

2 **INVESTIGATING CRITICAL FACTORS HINDERING FARMERS'**
3 **PARTICIPATION IN AGRICULTURAL RESEARCH IN ETHIOPIA**

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8 **ABSTRACT**

9
10 Agriculture is one of the key drivers of Ethiopia's long-term development and food security. It supports
11 85% of the total population, constitutes 43% of GDP and 80% of export value. For the country to
12 reach middle-income prestige by 2025 and make significant inroads against food insecurity, strategic
13 choices and concerted and strategic investments in agricultural sector are vigorous. The government
14 of Ethiopia has put maximum efforts to increase agricultural output. However, increments in
15 agricultural production and productivity, the expected benefits, have not been achieved yet. Low
16 agricultural production and productivity is the major cause of food insecurity in the country emanating
17 from lack of suitable technologies for beneficiaries, low adoption of agricultural innovations, and lack
18 of active participation of farmers in agricultural research. Therefore, this study examines critical
19 factors that hinder farmers' participation in agricultural research in Ethiopia. Two regions were
20 randomly selected from nine and 76 farmers, 39 researchers and 24 extension workers were
21 purposively selected based on snowball sampling technique from the two regions to give a sample
22 size of 139. Qualitative research design was used in this research. Data were collected using semi-
23 structured interviews, focus group discussions and observations and analysed descriptively. The
24 empirical results reveal that lack of sufficient time, bad experiences in the past, perception of farmers'
25 for researchers, farmer's attitude for research, the type of research, lack of stakeholder's willingness
26 to learn from one another, loose integration of indigenous and scientific knowledge and insignificant
27 change of new technologies to material wealth critically hindered farmer's participation in agricultural
28 research to bring innovation in agriculture. Innovation in agriculture comes from the interaction of the
29 different actors that are working in agriculture since each actor brings their own knowledge and
30 results in social learning. Insignificant innovation in agricultural research results in food insecurity in
31 the country.

32 **Keywords:** *Agricultural Research; Agricultural Innovation; Farmer; Participation; Research Project.*

33 **1. INTRODUCTION**

34 Agriculture is one of the key drivers of Ethiopia's long-term development and food security. It supports
35 85% of the total population, constitutes 43% of GDP and 80% of export value. For the country to
36 reach middle-income prestige by 2025 and make significant inroads against food insecurity, strategic
37 choices and concerted and strategic investments in agricultural sector are vigorous. More than 90% of
38 agricultural production is driven by smallholder farmers in the country. Given forecast of population
39 growth, without expanding cultivated land, the average size of land per farmer in highland areas will
40 be reduced to 0.7hectares by 2020 bringing additional pressure on food security in the rural areas.
41 Livestock and crop productivity, based on county comparisons, although improving, still remains by
42 far below the potential. The agricultural growth domestic product per hectare of the cultivated land is
43 half of Morocco or Kenya. In 2007, the figure was USD 1,150 per hectare for Morocco, USD 1, 190
44 per hectare for Kenya, and 587 per hectare for Ethiopia. Modelling the inferences of projection of
45 population growth, if Ethiopia remains on its present productivity path, food insecurity would climb to
46 over 50 million people reducing growth domestic product per farming household by 20% by 2020(1).

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47 In Ethiopia, the agricultural sector has the highest potential for improving the livelihood of the society.
48 A considerable increase in agricultural produce and output is anticipated to be recognized by
49 instigating interventions intended at speeding-up the adoption and assimilation of improved
50 agricultural technologies and management practices. Still the country needs to adopt innovative and
51 modern strategies to agricultural knowledge creation, dissemination and use. These require the
52 engagement of farmers' in agricultural research for agricultural innovation and knowledge creation.
53 Sources of agricultural knowledge include indigenous knowledge and scientific research. After the
54 sourcing, creation or accumulation of knowledge through the engagement of farmers' in the research
55 processes, the knowledge has to be disseminated to other stakeholders to support innovation process
56 in agricultural innovation to bring development and food security in the country(2).

