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# ejeset

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and Technology

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Research Article

# Effectiveness of Participatory Planning for Community Development: A Case Study on Ward No-6 in Pabna Municipality

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## ABSTRACT

In modern-day global, network participation is taken into consideration as the prerequisite of sustainable urban improvement. Its levels from just informing people approximately the plan or improvement projects utilizing the humans. However, public participation in neighborhood authorizes led applications is nonetheless confined in Bangladesh. Increasingly, community participation is considered important in ensuring the sustainability of community utility services. In return, better access to all service facilities such as water supply, gas supply, transportation, health care, recreational area, electricity supply, etc. are important in the development of the living standard of the communities of an area. As the rate of community participation, this paper reconnoiters the extent of public participation in spatial planning performs in the Pabna municipality built totally on the citizen's responses. Data were collected from community service facilities of ward no-06 in Pabna Municipality, Pabna District. Community Effect Index (CEI) and User Satisfaction Index (USI) were used to assess the performance of the community level utility services. The results indicate whether community-level utility services were effective or not. There is a general need to improve the quality and quantity of other services facilities like recreation facility, market facility, health facility, solid waste management system and transportation facility, and a need to improve authorized sections i.e. Municipality authority as well as NGOs to provide better services in this area.

**Key Words:** Community Participation, Service Facility, Community Effect Index (CEI), User Satisfaction Index (USI)

## 1. INTRODUCTION

Community participation is maybe one of the greatest overworked ideas in the planning of today's world. For the earlier few eras, it has contained as the essence of development creativities in nearly every country and has become a projecting concept in determining sustainable growth on space (Botes and Rensburg, 2000; Marfo, 2007). The self-organized network of human beings with a commonplace time table, motive, or interest, who collaborate by sharing thoughts, data, and different resources. The network emerged as a group of people with diverse traits who're linked employing social ties, proportion common perspectives, and interact in joint motion in geographical locations or settings. The United Nations defines network improvement as "a manner where community participants come collectively to take collective motion and generate answers to not unusual problems (Mahendra, and Mahesh 2015). The idea of participation has been focusing on extensive debates about its historical origin, theoretic grounding, and practical applicability (Mikkelsen, 2005). Despite comparable rhetoric and said rules, there are predominant variations discovered in the planning and management of cities in developed and growing countries. These differences are maximum glaring in the degree of involvement of residents in making plans and urban governance processes (Swapan, 2013). In the modern era where good governance is the principal factor of sustainable improvement, the concept of participatory planning and control has received good-sized popularity and is getting enormous significance in developing countries (Murdia, 2005). Public participation techniques in the planning process have been recorded and delivered to the developing quantity of literature of planning and come up with a new vision of making plans manner in response to the sustainable outcome of making plans and development projects. In the past due to the nineteen sixties, when interest in peoples' involvement was skyrocketing (Arnstein 1969).

Participation is one of the maximum critical ideas in planning and development because it is doubtlessly a car for special stakeholders to impact improvement techniques and interventions, which can be by and large ruled by using professional specialists in the government and personal area. Participation combines the experiences, expertise, and knowledge of numerous organizations and citizens (Mitchell, 1997). The participatory method can enhance the high-quality of local governance via growing approaches which might be greater democratic and equitable. The terrible regularly have little, if any, a voice in authorities' decisions. Session and communication among nearby government and interest agencies representing the negative can provide the latter greater voice and affect over choices. The participatory technique can

inspire the negative to be more accountable for, worried in, and aware of their function in nearby governance. It can assist reduce potential warfare and construct a local human feeling of possession within the government's plan. It could result in packages that might be better and greater efficient (So,1979). Pabna is a secondary town with huge potential. The rate of Urbanization and population is increasing day by day. For a fruitful plan and a sustainable development of secondary township alike Pabna, it is very important to access the efficacy of Participatory Planning. That's why This study can be used in identifying needs, planning, monitoring, or evaluating projects and programs. This is a powerful consultation tool, it offers the opportunity to go beyond mere consultation and promote the active participation of communities. The participatory planning approach is essential for at least two reasons, one is it strengths civil society and the economy by empowering groups, communities, and organizations to negotiate with institutions. By that, an effective and sustainable plan can be made and the governance of the city can be run efficiently.

## 2. LITERATURE REVIEW

Community participation has been encouraged for its unreserved benefits for planning and development of the society. Prominent Scholars i.e. Santrock (1998), Forester (1989), Healey (1992), and others have emphasized the need for participatory, need-based totally and socially satisfactory making plans in the neighborhood of the traditional pinnacle-down expert-driven method (khan and Swapan, 2010). To achieve these targets, sustained and on-going planning reforms have been inevitable. Making plans reforms throughout the 1980s and nineties in developed nations have led to a shift faraway from conventional urban making plans and control toward approaches that combine technological innovation in making plans management with the studies, understanding, and understanding of numerous groups and residents (Mitchell, 1997; Wandersman and florin, 2000). There is an extensive consensus on requirements of community participation in progressing towards sustainable urban improvement (Rahman, 2008). Genuine involvement of citizens in decision-making methods leads to better selections that allow wise making plans and management of long-term initiatives. Participation, in exercise, ranges from without a doubt informing people about the plan to making sure that the plan is made by way of the human beings (Arnstein 1969). (Glass 1979) identifies faculties of thought regarding the purpose of citizen participation, "one adopting the citizen attitude and the different advocating the administrative perspective". The former concept perceives residents as a dependable instrument to acquire the executive goal while the latter one gives citizens a valid position indecision-making. The critics of making plans agree that despite theoretical development and reforms in practice, making plans isn't democratic enough to ensure incorporated illustration from various sectors of the society (Forester, 1989; Healey, 1992; Sandercock, 1998). To foster democratic urban surroundings, network participation is identified as a maximum powerful tool for sustainable city policy and physical developments towards collective hobby (Alfasi, 2003). Network participation is considered fundamental to fair and representative decision making in cutting-edge urban planning exercise (Mahjabeen et al, 2009).

## 3. MATERIAL AND METHOD

### 3.1 Study area Profile

Pabna municipality is one of the first-born municipalities in Bangladesh and it turned into established in 1876. It is located at 161 km north-west of Dhaka metropolis and one hundred ten km east of Rajshahi town. The region of the Municipality is ready 16sq km and its populace is 1,33, 403. The Pabna Municipality is between 23°53" n and 24°05" n range and 89°09" e and 89° 25" e longitudes. General region about 16 sq. Km is inclusive of 15 wards and the number of 23 mouza. The boundary of the municipality (Parvez and Islam, 2020). The study area is ward no-6. The study area is one of the dominant wards of the Pabna Municipality. The area is about 256.117 acres with population 8949. Ward no. 6 is called the religiously dominated zone. Pabna central Eidgah is included under ward no.6 (MIDP, 2008).

**Table 1.** Ward No. 6 Projected Population (2001-2027)

Ward No	Area in acres	Household	Population					
			2001	2007	2012	2017	2022	2027
6	256.117	1441	6792	7435	8157	8949	9818	10772

Source: (MIDP, 2018).

### 3.2 Research Method

Random Sampling was used to determine the samples. Primary data was collected from the Household Interview Survey (HIS) and via Focus Group Discussion (FGD). Then the total study area was divided into three blocks. Based on the designated impartial open-ended and close-ended questionnaire was prepared to classify the insight of the local inhabitants regarding the optimistic or adverse changes. For making Mobility Map, a Social map, Resource Map Key Informal Interview (KII) was done. The secondary data was collected from the Municipality office, Non-Government Office (NGO) of the study area, previous research, and journals. From the collected data, criteria map such as social map which included road network map, educational institution map, administrative centers; resource map which included water body, industrial, vegetation, forest, reserved area, etc.; service facility map included drainage map, road network, water supply, etc.; mobility map included different types of dominant mode movement, maximum dominant mode between the study area and surrounding wards, etc. The road network map was then utilized for preparing different infrastructure maps of the Municipality. The maps include a drainage map, street lighting map, water supply pipeline map, gas line map, telephone line map, ongoing project map, etc. Those maps were prepared via the Geographic Information System (Arc.GIS-10.5), and

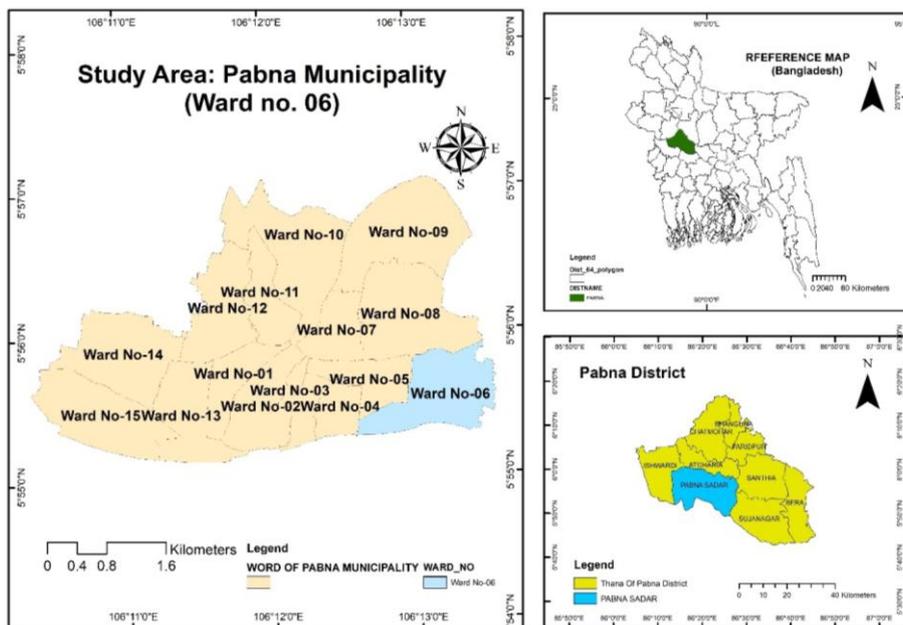
data were processed by SPSS 21.0.

