do you agree that agro-forestry is useful in maintenance of biodiversity and sustainability in dry farming situation?		yes/no

## Conclusion

This knowledge test was developed for the Ph.D. research purpose. Here the objective was to develop a tool to measure the knowledge level of dry farmers on sustainable dry farming. All the efforts were made to standardise this test even with the limited resources as the research was carried out by a student. This test might be useful for the quantification of the knowledge of similar respondents in the similar field conditions. The researchers would like to inform that this publication is made without any competitive interests.

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