57 Most agricultural research projects fail for the reason that when research projects are planned, local
58 people or farmers, culture, and socio-economic features are not considered that lead to outside
59 agents not being able to create and recommend suitable technologies that are well-suited with the
60 beneficiaries (3). Failure and poor adoption of agricultural research projects are results of lack of
61 active participation of farmers in all phases of the research projects. Farmers are not given chances to
62 actively engage themselves in all decisions that affect their lives directly (4). Experts and government
63 officials support the idea of farmers' participation in agricultural research in philosophies, however
64 practically there is no common consensus. Involving local knowledge or target group has limitations
65 such as solutions that are based on limited technical knowledge, limited scientific understanding of
66 processes and dissemination of results may be limited to specific socio-economic or gender groups
67 (5). The use of top-down approach is one of the key factors resulting in failure of agricultural research
68 projects. The approach constructs on farmers' experiences instead of building farmers capabilities
69 and promoting empowerment (6).

70 Development works which employ the top-bottom strategy with insignificant input and engagement of
71 farmers have long been known as an unsustainable and poor pathway to farmers' development and
72 empowerment (7). Bottom-up strategies that view farmers as partners, use local experiences and
73 make an effort to empower farmers have been encouraged in the past decades. Farmers'
74 participation in agricultural research recognizes the significant role farmers' play in the failure or
75 success of an agricultural research project. It distinguishes farmers' engagement in identifying farming
76 problems as well as solutions for sustainable agricultural development. The bottom-up approach has
77 shifted from instructing beneficiaries to coaching and collaborating farmers to identify and solve local
78 agricultural restraints (8, 9).

79 Participatory Technology Development (PTD) is one of the key arenas for social learning and helps
80 stakeholders to contribute their share in the innovation system. Participatory technology development
81 has different types of participation hierarchy in research especially in agriculture. These are nominal
82 (farmers' labour and land are used), consultative (farmers' opinions are required), action-oriented
83 (farmers are engaged in implementing portions of the research), decision-making (farmers take part in
84 decision making processes) and collegial participation (research strengthen farmers' own research).
85 In PTD, participation has seven grades of participation. These are positivist theoretical research (the
86 least inclusive type of approaches), passive information sharing (farmers are informed of the
87 processes and outcomes of the research), consultative stage (farmers are consulted and their needs
88 may be included in the research design), on-farm testing (researchers continue to dominate the
89 research processes but farmers' expertise is recognized), evaluation (farmers are involved in
90 assessing the process and results of the research), collaborative planning (scientists join hands with
91 farmers in defining problems and in designing the research process), and partnership (farmers and
92 scientists engage in a long term mutual learning and research process). Both of these typologies are
93 linear and they have the shortcoming that does not reflect the diversity and dynamics of agricultural
94 research. Stakeholder participation in agricultural research should take into account the dynamic and
95 complexity of agricultural research processes and diversity of stakeholder engagement in various
96 research contexts. Stakeholders' participation in research has to be from the planning phase to the
97 evaluation phase (10).

98 **BENEFITS OF FARMER'S PARTICIPATION IN AGRICULTURAL RESEARCH**

99 Farmer's participation in agricultural research has a number of benefits including the development of
100 agricultural technologies that brings improvement in the lives of farmers. " Success is often not found
101 in the agricultural technology alone, but rather in its grounding in and building of human and social

102 capital- confidence, knowledge, networks, and capacity-which then allow technologies to have full
103 effect on livelihoods” (11). Farmer’s participation in agricultural research enables them to acquire the
104 following basic benefits that bring innovation in agriculture.

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1. INNOVATIONS AND IMPROVED PRACTICES

107 The basic attention of development-oriented agricultural research is the development of institutional
108 and technical innovations and improved practices (12). Traditional agricultural research projects may
109 deliver “turnkey” elucidations that can be seen on demonstration farms. In these circumstances
110 farmers merely have the choice to reject or adopt the innovations, without the opportunity to adapting
111 the technology to their explicit farming system. The research would requisite to come up with a
112 “basket of choices” from which the beneficiaries can choose the solution that best suit to their
113 conditions (13).