The effects of various Utility services like water supply, gas supply, better transportation facilities, service opportunities to the community is a primary concern whether these services serve effectively or not. For the CSI, it was assumed that satisfaction level from 0 to 33 = 3 (excellent), from 34 to 66 = 2 (moderate) and from 67 to 100 = 1 (bad). The calculation is-

$$CSI = 100 - \frac{100(\sum Si - 1)}{3b} \quad (\text{Prihatmojo and Anindita, 2017}).$$

The consumer satisfaction index (USI) measures the provider satisfaction of a facility-based totally on the perceptions of the customers approximately that specific facility. The USI wide variety is calculated through the delight quotes expressed through the users, weighted based totally at the prices as (eboli and mazzulla 2009).

$$USI = \sum_{k=1}^n Sk . Wk$$



Source: (Author, 2020)  
**Figure 1.** Study Area Location Map

## 4. RESULTS AND DISCUSSION

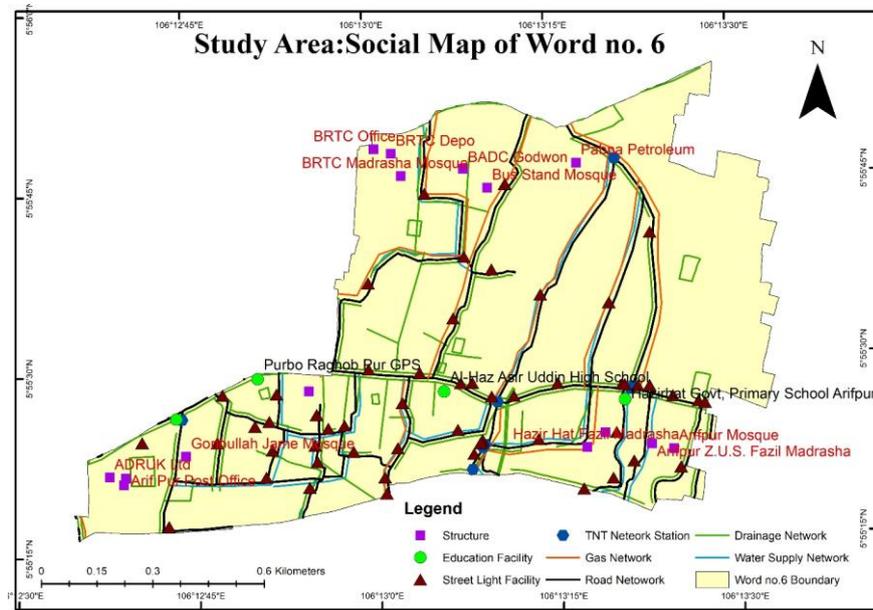
### 4.1 Participatory Approaches for Community Planning

Based on the current condition evaluation and the survey result, the overall performance evaluation of different municipal offerings had been recognized and some pointers had been furnished to reduce the related problems consistent with stakeholder’s attitude.

#### 4.1.1 Social Map

First decide what type of area the map will show or any limitations such as a village, an indigenous ancestral domain, a watershed, and so on. Social maps begin as physical maps of the residential area of a community. The principles followed in setting up the exercise and getting going for the social map are similar to those used with a community resource map. As a CBD area of the municipality, the overall social condition is better compared to the other wards. The majority number of public and private offices, administrative centers especially the municipality located in the study area. The two-govt. health center fulfilled the demand of the community people. Due to a better road network, the communication system is flexible with other areas.

Based on the Social Map (Figure-2) of the study area, it is noticed that there three Schools in the study area named Al-Haz Asir Uddin High School, Hazirhat Govt, Primary School Arifpur, and Purbo Raghob Pur primary School. Two Religious educational institutions named as Hazir Hat Fazil Madrasha and Arifpur Z.U.S. Fazil Madrasha are also situated at the study area. Five Muslim religious facilities: the mosque is situated in the study area. One bus depo: BRTC bus depo is also there. Moreover, one petroleum Station known as Pabna Petroleum is also there. One market is situated at word no.6 which is popularly known as Hazir Hat. An important institution is situated here. The food storage of the Pabna Municipality is situated here known as BADC Godaun. A well-known industry: ADRUK Ltd is situated at word no.6. Two TNT network station is situated in the study area. Finally, the road network, gas network, water supply network, drainage network, and street light points are also shown at the Social Map.



Source: (Author, 2020)  
**Figure 2.** Social Map of the Study Area

### 4.1.2 Resource Map

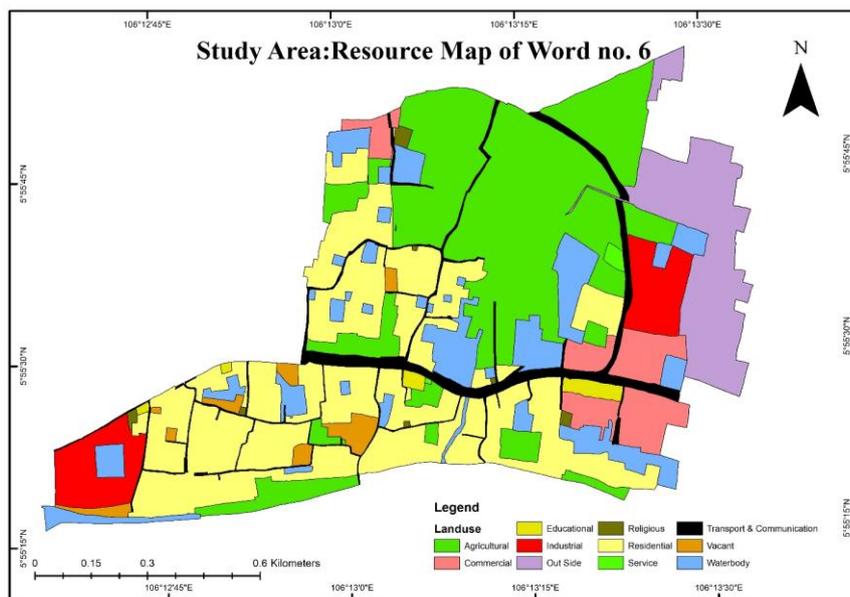
Ward no.6 is the most dominated land use as per residential and educational institutions. It can be said that Ward no.6 is a peri-urban area which is recently added to Pabna Municipality and it also called the residential zone. The resource is the assets of the institution and includes financial, physical (equipment, buildings, raw materials, or their tangible assets), human (experiences, skills, knowledge), intangible (reputation, registered design, database, etc.) and cultural (history, culture, work system). The land use pattern is shown at the resource map from where the current condition of the study area about the resource pattern will find out.

### 4.1.3 SWOT Analysis

SWOT stances for Strengths, Weaknesses, Opportunities, and Threats, and so a SWOT Analysis is a method for evaluating these four aspects for performance evaluation. SWOT analysis aims to recognize the main interior and exterior issues seen as significant to accomplishing an objective.

SWOT analysis groups key pieces of information into two main categories:

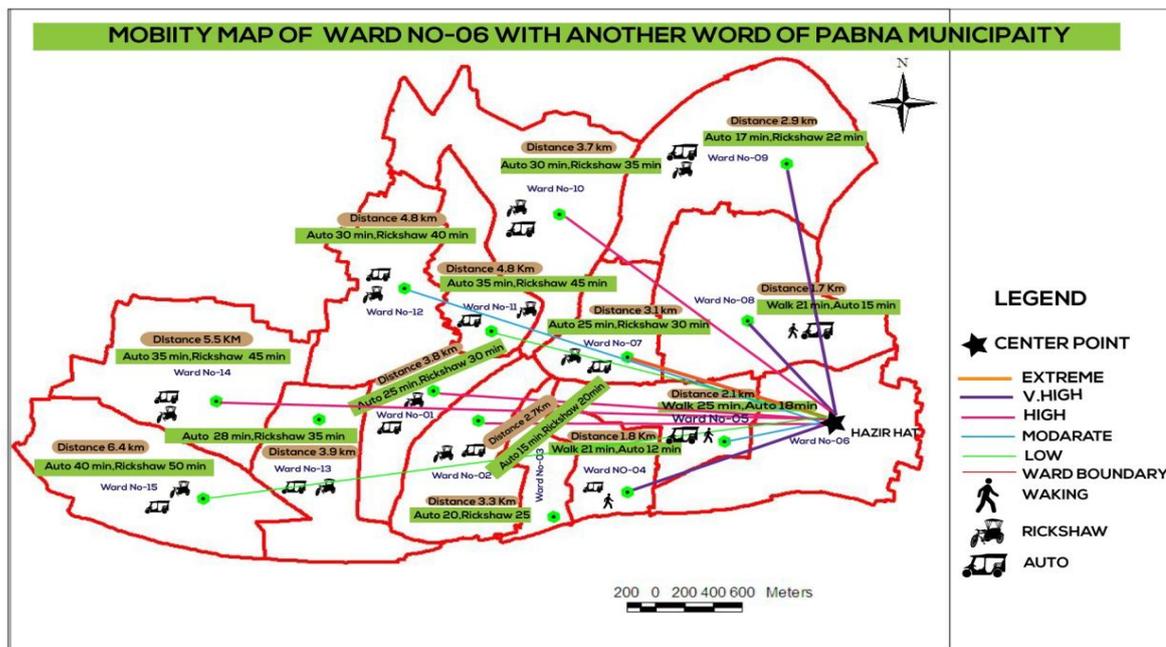
1. Internal factors – the strengths and weaknesses internal to the organization
2. External factors – the opportunities and threats obtainable by the environment exterior to the society



Source: (Author, 2020)  
**Figure 3.** Resource Map

### 4.1.4 Mobility Map

Mobility can be defined as the ease with which people and goods move throughout their community, state, and the world. Transportation's most essential function is to provide safe mobility for people and goods. This map does all the calculations for the transportation mobility map. It exists as a placeholder, in case there is a need to split automobile-based and transit-based transportation analysis. Use this map to assess transportation and mobility in the region. This map creates a composite opportunity score by combining fourteen maps showing different aspects of the transportation system and mobility options in the region. Areas with good transportation opportunities are easy to get to or travel from. This makes getting to work, school, shopping, and recreation are easier and less expensive. Areas with high transportation and mobility opportunities will provide many transportation options. This map is calculated using weighted scores from a set of transportation and mobility-related maps.



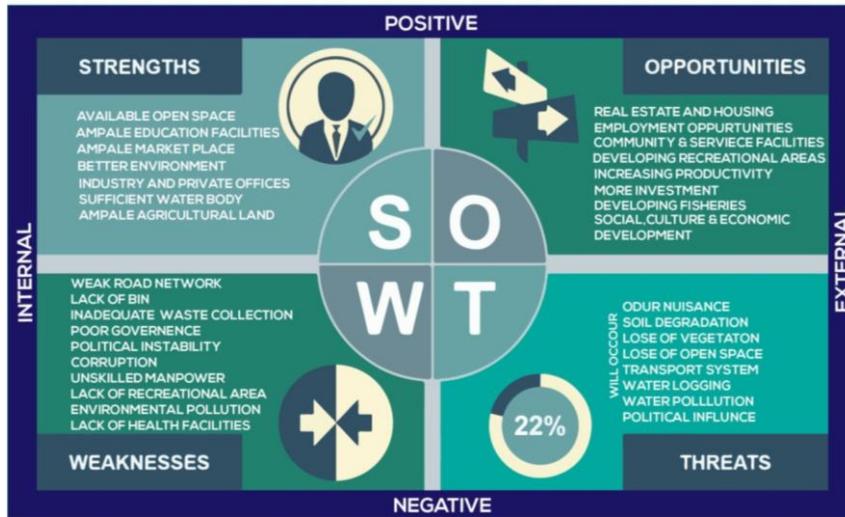
Source: (Author, 2020)  
**Figure 4.** SWOT Analysis

**Table 2.** Mode of Transportation And Cost in Ward No.6

Ward no 06	Distance(km)	Mode of Transportation & Time	Frequency of Trip
Ward No 01	3.8	Auto-25 min, Rickshaw-30 min	High
Ward No 02	3.3	Auto-20 min, Rickshaw-25 min	High
Ward No 03	2.7	Auto-15 min, Rickshaw-20 min	Low
Ward No 04	1.8	Walk-21 min, Auto-12 min	Very High
Ward No 05	2.1	Auto-18 min, Walk- 25 min	Moderate
Ward No 07	3.1	Auto-25 min, Rickshaw-30 min	Extreme
Ward No 08	1.7	Auto-15 min, Walk-21 min	Very High
Ward No 09	2.9	Auto-17 min, Rickshaw-22 min	Very High
Ward No 10	3.7	Auto-30 min, Rickshaw-35 min	High
Ward No 11	4.8	Auto-35 min, Rickshaw-45 min	Low
Ward No 12	4.8	Auto-30 min, Rickshaw-40 min	Moderate
Ward No 13	3.9	Auto-28 min, Rickshaw-35 min	Low
Ward No 14	5.5	Auto-35 min, Rickshaw-45 min	High
Ward No 15	6.4	Auto-40min, Rickshaw-50 min	Low

Source: (Field Survey, 2020).

Assume that, Hazir hat is the center point ward no: 06. This map shows the different types of dominant mode movements. Highly moderate –very low straight line shows, maximum dominant mode between study areas with the surrounding ward. The most dominant vehicle found that Auto Rickshaw. Due to a lack of better traffic management that vehicle takes vast time.



Source: (Author, 2020)

Figure 5. Mobility Map of Ward No. 06

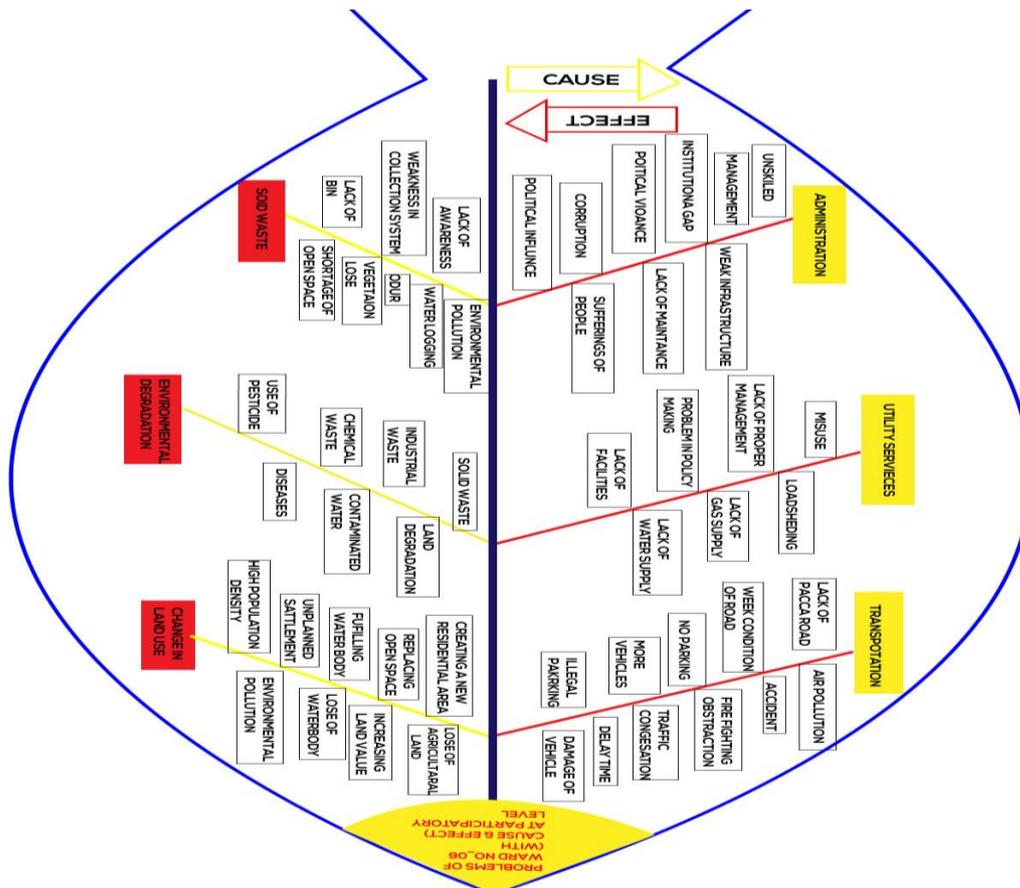
### 4.1.5 Cause Effect Diagram

A cause and effect diagram examines why something happened or might happen by organizing potential causes into smaller categories. It can also be useful for showing relationships between contributing factors. A fishbone diagram can help identify possible causes for a problem that might not otherwise be considered by directing the team to look at the categories and think of alternative causes. In this study, the fishbone diagram includes.

**Problems:** It includes problems in ward no. 6 such as transportation and solid waste management environmental degradation problem.

**Causes:** Causes include the factors which are responsible for the problems, which are shown on the left side of the diagram.

**Effects:** Because of the causes which effects are faced by the local people, shown on the right side of the diagram.



Source: (Author, 2020)

Figure 6. Fishbone Diagram

## 4.2 Performance Evaluation of Community Service Facilities

### 4.2.1 USI (User Satisfaction Index) for Ward No. 06

Satisfaction in utility services like water supply, gas supply, better transportation facilities, service opportunities is basic to the maintenance of an appropriate standard of living for the community. A wide range of community facilities is also necessary and assess the facility requirements for community uses. For the USI, it was assumed that satisfaction level from 0 to 33 = 3 (bad), from 34 to 66 = 2 (moderate) and from 67 to 100 = 1 (excellent). The ward no 06 was categorized into three blocks as Block – A, Block-B, and Block –C. the user satisfactions of each block for the community satisfactions are given as follow table 3.

**Table 3.** Block wise USI of each service facilities

Name of The Services	Block - A		Block - B		Block – C	
	USI (User Satisfaction Index)	Rank	USI (User Satisfaction Index)	Rank	USI (User Satisfaction Index)	Rank
Water Supply	73.33	1	71.25	1	73.33	1
Electricity Supply	55	2	62.5	2	47.5	2
Solid Waste Management	74.17	1	55	2	49.17	2
Educational Facility	63.33	2	59.38	2	81.67	1
Market Facility	75.83	1	60	2	74.17	1
Health Facility	46.67	2	38.13	2	43.33	2
Transportation Facility	90	1	96.25	1	39.17	2
Recreational Facility	0	3	0	3	0	3

Source: Author, 2020

**Table 4.** Average USI of Utility Services

Name of the Services	Average USI	Service Condition
1. Water Supply	72.64	Excellent
2. Electricity Supply	55	Moderate
3. Solid Waste Management	59.45	Moderate
4. Educational Facility	68.13	Excellent
5. Market Facility	70	Excellent
6. Health Facility	42.71	Moderate
7. Transportation Facility	75.14	Excellent
8. Recreational Facility	0	Bad

Source: (Author, 2020).

### 4.2.2 Community Effect Index (CEI)

The effects of various Utility services like water supply, gas supply, better transportation facilities, service opportunities to the community is a primary concern whether these services serve effectively or not. A wide range of community facilities is also necessary and assess the facility requirements for community uses.

**Table 5(a).** Block wise CEI of each service facilities

Name of The Services	Average CEI	Rank	Block A	Block B	Block C	$\Sigma$ Si
1. Water Supply	28.50	3	3	3	3	9
2. Electricity Supply	54.38	2	2	2	2	6
3. Solid Waste Management	52.42	2	2	2	2	6
4. Educational Facility	43.42	2	2	2	3	7
5. Market Facility	28.46	3	3	3	3	9
6. Health Facility	47.45	2	2	2	2	6
7. Transportation Facility	24.89	3	3	3	2	8
8. Recreational Facility	100	1	1	1	1	3

Source: (Author, 2020).

**Table 5(b).** Average CEI of Utility Services

Name of the Services	CEI	Service condition
1. Water Supply	11.11	Excellent
2. Electricity Supply	44.44	Moderate
3. Solid Waste Management	44.44	Moderate

4. Educational Facility	33.33	Moderate
5. Market Facility	11.11	Excellent
6. Health Facility	44.44	Moderate
7. Transportation Facility	22.22	Excellent
8. Recreational Facility	77.77	Bad

Source: (Field Survey, 2020).