114

2. CREATION OF AWARENESS AND KNOWLEDGE

115 Increased awareness and knowledge among the different stakeholders can be a key result of
116 agricultural research project. They are frequently called to as “disembodied” things as they are not an
117 essential part of institutional or technical innovation (11). These effects can cover a wide range from
118 knowledge on a commodity or specific theme to awareness of underlying relationships in agro
119 systems to knowledge on how value chains or whole systems function. Agricultural research may
120 enhance farmers’ awareness about the negative or positive effects some practices have on the
121 ecological amenities of a watershed on downstream residents. Farmers’ participation in agricultural
122 research enables them to blend their indigenous knowledge with “expert” scientific knowledge in a
123 synergic or complementary way (14). It is recognized that researchers and farmers have diverse
124 comparative benefits in creating knowledge. For example, Maori farmers from New Zealand, in a
125 research project, were insisting that their own traditional knowledge - obtained through long term
126 experience and passed down through elders would be merged with researchers’ technical knowledge
127 rather than being by it (15).

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3. DEVELOPMENT OF SKILLS

129 Farmers’ skills can improve significantly through their engagement in agricultural research. These
130 contain technical and diagnostic skills obtained through the application of water saving irrigation
131 scheme. Organizational or managerial skills are often learned through participation. Farmer’s
132 participation in agricultural research improves problem solving capacities and experimental skills of
133 farmers in agricultural innovation (16).

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4. SOCIAL CAPITAL DEVELOPMENT AND EMPOWERMENT

135 Today most specialists in agricultural research give due attention to a functional role of participation
136 (17), even though the question of power relationships in participatory strategies is still of significant
137 relevance, especially when the research emphasizes on marginalized groups specially the poor.
138 Engaging farmers in agricultural research regularly has an influence on social capital formation. For
139 example, the potential for joint action between partaking stakeholders can be increased in the
140 development of the research process (18).

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5. ENHANCEMENT OF LIVELIHOODS

142 Farmer’s participation in agricultural research project increases resilience of the resident livelihoods to
143 outside shocks and improve the capability of local institutions and stakeholders to adapt to altering
144 circumstances (19).

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146 Low performance of agriculture does not only threaten livelihood but it also accelerates environmental
147 degradation, affects production capacity of natural resources bases and fails to address malnutrition
148 and poverty(20). In order to increase the performance of agricultural sector, different programmes are
149 introduced by different countries. This includes rural development, food security and farmers
150 participation in agricultural research. Participation and empowerment are the most critical issues in
151 development programs. Participation is the engagement of marginalized groups in development
152 operations that intend to build peoples abilities to control and access of resources, opportunities and
153 benefits towards self-reliance and to better standard of living. Farmer’s participation plays a critical
154 role in poverty alleviation and economic development. Lack of farmers’ participation in decision
155 making to use or implement agricultural policies could lead to failure in agricultural development (21).
156 Active participation of farmers in agricultural research is hindered by people’s lack of skills,
knowledge, capital, knowledge, ignorance, shortage of incentives to those who participate and lack of

157 capable organization (22).The critical relationship between farmer's engagement in agricultural
158 research projects on one hand, and poverty alleviation and economic development on the other hand,
159 cannot be over emphasized. Without participation there is no program and without program there is
160 no development (23). Without farmers' active participation in agricultural research projects, there
161 would be little success to bring food security and development.

162 The government of Ethiopia has put maximum efforts to increase agricultural output. However,
163 increments in agricultural production and productivity, the expected benefits, have not been achieved
164 yet. Low agricultural production and productivity is the major cause of food insecurity in the country
165 emanating from lack of suitable technologies for beneficiaries, low adoption of agricultural
166 innovations, and lack of active participation of farmers in agricultural research (24, 25).