## 5. CONCLUSION

The performance evaluation of various service facilities in this study area was measured by the community participation in their satisfaction level and by the community effects. Community perceptions regarding service quality are central to evaluating different utility performance and can reveal performance gaps and identify areas of concern. Besides, trends over time can be used by regulators and policy-makers to evaluate utility performance. In principle, expenditure decisions made by distribution utilities should be largely driven by the quality of service requirements imposed by corresponding. The study tried to find out the participatory planning involvement in the development of the community. It is seen that the USI value is excellent at the study area on water supply, education, transportation, and in-market facility. But at the recreational facility, the municipality authority should focus more to satisfy the users. Some attention needs to be addressed towards the electricity facility, solid waste management, and health facilities according to USI value. According to CSI value, special attention needs to be given towards the recreational facility along with moderate attention need to be given towards electricity supply, education, solid waste health facility, and transportation facility. From the whole study, it concludes that participatory planning tools are one of the most appropriate and suitable methods for finding the actual position of community services, which service is effective more and which are less effective to the community. Through these analyses, the socio-economic and infrastructural aspects of the community can be expressed. The main focus of the project was on mobility, resources, cause-effect, and services opportunity. The community peoples are very happy and satisfied with the PRA role because they will ensure maximum participation through Community Based Organization for community development.

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Research Article

# Effect of Dimensions of Workplace Spiritualism: Meaningful Work, Sense of Community, Organizational Values and Compassion with Reference to Job Satisfaction

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## ABSTRACT

Workplace spiritualism (WS), although a newer concept, is seen to have gained tremendous importance in the recent years and is expected to furthermore expand in scope and applicability in future. The objective of this research paper is to understand the impact of workplace spiritualism on the degree of job satisfaction of employees with special reference to IT industry. Through this research impact of Workplace Spiritualism on enhancing employee performance was studied. The methodology used was articulating the problem, formulating the hypothesis and collection of facts from survey. An empirical study was carried out to get the results for this research study. A total of 110 completed questionnaires were received. Descriptive Statistics, casual research and correlations were carried out. Four main dimensions used for measuring the spiritualism at the workplace are identified which include meaningful work; sense of community; organizational values as well as compassion. The results of this study showed that all the four dimensions of WS have a significantly strong as well as positive relationship with the level of employee job satisfaction. Sense of community as well as organizational values are the two most important dimensions influencing job satisfaction. The paper recommends that WS should be enhanced in the IT sector since it influences job satisfaction and employee performance. The study would be useful for the policy makers, researchers and HR professionals to understand the importance of WS in IT sector.

**Key Words:** Workplace Spiritualism, Meaningful Work, Compassion, Sense Of Community, Organizational Values, Job Satisfaction

## 1. INTRODUCTION

All organizations should be focusing on maximizing the job satisfaction of their employees in order to ensure maximum contribution and efforts from them towards the growth of the organization. It is essential to understand the concept of workplace spiritualism in the organizational context. Job satisfaction highlights to what extent an employee feels satisfied with his/her respective job. The objective of this research paper is to understand the impact of workplace spiritualism on the degree of job satisfaction of employees. Workplace spiritualism is about understanding that the employees are not only having a mind but also a spirit which induces them to look for a purpose in the work they perform as well as a wish to develop an association with others and having a sense of community. In context of the workplace, the idea of spiritualism is a relatively new one even though it has existed in other aspects of human experience for long. People tend to look for a meaning in their work as well as maintaining harmonious relations with other employees in the organization. Workplace spiritualism is much more than just implying one's physical and intellectual capabilities to one's work and instead explore other aspects of one's being. In order to have a clear understanding of spirituality at work one needs to recognize that people have an inner life as well as an outer life wherein the outer life's meaningfulness and productiveness depends on how one's inner life is nurtured (Ashmos and Duchon, 2000).

With the dynamic changes going on within the global economic environment like downsizing, competition and globalization, to some extent have resulted in a sense of less relevance and lower meaningfulness of work among the employees which requires the organizations to bring in the concept of spirituality in the workplace to embrace such changes effectively. The organizations need not be of spiritual nature for implying workplace spiritualism, rather the employees must be permitted as well as urged to be able to experience spirituality in their work environment. Nevertheless

higher profitability as well as productivity can be achieved once the organization and its employees both are spiritual (Walt and Klerk, 2014).

Job satisfaction means the degree of contentment that employees have with their respective jobs. It is an attitude that an employee possesses for a particular job.

The employees are said to be satisfied with their job when they are happy to perform it and have a positive perception towards the same. The perception of the employee has an important impact on the level of satisfaction with the job. (Aziri, 2011). Job satisfaction is of utmost importance as unless the employees are satisfied with their jobs, they will not be contributing the best of their efforts for effective job performance. Job satisfaction is essential to ensure that the employees enjoy their work and have a sense of positive approach towards their job. There are various personal as well as organizational variables which impact the degree of employee job satisfaction. Organizations that are spiritual in nature offer a sense of spiritual fulfillment to employees through meaningful work with employees considering work as most important in their lives. This not only results in general life satisfaction but also job experience further contributing to job satisfaction. On the contrary, the lack of workplace spiritualism in an organization may lead to a negative work experience resulting in dissatisfaction of employees with their job (Walt and Klerk, 2014).

The prime purpose of the study is understanding the link between workplace spiritualism and job satisfaction within the organizations. The concept of workplace spiritualism is trending in the recent times and has a huge scope for research. From the results of this study, valuable insights can be drawn by the HR managers while making decisions related to job satisfaction strategies keeping the employees interests in mind.

## 2. LITERATURE REVIEW

### 2.1 Workplace Spiritualism

Ashmos and Duchon (2000) discussed workplace spirituality as recognizing that there is an inner life of employees that nurtures and is nurtured through the meaningfulness of the work taking place in community context.(Harrington, 2004) described spirituality at the workplace as a desire of the spirited beings to get energized by the work they perform in the organization. It is viewed as experiencing a more real meaning and purpose of work that is beyond the paychecks and review of work performance and which gives an essence of togetherness, attraction and common attachment, both within the separate work department as well as the entire organization taken on the whole.(Gotsis and Kortezi, 2008) describe workplace spiritualism as an experience involving a sense of personal completeness and joy, transcendence as well as interconnectedness as analyzed in various theoretical frameworks. Workplace spirituality can be referred to as those workplace aspects, be it in the individual, the group or the organization which encourage feeling of satisfaction in individuals through transcendence (Giacalone and Jurkiewicz, 2010). (Schutte, 2016) has discussed that no universally agreed definition exists for workplace spiritualism which leads to obscurity and vagueness in this area of study. The paper also revealed the influence of the spiritual beliefs already existing within the strategic leaders as well as the employees on their respective leadership and day to day workplace operations exercising style.

### 2.2 Job Satisfaction

Job satisfaction is a mixture of environmental, psychological and physiological circumstances which makes people truthfully tell that they are satisfied with their respective job they perform (Hoppock, 1935).(Davis et al., 1985) described job satisfaction as a blend of workers' feeling towards their work, both positive as well as negative. The expectations that an employee has dismissed can be determined through the desires and needs that he brings with him when he gets employed at a business organization. Job satisfaction measures the degree to which the expectations and the actual awards match. It is related to the behaviour of the individual employee at the place of work. Job satisfaction can also be described in terms of the level of contentment that one has with the rewards that one receives from the job they perform especially in the form of intrinsic motivation (Statt, 2004).The people's attitude and feelings towards their work define their degree of employee job satisfaction. A positive and favourable attitude can suggest job satisfaction whereas a negative or unfavourable may reveal an employee's dissatisfaction with the job (Armstrong, 2006).(George et al., 2008) described job satisfaction as a combination of the people's feelings and beliefs regarding their respective jobs. The level of job satisfaction that people have with their jobs ranges between extreme satisfaction to extreme dissatisfaction. Also, apart from having attitude towards the job on the whole, attitudes of people can also be with regard to other parts of job such as their colleagues, superiors, work, pay etc.

### 2.3 Relationship Between Workplace Spiritualism And Job Satisfaction

Chawla and Guda (2010) discussed the association that individual spirituality at workplace has with the job satisfaction, job commitment as well as the propensity to leave of the sales professionals across several industries. The results showed a positive relation exists between workplace spiritualism and job satisfaction as well as job commitment while a negative relation exists among workplace spiritualism and propensity to leave.(Noor and Arif, 2011) examined how job satisfaction might be achieved through workplace spiritualism in context of Pakistani doctors. Organizational spirituality and personal spirituality are the two constructs of spirituality identified in the paper. The theoretical framework used for the same highlights that the workplace spiritualism includes both personal as well as organizational spirituality which together effects the job satisfaction of employees. The study concluded that organizations with different structures would also differ in their culture as well as spirituality while the personal perspective of spirituality may indicate an individual reflection, feeling as well as an emotional experience. The results determined that spiritualism plays a prime role in ensuring job

satisfaction among the employees. (Marschke, Preziosi and Harrington, 2011) have analyzed the relationship that exists between job satisfaction and workplace spiritualism. The intrinsic as well as extrinsic job satisfaction was studied with respect to spirituality at the workplace as standalone variables. Also the relationship between such variables that can contribute to employee development, employee retention, lower turnover rates etc. The results showed that if workplace spiritualism is positively related with job satisfaction, it can transform the individual and organizational lives. (Gupta, Kumar and Singh, 2013) analyzed how workplace spiritualism impacts the employee job satisfaction with regard to the private insurance sector of Punjab, India. For this they identified and examined four dimensions that can be used to measure spiritualism at workplace, namely, sense of community; organizational values; meaningful work as well as compassion. The correlation results revealed a positive relation between each of these four dimensions of workplace spiritualism and job satisfaction. The regression analysis highlighted that organizational values as well as sense of community are highly significant dimensions of workplace spiritualism in context of job satisfaction among employees. (Dandona, 2013) discussed the importance of workplace spirituality as a concept in the management field. Organizations are analyzing how employees are no longer looking for just material gains but something superior to that. The importance of job satisfaction is also described as it measures how much the employee loves his job, looks forward to come to work, be enthusiastic about his job and willing to work for the organization. Personal growth and achievement, fulfillment, self-actualization, creativity etc. can be observed in a spiritual being whose inner self is energized. The paper discussed three parts of conceptualization of spirituality at workplace that are, inner life, meaningful work as well as sense of community. The benefits of workplace spirituality are suggested in terms of resulting honesty and trust, personal fulfillment, creativity and commitment all together contributing towards higher organizational performance. (Walt and Klerk, 2014) examined the association of workplace spirituality with job satisfaction. The results are based on a cross sectional study of employees working at two different industries of South Africa. The findings highlighted a positive relationship among the two along with offering a deeper and more clear idea about the personal and organizational spirituality as well as job satisfaction. Also, the importance of spiritually based organizations was highlighted which will result in the employees being satisfied with their overall work experience.

Hassan, Nadeem and Akhter (2016) discussed the link of dimensions of workplace spiritualism with job satisfaction, having trust as the mediating factor. Workplace spiritualism was found as a topic of great interest among academicians as well as industry people. The dimensions of workplace spirituality identified included meaningful work, sense of community as well as value of organization. The results are based on the responses obtained from the education sector. The findings revealed that workplace spiritualism and trust are positively related with trust mediating the interaction between workplace spiritualism and job satisfaction. (Fatima et al., 2017) analyzed, using intrinsic and extrinsic values as a moderating factor, the relation of workplace spiritualism with job satisfaction. The survey was conducted using self-administered questionnaires. The results of the study showed that the existence of high intrinsic values makes the relation between job satisfaction and spirituality at workplace stronger. On the other hand, the extrinsic values are also found to be moderating this relationship although it has a negative impact on the same. The paper also briefly discussed four aspects of spirituality at workplace, namely, work values, meaningful work, inner life as well as sense of community. The study revealed that spirituality at the work place is an important indicator of job satisfaction. (Habib and Khan, 2018) measured the impact of workplace spiritualism on job satisfaction of the employees working in Prasar Bharti and All India Radio (New Delhi). The study discussed four main dimensions of measuring workplace spirituality, that are, transcendence, compassion, meaningful work as well as mindfulness. The study focused at identifying possible links among the mentioned dimensions related to workplace spiritualism and job satisfaction for which cross sectional study was conducted in 2014 on 30 government employees working in Prasar Bharti and All India Radio. The results revealed that there exists a significantly positive correlation among the selected dimensions of spiritualism at the workplace and job satisfaction that can contribute towards higher productivity in the workplace.

### 3. RESEARCH METHOD

#### 3.1 Research Objectives

- a) To study the concept of workplace spiritualism.
- b) To understand the various dimensions of workplace spiritualism.
- c) To study the relationship between workplace spiritualism and job satisfaction with respect to the IT sector.
- d) To analyze the effect of workplace spiritualism on the job satisfaction with respect to the IT sector.

#### 3.2 Research Hypothesis

##### Hypothesis I

H<sub>0</sub>1: There is no significant relation between meaningful work and job satisfaction with respect to the IT sector.

H<sub>a</sub>1: There is significant relation between meaningful work and job satisfaction with respect to the IT sector.

##### Hypothesis II

H<sub>0</sub>2: There is no significant relation between sense of community and job satisfaction with respect to the IT sector.

H<sub>a</sub>2: There is significant relation between sense of community and job satisfaction with respect to the IT sector.

## Hypothesis III

H<sub>03</sub>: There is no significant relation between organizational values and job satisfaction with respect to the IT sector.

H<sub>a3</sub>: There is significant relation between organizational values and job satisfaction with respect to the IT sector.

## Hypothesis IV

H<sub>04</sub>: There is no significant relation between compassion and job satisfaction with respect to the IT sector.

H<sub>a4</sub>: There is significant relation between compassion and job satisfaction with respect to the IT sector.

## 3.3 Research Design

An empirical study was conducted with the aim of attaining the objectives of the study. The study includes two types of research designs. Firstly, descriptive statistics has been carried out with the aim to study the concept of workplace spiritualism and the various dimensions that constitute workplace spiritualism. Secondly, causal research has been conducted for understanding the association of the independent variables with the dependent variables of this research. Correlation was used for studying the link between workplace spiritualism and job satisfaction with respect to the IT sector while regression analysis was used for measuring the effect of workplace spiritualism on job satisfaction with respect to the IT sector.

## 3.4 Sampling Design

Simple random sampling was used to pick the respondents working within the IT sector. A total of 110 responses have been collected for the research study.

## 3.5 Tools For Data Collection

For this research, data was gathered through both primary and secondary sources. The primary data was gathered through a questionnaire while the existing data on similar studies was analyzed for obtaining the secondary data. The research questionnaire comprises of 3 sections. Section A contains 2 questions regarding personal information, section B has 35 questions related to the workplace spiritualism in the form of 4 subsections, namely, meaningful work, sense of community, organizational values and compassion, section C relates to measuring job satisfaction and it includes 18 questions. The questions for measuring workplace spiritualism used in section B were taken from the scale that was developed by (Gupta, Kumar and Singh, 2013) in their paper titled "Creating satisfied employees through workplace spirituality: A study of the private insurance sector in Punjab (India)." The section C of the questionnaire measuring job satisfaction is the modified form of the short form version of the Minnesota Satisfaction Questionnaire (MSQ) (Weiss et al. 1967) as used in the paper titled "Creating satisfied employees through workplace spirituality: A study of the private insurance sector in Punjab (India)" (Gupta, Kumar and Singh, 2013).

## 3.6 Techniques for Data Analysis

Statistical package for social sciences (SPSS) version 25.0 was applied to the data for conducting descriptive analysis as well as causal analysis (correlation and regression). For testing the research hypothesis, correlation and regression was used. Pearson's correlation coefficient is significant at 0.01 levels, 2-tailed.

## 4. RESULTS AND DISCUSSION

### Hypothesis I

The analysis revealed the Pearson's coefficient of correlation to be 0.927, a value which is highly significant, ( $p < 0.01$ ). The high value of correlation indicates that job satisfaction is positively affected by meaningful work. Therefore, hypothesis I (H<sub>a1</sub>) is accepted. The result R square = .860,  $p < 0.01$  highlights that when the work assigned is meaningful, there is a 86.0 % rise in the employee job satisfaction.

**Table 1.** Results for correlation between meaningful work and job satisfaction

R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Standard error of the estimate
.927	.860	.859	5.65893

### Hypothesis II

The analysis revealed the Pearson's coefficient of correlation to be 0.945, a value which is highly significant, ( $p < 0.01$ ). The high value of correlation indicates that job satisfaction is positively effected by a sense of community at the workplace. Therefore, hypothesis II (H<sub>a2</sub>) is accepted. The result R square = .893,  $p < .01$  highlights that a 89.3% increase in employee job satisfaction can be achieved if the employees identify themselves as a team and work with a sense of common purpose.

**Table 2.** Results for correlation between sense of community and job satisfaction.

R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Standard error of the estimate
.945	.893	.892	4.93917

### Hypothesis III

The analysis revealed the Pearson’s coefficient of correlation to be 0.942, a value which is highly significant, ( $p < 0.01$ ). The high value of correlation indicates that job satisfaction is positively effected by organizational values. Therefore, hypothesis III ( $H_{a3}$ ) is accepted. The result R square = .888,  $p < .01$  highlights that a 88.8% increase in employee job satisfaction can be achieved through organizational values such as rewards, recognition, participation of employees in making decisions etc.

**Table 3.** Results for correlation between organizational values and job satisfaction

R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Standard error of the estimate
.942	.888	.887	5.06105

### Hypothesis IV

The analysis revealed the Pearson’s coefficient of correlation to be 0.915, a value which is highly significant, ( $p < 0.01$ ). The high value of correlation indicates that job satisfaction is positively affected by compassion. Therefore, hypothesis IV ( $H_{a4}$ ) is accepted. The result R square = .838,  $p < .01$  highlights that a 83.8% increase in employee job satisfaction can be achieved through the presence of sympathy as well as sorrow for one another at the workplace.

**Table 4.** Results for correlation between compassion and job satisfaction

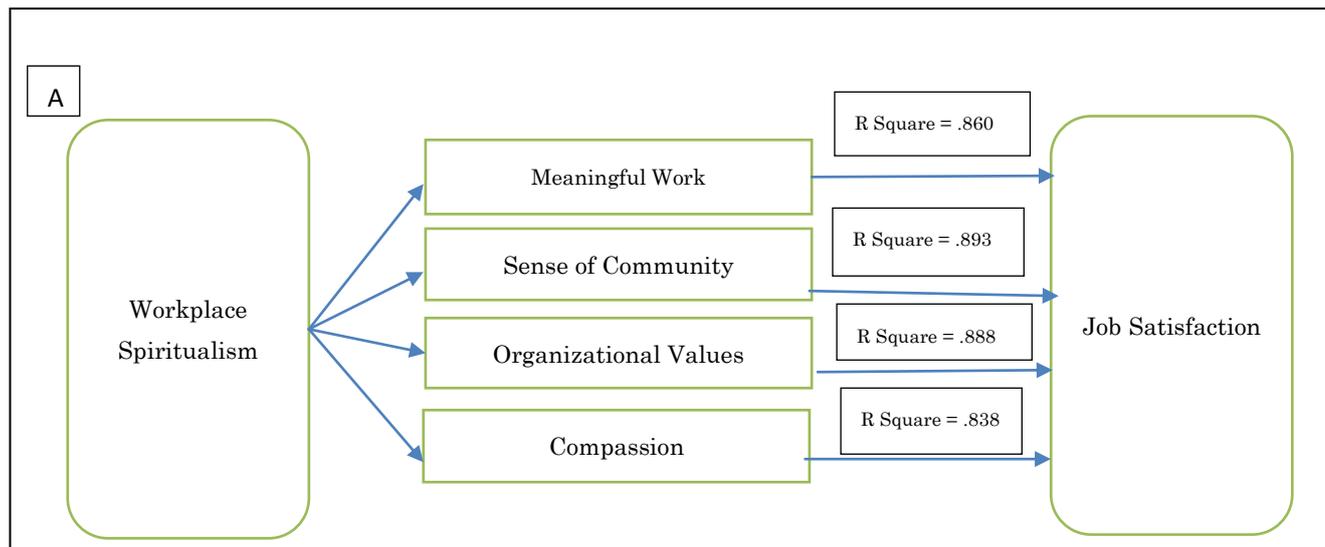
R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Standard error of the Estimate
.915	.838	.836	6.09298