167 Therefore, the objective of this study was to investigate critical factors hindering farmers' participation
168 in agricultural research in Ethiopia. The research findings, hopes to inform recommendations to policy
169 makers and public authorities to contribute to solve the problems which hinder active participation of
170 farmer's in agricultural research with the aim to solve practical problems at grassroots levels in
171 agricultural innovation in the country. Agricultural Innovation System (AIS) was used as a theoretical
172 framework to guide this research.

173 **2. RESEARCH METHODOLOGY**

174 Qualitative research method was used in this study. A multi-stage sampling technique was applied in
175 this research. The first stage involved the selection of two (Amhara and Tigray) regions (out of nine)
176 that were active in research activities in the country. The second stage involved random selection of
177 four knowledge institutes (two universities and two research institutes), and twenty four villages from
178 the selected regions. The third stage was identifying interviewees through snowball sampling from
179 both regions. In qualitative research the sample size for the interview depends on the aim of the
180 research. Most qualitative research uses purposive sampling which is explicitly selecting interviewees
181 who it is intended will generate appropriate data. It is to contain information rich cases for in-depth
182 study. Purposive sample sizes are often determined on the bases of theoretical saturation (the point
183 in data collection when new data no longer bring additional insights to the research questions).
184 Purposive sampling is therefore most successful when data review and analysis are done in
185 conjunction with data collection. Snowball sampling (known as chain referral sampling) is a type of
186 purposive sampling in which informants with whom contact has already been made use their social
187 networks to refer the researcher to the people who could potentially participate in or contribute to the
188 study.

189 For the study, a total of 139 respondents were interviewed: 39 researchers from both universities and
190 research institutes, 76 farmers from both regions, and 24 extension workers. Focus group discussions
191 (FGD) were used in this research since it has the advantage over one-to-one interviews of providing
192 access to interaction among the participants and give some insight in how knowledge and innovation
193 was produced. It was also used to augment the individual interview. Moreover, FGD can be a critical
194 way of researching some sensitive matters such as dissatisfaction of farmers with researchers.
195 Facilitating a qualitative research interview is a hard work and difficult to write down responses while
196 maintaining eye contact, providing encouragement and planning the prompt, probe or link to the next
197 topic of interest, listening and other activities. Therefore, the interview was recorded on memory
198 recorder. Interviews were fully transcribed and coded applying principles of grounded theory (26, 27).
199 Also, observation at meetings took place in the role of observer-as-participant (28), in which the
200 researcher relates to and is known to the subjects under study as a researcher. Several documents
201 such as meeting minutes, policy documents and internal evaluations were analysed. Triangulation
202 between different data sources took place to ensure validity (29).

203 The best methodological answer to sample size in qualitative research is a grounded theory
204 approach. The grounded theory approach is a qualitative research method that uses a systematic set
205 of analytical, interpretative, and coding procedures, to develop an inductively derived grounded theory
206 about a phenomenon. Grounded theory emerged in reaction to the formerly common practice of
207 considering research only as a means of testing hypotheses. That means that the research started
208 with theory that was subsequently tested. Grounded theory was developed as a systematic approach
209 to develop theory on the basis of empirical research. The theory is then the 'finding' of the research.
210 Grounded theory approach advocates theoretical sampling or including interviewees (the incidents

211 and events that interviewees and other sources do provide) in the sample on the bases of both an
 212 emerging hypothesis from on-going data analysis, an understanding of the field and a delicate attempt
 213 to test such hypotheses. The objective is to keep sampling and analysing data until nothing new is
 214 being generated. This point is called saturation and the techniques are called sampling to saturation.
 215 When sufficient data are gathered it reaches theoretical saturation. In qualitative research statistical
 216 significance of relations between the empirical phenomena which are being described is not a major
 217 criterion. A better criterion is what has been called sociological significance (26, 27).