**Table 5.** Combined results for measuring the inter - correlation between workplace spiritualism dimensions and job satisfaction

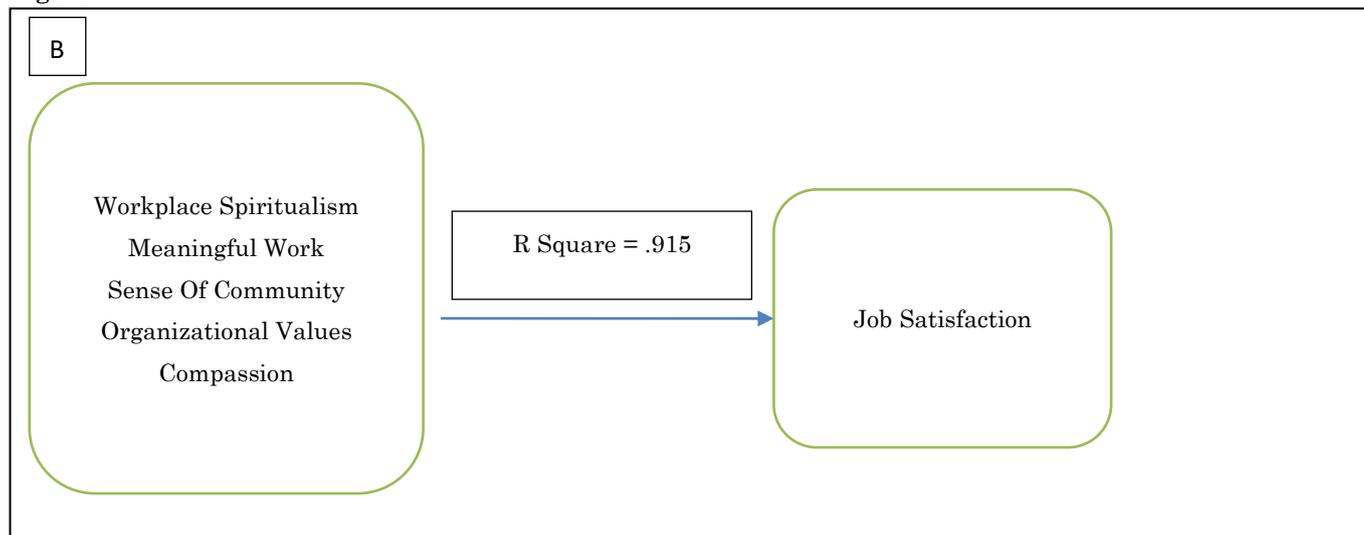
R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Standard error of the estimate
.956	.915	.914	4.42187

**Table 5.** Highlights An Increase In The Degree Of Employee Job Satisfaction By 91.5% when all the four dimensions Of Workplace Spiritualism Are Applied Together.

**Figure A**



Source : Author

**Figure B**

Source:Author

Figure A represents the individual effect of each dimension of workplace spiritualism on the employee job satisfaction level. Through this figure, it can be observed that all the four dimensions of workplace spiritualism are having a highly significant impact on the job satisfaction levels of employees, but sense of community as well as organizational values are the two dimensions with the highest R<sup>2</sup> values of 0.893 and 0.888 respectively, indicating that out of the 4 dimensions, these two have the maximum impact on the level of employee job satisfaction, followed by meaningful work dimension and then the compassion dimension.

Figure B represents the combined effect of all the four dimensions of workplace spiritualism on the employee job satisfaction level. Through this figure, it can be observed that the overall impact of these 4 dimensions of workplace spiritualism on the level of employee job satisfaction is even higher than the individual impact that each such dimension has on level of job satisfaction. The combined R<sup>2</sup> value comes out to be 0.915 which is highly significant indicating a strong association of workplace spiritualism with level of job satisfaction of employees.

### Future Scope

The current research is concentrated at measuring the impact of workplace spiritualism on the degree of job satisfaction of employees in the IT sector only. However, it being a new but trending concept can be studied in more industry – specific terms or company specific terms. This relationship between the two can be analyzed in different sectors as well as in terms of different companies within a sector or comparison between employees of different companies or different sectors. Workplace spiritualism has a broad scope in the area of management research as organizations are beginning to realize that employees are looking for something more than just the monetary aspect, they look for a sense of spiritual fulfillment of their inner selves. Studies in this area can help managers create more opportunities for employees to fulfill such needs which can have a favourable impact on their contribution and efforts towards their job which, in turn effect the organization and its growth on the whole.

### Research Limitations

This research study is limited by the availability of literature used for the secondary research aspect. The secondary research done in this paper is dependent upon the level of accuracy of the studies carried out earlier by researchers in this area of research. Also, the responses received are subject to the risk of inaccuracy in cases where some respondents might not have been truthful with their response. Another limitation to this study is the sample size, a sample size larger in number or even a same sample size consisting of a different set of respondents selected through simple random sampling method may lead to different results. Furthermore, the results of this study are subject to the four dimensions identified for measuring workplace spiritualism in this paper, the use of some other dimension in exchange of or in addition to the ones used in this study can lead to a completely different result.

## 5. CONCLUSION

This paper attempts to emphasize on the importance of the currently trending concept of workplace spiritualism in relation to its associated impact on the degree of employee job satisfaction with respect to the IT sector. The results revealed that there is a significantly strong as well as positive relation between workplace spiritualism and employee job satisfaction. From the results of this study, an increase in the degree of employee job satisfaction by 91.5% when all the four dimensions of workplace spiritualism are applied together can be seen. The four dimensions used for measuring the level of workplace spiritualism include meaningful work; sense of community; organizational values as well as compassion. The results from regression analysis highlighted that sense of community as well as organizational values are the two most important

dimensions influencing job satisfaction. It is important to understand that those employees who find themselves spiritually connected with the organization and its practices are more likely to keep working hard for the benefit of the organization as well as remain highly satisfied with the work they are expected to perform as part of their respective jobs. Also, employees are looking for something more than just the monetary aspect from their job. Spiritual fulfillment of employees at their place of work therefore becomes essential for ensuring their satisfaction. All organizations should therefore work towards creating an environment which fulfills the spiritual needs of the employees. The higher the degree of workplace spiritualism, greater will be their satisfaction from the job which will lead to higher commitment, contribution, retention, hard work, productivity as well as profitability for the organization. Hence, this is not only important from the employees' point of view but is also crucial for the benefit of the organization as satisfied employees contribute more effectively and efficiently towards the achievement of organizational objectives. More and more organizations are becoming aware as well as working towards offering the same to their workers. Job satisfaction is what ensures the continuous contribution of workers towards accomplishment of organizational objectives and knowing the importance of the relation of spirituality at work place with the same is the reason why this has gained more importance. The management can use these dimensions while forming strategies directed towards increasing the degree of satisfaction of workers in respect of their jobs. In conclusion, the scope of workplace spiritualism is vast as it is still in the stage of conceptualization whereby this area can be taken up for future researches in industry or company specific terms. Those organizations which understand the importance of workplace spiritualism and effectively work towards ensuring fulfillment of spiritual needs of their employees will be successful in creating greater level of job satisfaction among the employees. This is essential not only from employee perspective but also for the organization as higher the satisfaction level of employees, more will be their contribution through greater efforts, hard work and commitment which will be beneficial for the effective attainment of organizational objectives and overall growth of the organization.

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Research Article

# Impacts COVID-19 pandemic Diseases on Ethiopian Agriculture, Food Systems, Industries, and Mitigation and Adaptation Strategy

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## ABSTRACT

The COVID-19 pandemic is a recent outbreak in almost all parts of the world including Ethiopia influencing the socio-economy of people and mainly threatening the agriculture and food security of the least developed countries. The current desk review and opinion synthesis by a multi-disciplinary team of experts from Haramaya University aimed at assessing the probable impact of the virus on the Ethiopian agriculture and food security and suggesting the possible mitigation and adaptation strategies to all responsible. Experts' opinion and desk review of existing information were employed for the analysis and conclusions drawn, due to the difficulty of data generation at this time of movement restriction and poor database availability on websites of relevant institutions. Accordingly, the information gathered were synthesised and described following the major stages of food supply chains as production, handling and storage, processing and packaging, distribution and marketing, and consumption are key messages drawn from the overall assessment.

**Key Words:** Agriculture, COVID-19, Food Systems, Impacts, Industries, Adaptation and Mitigation Strategies

## 1. INTRODUCTION

The current novel coronavirus (COVID-19) outbreak was assumed to have originated from a seafood and wild food wet market in Wuhan and has quickly spread across China and to almost all countries in the world (WHO, 2020). Two-third of the world has imposed control of movement both within its borders and at international boundaries to contain the pandemic. Though these measures are necessary, they could adversely affect food and nutrition security through disruption of food supply chains. All past pandemics like Ebola, Severe Acute Respiratory Syndrome (SARS), and Middle East Respiratory Syndrome (MERS) had negative impacts on food and nutrition security particularly for vulnerable populations including internally displaced people, children, women, the elderly, persons with disabilities and the poor (Reperant and Osterhaus, 2017). As it stood now, the COVID-19 pandemic is already having a significant impact on supply chains and logistics, both for producers and consumers as evidenced by closed borders, national lockdowns, and the reduction in air traffic. This will have many adverse effects on food and nutrition security, particularly in developing countries like Ethiopia, where there are many vulnerable populations to food security.

The first case of the pandemic was reported in Ethiopia on March 03, 2020, and to date, there are more than 100 reported cases almost in a month time. It is expected that the spread may increase until it reaches peak unless strong preventive measures are taken. Cognizant of this fact, the Ethiopian government has been taking several preventive measures including the state of emergency, partial to complete lockdown, quarantine, awareness creation and social protection to minimize the danger of the pandemic. Furthermore, resource mobilization from the community, private institutions and development organizations are going in an organized form. The government of Ethiopia has considered the probable effect of COVID-19 and to mitigate the effect and build resilience; the government announced a USD 154 million package to bolster health care and tax exemptions of imported products for the prevention and containment of COVID-19. The National Bank of Ethiopia (NBE) will avail 15 billion ETB liquidity in support of private banks, to allow them provide debt relief and refinancing to customers in need (World Bank, 2020b).

Such measures may continue depending on the intensity of the disease. However, there can be food security and agricultural risks emanating from the COVID-19 crisis unless clear directives and decisions for mitigations are outlined. Therefore, there is a need for careful planning in food supply considering the various actors along the food value chain and mainly on an inclusive basis, considering the vast, vulnerable groups of the nation to food insecurity. In connection with

this, a team of researchers from Haramaya University, Ethiopia, compiled a brief synthesis of experts view on the impact of COVID-19 on Ethiopian food supply chains and its mitigation measures based on desk review from the experience of other countries and local observations, to inform the government, stakeholders and community possible ways of reducing COVID-19 related risks on agriculture and the food supply chains. The document contributes to the available information on the impact of COVID-19 on food supply chains and mitigation strategies for developing countries. It is a comprehensive document taking into account the possible effects on the major stages of food supply chains including, production, handling and storage, processing and packaging, distribution and marketing, and consumption with possible mitigation strategies for the impact at each stage. The document can help decision making by federal, regional, and local administrations and other stakeholders who are supporting the agriculture and food supply systems of the country. It, however, prioritizes the negative effects of the COVID-19; the potential positive effects are not covered in this document, except the spillovers from the mitigation strategies. Therefore, this paper is a rapid synthesis of experts' desk review and opinions on the probable impact of COVID-19 pandemics on Ethiopian agriculture along the food supply chains.

## Key impact assessment questions

The following general and specific questions guide the synthesis on possible impact of COVID-19 on Agriculture, Food Systems, Industries and potential mitigation strategies.

### General question

What would be the possible effect of COVID-19 on agriculture, Industries and food supply chain in Ethiopia ?.

### Specific impact assessment questions

1. What are the possible effects of COVID-19 on Agricultural the production of foods in Ethiopia? What are the alternative strategies for mitigating such effects ?.
2. What are the possible effects of COVID-19 on the handling, storage, processing and distribution of Agriculture, Industries and food in Ethiopia? What can be done to minimize the effects of COVID-19 on food loss ?.
3. What are the possible effects of COVID-19 on the marketing and consumption of Agriculture, Industries and food commodities in Ethiopia?.

## 2. MATERIALS AND METHODS

### 2.1. Data Sources, Data Collection and Analysis

A multidisciplinary team of experts involving crop and livestock production experts, and socio-economic experts was established for conducting this rapid desk review and expert opinion assessment of the impact of COVID-19 on Ethiopian agriculture and food security. The team shared specific tasks clustered by the thematic topics along the food supply chains. Brainstorming sessions were conducted among the experts to describe the key areas of probable COVID-19 impact and sort specific mitigation strategies. Relevant up-to-date documents were retrieved from blogs and relevant websites, to supplement the expert opinions.

The primary data sources are therefore mainly expert opinions and judgments, and that of secondary data were collected through review of materials published on lessons learned from previous pandemics as well as short notes and expert opinions published by different reputable sources such as International Food Policy Research Institute (IFPRI), Food and Agriculture Organization of the United Nations (FAO), International Livestock Research Institute (ILRI), World Bank (WB), United Nations Office for the Coordination of Humanitarian Affairs (OCHA), World Health Organization (WHO) and Ethiopian Economic Association (EEA). However, as the COVID-19 is a recent phenomenon and under investigation, very little literature directly dealing with its effects on agriculture is available. Therefore, to address the evidence gap, the experts team conducted several triangulation and cross-checking validations for ensuring the validity of the opinions.

Accordingly, the possible negative effect of COVID-19 and the adaptation/mitigation strategies were assessed at each food supply chain stages and food security dimensions simultaneously. The synthesis of findings follows a qualitative value chain approach where key concepts are thermalized under each food supply chain stage. Though the team believes that COVID-19 can have positive effects, focus was given to the probable negative effects and their mitigation strategies. However, some measures, if successful, indirectly imply the opportunities from the pandemic outbreak.

Team aimed at assessing the probable impact of the virus on the Ethiopian agriculture and food security and suggesting the possible mitigation and adaptation strategies to all responsible. The potential impacts of the pandemic and possible mitigations have been assessed considering the implications along the supply chains functions and stages, and each has been elaborated under the following topics: Production, Handling and storage, Processing and packaging, Distribution and marketing and, Consumption level. Experts' opinion and desk review of existing information were employed for the analysis and conclusions drawn, no statistical analyses were conducted using these data. The results are regarded as only indicative and were used only for synthesized narratively, subjective analysis and interpretation, due to the difficulty of data generation at this time of movement restriction and poor database availability on websites of relevant institutions.

### 3. RESULTS AND DISCUSSION

#### 3.1. Impact of COVID-19 on Agricultural Production, Food Systems and Mitigation and Adaptation strategy

According to FAO (2020), food security analysis conducted in six regions of Ethiopia indicates that, an estimated 8 million people (27 percent of the 28.7 million people analyzed) were severely food insecure in Integrated Food Security Phase Classification (IPC) Phase 3 (Crisis) or worse between July and September 2019. Of these, about 6.1 million people were classified in IPC Phase 3 (Crisis) and about 1.9 million people in IPC Phase 4 (Emergency). The same report also indicated that between October 2019 and January 2020, Ethiopia's food security situation is likely to improve slightly due to the seasonal (Meher) harvests. Whereas, between February and June 2020, harvests from the Meher season will likely be dwindling and insufficient to sustain adequate food consumption through the lean season in areas that rely on Belg agricultural and pastoral production. Moreover, households relying on pastoral livelihoods typically depend on markets for food during this period. As food prices are expected to remain higher than previous years, these will most likely affect market access. About 8.5 million people are thus expected to be in Crisis (IPC Phase 3) or worse. Several factors exacerbate food insecurity in Ethiopia. Conflict and climatic factors have driven internal displacement in different parts of the country, disrupting livelihood activities and distorting food market systems and prices.

Ethiopia is highly food-insecure, with 54 percent of the population (52 million people) consuming less than 2,100 calories a day (Thome et al., 2016). According to the national official data about 26 percent of the rural people is already living below the national food poverty line (World Bank, 2020a). The annual inflation rate in Ethiopia climbed further to 22.6 percent in March of 2020 (26.9 percent came from food prices). If food prices increased because of supply shocks and constrained imports related to COVID-19, the food insecure population could rise.

The above analysis of food security in Ethiopia was made before COVID-19 has become a global emergency and can be used as a baseline to combine the effects due to the pandemic for effective planning ahead. The prior food insecurity coupled with the current COVID-19 can immensely increase the vulnerable population in Ethiopia. The current pandemic has forced the government to implement restrictions of movements, divergence of the available resources more to health related materials like personal protective equipment (PPE), increased unemployment rate on the one hand and shortage of labor force, especially on labor intensive agricultural activities. Summaries stating potential short- and long-term effects of COVID -19 pandemic on production of agricultural products (assessed in terms of availability and access to inputs; energy/fuel availability and affordability; labor shortage and layoff; agricultural extension system, system; supporters/service providers: finance, cooperatives and unions, NGOs, grassroots community groups, research and development; local administration, desert locust control, restriction of pastoral movement etc.) and their respective adaptation and mitigation.

##### 3.1.1. Input supply and distributions (crop and livestock)

Availability of agricultural inputs: Application of a range of agricultural packages and inputs including appropriate use of fertilizer and improved seeds, judicious use of pesticides and improved agronomic practices are required to increase agricultural production and productivity. In Ethiopia fertilizer and high yielding variety of crops are the most important technologies to increase crop production. Smallholder farmers rely on primary cooperatives, cooperative unions and, most significantly, informal markets to access agricultural inputs (HGT and LIFT, 2019). Fertilizers are often imported from Saudi Arabia, Morocco, China, Russia and Ukraine, and Agricultural Inputs Supply Enterprise (AISE), using operational service providers (transporters), transports fertilizers from Djibouti port to central warehouses, and through cooperative unions to farmers. Lockdowns due to the pandemic in input producing countries could affect timely delivery/transport of the inputs, which could in turn delay their supply to Djibouti port, and to end users within the country. Animal production is also largely affected by such inputs and services like feeds and healthcare. In Ethiopia, imbalances have already been witnessed between the available feed (in terms of quantity and quality) compared to what is required. According to FAO (2018), the difference between availability of feed resources as dry matter (DM), ME and CP and the requirements of all animal species (i.e. feed balance) showed that feed deficiency in Ethiopia is 9 percent as DM, while ME and CP deficiencies are 45 percent and 42 percent respectively, again suggesting lack of good quality feeds in the country.

Unprecedented COVID-19 pandemic has caused lockdowns/restriction of movements, closure of some input producing companies, and borders which has in turn reduced imports from countries such as China (Mahendra, 2020). Important inputs including fertilizers, improved seeds, feeds and pesticides are either not available or their prices are high due to shortages (FAO, 2020). Farmers will thus have lower incentives to produce crops and livestock, likely leading to lower yields and production in the near future. Long-term impact could lead to decline in agricultural production and productivity, increase in input price, and food insecurity may persist. Ensuring the availability of agricultural inputs to farmers at the right time of the season, with reasonable prices, and assuring incentives for production, should be a priority for the government in the next few months to avoid disruptions to input supply. Hence efficient transportation of agricultural inputs from one part of the country to another through creation of multiple channels for their timely delivery could be achieved by involving government bodies, cooperatives, unions and private sector. To this effect, lessons from Chinese 'Green channel' model (innovative initiative to help get inputs to farmers and produce to market) for import and distribution of agricultural inputs to keep the supply chains alive even during lockdown. For agricultural inputs imported from abroad, availability of inputs could be achieved through negotiations with producing countries. Furthermore, mobilizing local community so that resources and best practices are pulled together and used for food security could be helpful. To enable sustained good production of crops and livestock, smallholders need urgent support from government as well as private sector. Small poultry and dairy farmers in urban and peri-urban areas need more targeted help, as their

pandemic-related input supply are urgent; while at the same time demand for livestock products has been affected due to closure and/or reduced demand of cafés and restaurants.