218 **Details of respondents selected for this study from both regions.**

Region	Woreda (district)	Kebele (village)	DAs interviewed	Farmers interviewed	Researchers interviewed	
					Location	Number
Amhara	Wera Ilu	Abajale	1	3	Bahirdar university	11
		Dolo	1	4		
		Gatra	1	4		
		Kuyu	1	3		
		Doyo	1	4		
	Kalu	Beke	1	2	Amhara Agricultural Research Institute	13
		Kedida	1	4		
		Abidcho	1	2		
		Birko Debele	1	3		
		Ardibo	1	2		
Tigray	Alaje	Jarsa	1	4	Mekele University	9
		Angot	1	3		
	Endamekoni	Temamang	1	3		
		Yewula	1	4		
		Atsela	1	5		
	Oflla	Ayba	1	2		
		Mekan	1	3		
	Raya-Alamata	Simret	1	2		
		Hashenge	1	4		
		Menkere	1	2		
Raya-Azebo	Tumuga	1	3	Tigray Agricultural research institute	6	
	Gerjale	1	4			
	Tsigea	1	3			
		Genete	1	3		
Total	9	24	24	76	4	39

219 **3. RESULTS AND DISCUSSION**

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Ethiopia is one of the countries that is not yet achieved food security at household levels. Most of the mass of the marginalized and poor farmers are struggling to secure their basic needs for their family on daily bases. For the country, more than any programs, granting food security at household level is one of the most urgent programs to be achieved. To achieve this food security program, a number of urgent actions have to be implemented. The urgent actions needed to let the different programs to run effectively and to get the confidence of farmers in the study areas were many and diverse. Conducting research that is relevant to farmers need by participating them in agricultural research, integrating the use of indigenous knowledge with scientific knowledge in agricultural technology development by engaging farmers in agricultural research process, changing the attitude of researchers from negative to positive for farmers and engaging farmers in decision making that matters in their life are some of the most urgent actions need to let the food security program to run effectively and helps to get the confidence of farmers in agricultural research and development in the country. Having positive attitude for farmers can be achieved by a number of factors. Researchers have to go and work alongside farmers in their farms practically by identifying their problems. By doing these important activities, researchers can win the trust of farmers.

237 Farmers in the country are engaged both in rearing of animals and production of plants. Knowledge
238 institutes were involved in the production of skilled manpower besides the production of technologies
239 that solve problems of farmers to bring food security in the country. Both knowledge institutes and
240 farmers were needed to work together to create and develop knowledge that is relevant to the needs
241 of the different stakeholders that are working in the development of the country. Researchers in the
242 study areas conducted agricultural research that had little room for farmers' participation mostly for
243 publication. The relationship between farmers and researchers were not closer and stronger because
244 of lack of active participation of farmers in agricultural research to bring innovation in Ethiopian
245 agriculture to bring food security for the marginalized and poor farmers. In principle the joint-venture
246 of farmers and researchers is sharing the common vision to bring development in the country by
247 conducting demand-driven and problem solving research by integrating the indigenous and scientific
248 knowledge that both actors have in agriculture to bring innovation in agriculture. However, due to lack
249 of farmers' active participation in agricultural research to bring innovation, food security is not yet
250 achieved in the country. Instead of conducting demand-driven and problem solving research,
251 researchers were conducting research that had no or little practical application in the lives of farmers.
252 Lack of active farmers' participation in agricultural research limited innovation in Ethiopian agriculture
253 and this hammered food security in the country.

254 Hence, the research findings revealed a number of critical factors that hindered farmers' participation
255 in agricultural research to bring innovation in agriculture. Innovation in agriculture is a base for food
256 security. These farmers' engagement inhibiting factors are presented and discussed as follows briefly.

257 **3.1 KIND OF RESEARCH**

258 Some of the researchers in the study area conducted basic research that had no room for farmer's
259 participation. Researchers used the conventional research strategy that was based on identification of
260 problems from others research recommendations and literatures. This type of problem identification
261 for research from literatures resulted in conducting research that had less relevance to farmers need.
262 Once the technology was developed, farmers were asked or forced to use the technologies that were
263 not relevant to their specific agro-ecological condition and their problems. This researcher oriented
264 research topic development hindered farmers engagement in the research process. Researchers did
265 not regularly develop research topics that were applied in type. Researchers mostly focused on basic
266 research that did not have room for farmer's participation in the research process to bring impact on
267 farmers live. Even when the research was of applied type, there was a problem of conducting the
268 research on farmer's farm to participate farmers in the whole research process. Researchers conduct
269 research on-station that excluded farmers from participating in the whole research process. This type
270 of research that was not applied under farmer's condition hindered farmers from participating in the
271 agricultural process and inhibited innovation in agriculture to bring food security. Empirical studies
272 (10, 11, 12, 14) reveal that participatory approaches are basically realistic in adaptive and applied
273 stages of agricultural research. Basic research i.e. theoretical or experimental research intended at
274 obtaining knowledge for comprehending of some phenomena without any specific use of the research
275 in view - seems to have less potential for implementing a participatory method. Hence, it hinders
276 farmer's participation in research to bring innovation in agricultural research to bring food security.

277 **3.2 PERCEPTION OF FARMERS' FOR RESEARCHERS**

278 Farmers in the study areas have had their own agricultural experiences which they inherited from their
279 ancestors. They have their own indigenous knowledge to solve their own agricultural problems.
280 Farmers have practical skills that helped them to solve the problems that were common in their
281 agriculture. Farmers evaluated technologies that were developed in research in relation to the
282 practical applicability of the technologies under their own field conditions. Farmers valued
283 researcher's knowledge and skills in terms of the real-world applicability in solving their problems.
284 Farmers perceived researchers as white-collars who did not want to make their hands dirty, teachers
285 who talked mostly things in theory, and people who ignore farmer's indigenous knowledge and have
286 less interest to hear farmer's ideas. Farmers looked researchers as bosses and fear to work with
287 them. Researchers were not working with farmers in a friendly and collegial manner. These all
288 perceptions and factors hindered farmer's participation in agricultural research and inhibited
289 innovation in agriculture in the country. The research findings affirmed that farmers observe the
290 behaviour of researchers, label their social status and use this in their engagement in the research
291 process. Farmers may see researchers as teachers who need to instruct them, ignorant outsiders,
292 facilitators of a mutual and continuous learning process and experts who provide them support. These

293 perceptions will always have a strong bearing on the participation of farmers in research process to
294 work with researchers. These perceptions are most critical factors for the failure or success of
295 research and are critically hinder farmer's participation in agricultural research (10, 18, 19).

296 **3.3 FARMERS' OUTLOOK FOR RESEARCH**

297 Farmers in the study areas were adapted to the use of the traditional way of farming and rearing of
298 animals that they learnt from their fathers and grand-fathers. For farmers in the study areas, research
299 activities were the western way of farming that they looked the work as a difficult and complex activity
300 to perform. For them, agricultural research was a special type of agricultural work that was performed
301 by educated people. Farmers thought that their engagement in research had no value because they
302 could not contribute anything in the research process. They thought that they did not know about
303 scientific knowledge and they did not have western mentality. Farmers did not believe that research
304 solve their problems in agriculture. These types of perceptions for research critically hindered farmer's
305 participation in agricultural research and limited innovation in Ethiopian agriculture. According to the
306 works of (10, 19) that farmers perceive not all research projects whether conventional, participatory or
307 a combination of both as relevant to their local problems. Farmers participate in agricultural research
308 when they believe an improved profitability of their cropping system. Farmers are willing to participate
309 in research if there is a problem that they want to solve and if they think that they can impact the
310 research process.

311 **3.4 LACK OF GOOD EXPERIENCES IN THE PAST**

312 Most of the farmers in the research areas had bad experiences in the past in relation to the use of
313 technologies produced through research. Farmers were told that the use of new agricultural
314 technologies would double or triple their agricultural outputs. Farmers were given false promise from
315 extension workers and government agents about the success of agricultural technologies. In contrary,
316 the yield of agricultural outputs did not double or triple because of the use of new agricultural
317 technologies. Farmers sold their cattle to purchase the agricultural inputs with the assumption that the
318 yield could double. However, farmers did not get the yield to cover their expense and their field were
319 failed and they suffered from lack of good return from the use of agricultural technologies.
320 Inappropriate technologies were also given to farmers for adoption. These technologies which were
321 not appropriate to the given agro ecological zones failed and farmers concluded that new
322 technologies were not working under their farm condition. This emanated from lack of considering the
323 local problems before the introduction of the new technologies. Failures of technologies had risk on
324 farmers live and they feared risk since there was no insurance for the failure of the technology.
325 Because of the failure of technologies and fear of risk, farmers needed to adhere to the practice that
326 they had used for many years. These factors hindered farmer's to participate in agricultural research
327 to bring innovation in agriculture. The research findings confirm that farmers have numerous
328 experiences with research projects. Farmers experiences show that a situation where farmers have
329 become tired of passionate experts who come with toolkits of participatory approach just as they had
330 become investigation weary in earlier years. If earlier research projects fail to provide, farmers are
331 likely to approach the new research with a great deal of reserve and scepticism (10).

332 **3.5 INSUFFICIENT TIME**

333 The research revealed that farmers were involved in different activities besides agricultural works in
334 their life. They spent most of their time on social affairs, agricultural routine activities and family
335 matters. Since most of the farmers were poor, they engaged themselves in different routine activities
336 to support their family. Farmer's involvement in different activities to get their basic needs hindered
337 farmer's engagement in agricultural research. According to the works of (10, 15, 18) that participatory
338 agricultural research needs a major commitment on the parts of farmers in terms of time. But farmer's
339 opportunity costs of time are frequently undervalued by researchers engaged in participatory
340 agricultural research method. Agricultural researchers need to be aware of that "time is a precious
341 commodity not only for scientists but also for farmers". Poor farmers are basically concerned with
342 meeting their basic requirements and could not have time to become involved in research works.

343 **3.6 WEAK INTEGRATION OF INDIGENOUS AND SCIENTIFIC KNOWLEDGE**

344 Lack of indigenous and scientific knowledge integration was one of the problems revealed by the
345 research. Most of the researcher's did not have the interest to hear to farmers ideas. These type of
346 mentality inhibited researchers to effectively use knowledge of farmers in their research. Most of the

347 time researchers' needed farmers to use their labour, land and time but not their indigenous
348 knowledge. Most of agricultural researchers were adhered to the scientific knowledge to develop new
349 agricultural technologies to bring food security. However, farmers have used the local knowledge to
350 lead their life and highly dependent on their indigenous knowledge. Researchers were not in a
351 position to integrate the local knowledge with the scientific knowledge to bring innovation in
352 agriculture in the county. Researchers thought that indigenous knowledge has no capacity to solve
353 the problems of farmers in agriculture. Farmers had great suspect on the scientific knowledge and
354 believed that it did not bring significant solution to their existing problems in their lives. The research
355 also showed that researchers did not have the experiences of integrating scientific knowledge with the
356 indigenous knowledge. Problem of weakness in integrating these important types of knowledge
357 created gap between farmers and researchers and hindered farmer's participation in agricultural
358 research to bring innovation in agriculture. Empirical studies (3, 4, 6) show that most agricultural
359 technologies fail due to lack of indigenous knowledge integration with scientific knowledge in
360 agricultural research process. Moreover, the research does not consider the role of local knowledge
361 in alleviating food security. Researchers try to recommend technologies that seem suitable to a
362 different context without considering farmers, their culture and the socio-economic features of the
363 environment. Lack of integrating farmer's knowledge with scientific knowledge is a common problem
364 across most developing countries and resulted in food insecurity.

365 **3.7 UNWILLINGNESS TO LEARN FROM ONE ANOTHER**

366 The study exposed that the different stakeholders engaged in agricultural development were not
367 ready and willing to learn from one another. Due to their low academic status, farmers were not ready
368 to learn from researchers as well as other farmers. Even there was a problem of knowledge and
369 experience sharing among researchers. Junior researchers did not have the willingness and interest
370 to learn from experienced agricultural researchers. Moreover, senior researchers did not have the
371 interest to share their experiences to junior researchers. Lack of readiness and willingness among
372 farmers, researchers and other stakeholders in agricultural sector inhibited skill development,
373 empowerment and social capital formation that are the key to bring innovation and development in
374 agriculture. This problems hindered farmer's engagement in agricultural research. Most agricultural
375 researchers give due attention to the functional role of participation ignoring skills development, social
376 capital formation and empowerment which can be obtained from social learning (16, 17, 18).

377 **3.8 INSIGNIFICANT CHANGE OF NEW TECHNOLOGIES TO MATERIALS WEALTH**

378 Farmers in the study area told that the new agricultural technologies were not capable of bringing
379 material wealth in their life. Users of the new technology needed the material benefits in terms of
380 money or other materials that would bring change in their life but it was not bring change in the life of
381 farmers. These were due to the use of technologies that was irrelevant to farmer's condition.
382 Researchers mostly spent their time on conducting research that was not demand driven and problem
383 solving. These type of technologies that were not problem solving did not bring material wealth for
384 farmers. Since farmers were not getting material wealth from the technologies, they did not have the
385 interest to participate in agricultural research. According to (19) farmers engagement in agricultural
386 research increases if the technologies produced can bring material wealth and increases resilience of
387 the farmers livelihoods to external shocks and improve the capability of farmers and their local
388 institutions to adapt to changing conditions.

389 **4. CONCLUSION**

390 Based on the above empirical results, farmers' participation in agricultural research is critically
391 hindered by lack of sufficient time from the farmers' side. For farmers' time is critically a limiting factor
392 since they engage themselves in different activities to secure their basic needs. Even though, farmers
393 have participated in agricultural research to a little degree, they do not have good experiences in the
394 past. Some of the technologies were failed and this influenced farmers' participation in research.
395 These bad experiences created in the mind of farmers' bad attitude both for research and
396 researchers. Most of the researchers in the country conduct basic research that inhibited farmers'
397 participation in research. This type of research does not have room for farmers' participation and
398 hindered the readiness and willingness of both farmers and researchers to learn from one another.
399 This unwillingness and lack of readiness to learn from one another created in poor integration of
400 indigenous and scientific knowledge in research to bring innovation in agriculture. Lack of farmers'
401 participation in agricultural research occasioned researchers' to conduct research that is irrelevant to
402 farmers' need. These technologies that are not demand driven and irrelevant to the context of farmers

403 brings insignificant change of the new technologies to material wealth. These all factors critically
404 affect farmers' participation in research and inhibit innovation in agriculture. Innovation in agriculture
405 comes from the interaction of the different actors that are working in agriculture since each actor
406 brings their own knowledge and results in social learning. Insignificant innovation in agricultural
407 research results in food insecurity in the country.

408 **ACKNOWLEDGMENTS**

409 I am very much indebted to Dr. Laurens Klerkx (Wageningen University, knowledge, Technology and
410 Innovation Group) for his extensive suggestions and encouragements, as well as two anonymous
411 reviewers and the editors of American Journal of Experimental Agriculture (AJEA) for constructive
412 comments. I am grateful to Amhara Agricultural Research Institute, Tigray Agricultural Research
413 Institute, Bahirdar University, Mekele University and all people who were involved in the research
414 process. This research was funded by Wageningen University, CASCAPE project and The
415 Netherlands organization for international cooperation in higher education (NUFFIC). Without the
416 support of these organizations, the article could not have been written.

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