Government preparedness to fill the food scarcity gap through purchase and food aid is among short as well as long-term mitigation measures. It is also important that the country builds local capacity to produce agricultural inputs; example fertilizer demand could be met by completing construction of the local fertilizer blending plants, which is one of the goals to raising productivity and encouraging commercialization to reduce poverty and food insecurity (ATA, 2015). These fertilizer blending plants, if made operational, are expected to have capacity of over 250,000 tonnes per year. Flexible design of these plants allows them to accommodate a variety of new formulas, so, availability of fertilizer will be on board for crop production in the country. With regards to livestock production, majority of the feed processing plants are located in and around Addis Ababa while farmers in other urban and peri-urban areas face supply shortage or higher cost of transportation. Hence, incentivizing private agribusiness sectors like feed mills at different parts of the country will be essential as a long-term strategy since potential animals for commercial supply are found far from Addis Ababa.

**Access to agricultural inputs:** Movement restrictions imposed following the COVID-19 pandemic has resulted in sluggish supply due to longer collection and transportation time, higher loading and unloading markup, higher distribution cost and longer retail filling. Slowdowns could also impact the availability and movement of fertilizer, fuel and other inputs. This in turn results in decline in agricultural production and productivity, increase in input price, and food insecurity may persist. Therefore, the government needs to develop policies in the long-term to respond to these varied impacts to avoid the supply chain disruptions, higher input prices etc. Other possible areas of mitigation include subsidy for access to inputs, increasing access points, credit facilities (loan finance) for recovery from adverse effect of the pandemic, and encourage saving and investment by farmers.

**Energy (fuel) availability and affordability:** In recent years, power-driven farm activities such as pump-driven irrigation, tractor-based land preparation, combine harvester/thresher, feed and milk processing, etc. are growing in the country. These all farm activities require dependable power source accessible when needed. Movement restrictions due to the pandemic could cause fuel scarcity and price hike, which in turn affects crop and livestock production. Possible mitigation areas to alleviate these challenges include establishing fuel reserve for farm implements and establishing sustainable energy supply system for agriculture sector, among others. Mechanized farming could be attractive to involve youth in food and feed production. In the long run we suggest the launching of environmentally friendly solar energy supply for small scale irrigation pumping.

### 3.1.2. Labor shortage/layoff

One of the short-term effects of COVID-19 is shortage of labor due to restriction of movement to contain the pandemic. Measures affecting the free movement of people, such as seasonal workers, might have an impact on food production. Agriculture labor force shortage in fear of the disease and because of illness could significantly affect the production of crops and livestock in Ethiopia. Such restriction of movement impedes many laborers not to move to their places of work or carry out their jobs. For instance, in the Central Rift Valley of Ethiopia, where most vegetable production occurs, labor is becoming scarce (Tamiru et al., 2020). Vegetable production is labor intensive and usually attracts a large number of daily laborers. In response to the restriction on travel and gatherings, these workers are increasingly returning to their villages.

Reverse migration of labor from towns to villages as well as from schools to families in fear of the pandemic may add workforce to family labor although the risk of COVID-19 spread and competition for family food become high. On the other hand, there is labor layoff under floriculture industry due to marketing problem. Export of floriculture products (cut flowers, herbs, bedding plants etc.) has dropped by 70 percent due to lockdowns in consumer countries. The volume of flower export has dropped following the outbreak of COVID-19 pandemic. Consequently, in Ethiopia's flower industry a total of 150,000 employees are on the edge of losing their jobs (labor layoff) (Addis fortune, 2020). In the long-run, COVID-19 could result in area and production reduction especially of labor-intensive agriculture, such as flowers and vegetables production. The reverse migration due to COVID-19 could also increase unemployment in rural areas. Moreover, in the long-term, foreign currency the country generates from export of horticultural crops could be reduced. The pandemic also increases inefficiency of commercial farms as a result of which some of them might even be closed. The short-term solution for enhancing the availability of labor could be facilitating careful movement of temporary or seasonal farm workers to areas where labor-intensive production (example vegetable production) are practiced. For reducing the risk of COVID-19 spread, self-quarantine of the returnee and establishing emergency shelter should be implemented in each location/region. Encouraging the returnees to engage in farming activities and minimizing reverse migration by stimulating agribusiness firms to operate safely (by applying COVID-19 prevention measures) should be taken as short-term solution to minimize unemployment. The government could also subsidize the commercial farms and encourage them to pay wages to workers to avoid labor layoff. Availing labor-saving farm tools/machines suited to smallholder farmers and promotion of contract farming using irrigation to boost production could be practiced as a long-term solution for the available labor to avoid such unexpected risks. Promotion of bi/multilateral negotiations and versatility in production (i.e. possibility of growing alternative crops) needs to be encouraged in the future to avoid labor layoff from commercial farms in Ethiopia.

### 3.1.3. Psychological effect

COVID-19 pandemic is not just a medical phenomenon; it affects individuals and society in many ways, causing disruptions and mental stress. Panic and stress have also been linked to such outbreaks. Similarly, can be fear of isolation and quarantine and sometimes miscommunications about the type of food to consume. For example, demand for raw consumed foods such as meat, vegetables and fruits may decrease in fear of the virus and disrupt the demand and supply relationship

by creating risk attitude and uncertainty about the future and loss of confidence by growers about what type and amount of agricultural crops to produce. In order to avoid such problems, it is necessary to provide psychological therapeutic measures and create optimistic mindset through counseling and provision of evidence-based information so that the society gets accurate information about the different foods and their relationship with COVID-19.

### 3.1.4. Disruption of the agricultural extension system

Ethiopia's extension system has great potential to help farmers throughout the country, with approximately 21 development agents (DAs) per 10,000 farmers, it is considered as one of the countries with strong public extension systems among Sub-Saharan African (SSA) countries in terms of human capital. As a result, the agriculture sector is an engine of growth in the country. The COVID-19 could have short and long-run impacts on Ethiopian agriculture in general and extension systems in particular, thereby affecting the food security. The probable short-run impacts of the COVID-19 on the Ethiopian extension system could be the disruption of the normal and major activities of the extension services (advice, training, input delivery etc.) due to restrictions on movement, gathering, and meetings. Ban on movement restricts extension personnel from providing training at Farmers Training Centers (FTCs), demonstrations, field days, and visits to groups of farmers in contrast to what has been happening in the past. The other possible impact of COVID 19 on Ethiopian agricultural extension is related to prohibitions of market gatherings that disconnect farmers from the cash economy. These further limit the farmers' purchasing power of farm inputs and the adoption of farm technologies.

A customized extension approach should be devised to mitigate the short-run disturbances on the extension functions related to COVID-19 and provide farmers with necessary information and inputs. To customize the extension service to COVID-19, the individual and mass extension methods should be adopted. Individual based extension method: Individual extension methods are time and labor-consuming but can be used for family extension approaches for communicating the household head on one to one basis for providing extension messages and advice. Alternatively, potential individuals and model farmers in each village can be contacted by the extension personnel. Then the model farmers can do the farmer-to-farmer extension in a protected manner from the pandemic. For instance, farmers with landholding of more than one hectare or who own livestock could be given priority services during the individual family extension services. Also, for extension workers, to reach a wider population, primary education teachers can be deployed with adequate training for dissemination of extension messages provided that they are adequately trained. The mass media or ICT based communication will help in efficient communication of large number of farmers at the same time and is cost-effective. For this purpose, mobile applications (e.g. mobile SMS messages), and local radios such as FM radios can be used to provide extension messages in local languages. The timing of extension broadcasting through radio needs to be conducive for farmers (e.g. evening is preferred to morning). For those farmers who are able to read and write, printed media and extension leaflets can be developed and distributed in local languages. The extension agent can provide technological packages, training, and advisory services to the targeted farmers in a protective manner from COVID-19. To be successful, the extension agents have to be oriented and trained and provided with Personal Protective Equipment (PPE) such as masks and gloves to protect themselves and farmers from the virus. In this regard, a new collaboration framework between health extension workers (HEWs) and development agents (DAs) has to be established.

In the long-run (after six months) in the worst case, there could be lower crop/livestock production and productivity and farmers may also be indebted and fail to repay input loans. For farmers and producer cooperatives, during such a big crisis time, a waiver policy for inputs purchased and long-term credit supply or in-kind contractual arrangements has to be prioritized. Besides, a tax waiver for agricultural inputs (seeds, feed, fertilizer, pesticides) import will stabilize price of farm inputs, as well as for waiving debts and loans associated with agricultural inputs. In the long-run, the Ethiopian government can improve the agricultural extension system by (i) developing more innovative ICT based communication channels (e.g., mobile-based agricultural information delivery), (ii) rural radio-based extension training, and (iii) geographical information systems (GIS) for planning and monitoring extension activities. The application of GIS for agriculture extension would help the planning and forecasting of agricultural activities. (iv) initiating private extension systems. In many African countries such as Kenya and South Africa, private extension service providers have played a significant role in improving the agriculture sector. Diversification and involvement of the private sector in extension service delivery will create employment opportunities for agricultural graduates and provide innovative services to farmers.

### 3.1.5. Supporters/service providers

Support sectors like finance, cooperatives and unions, NGOs, community organizations and research institutes are few, among others, having a greater role in affecting agricultural production and productivity. Financial institutions: Financial institutions can affect economic growth through a growth in economic sector developments by efficiently carrying out its functions, among which is the provision of credit. Rural finance access (credit) plays a major role in the transformation of traditional agriculture into a modern/ commercial type, which enhances agricultural development. It is necessary for purchasing inputs needed for effective adoption of modern agricultural techniques. The main financial institutions that give financial services in Ethiopia are banks, insurance companies, microfinance institutions, cooperatives and informal financial institutions. The financial service offerings to agricultural sector in Ethiopia face gaps in terms of access to financial services and demand for financial services (Wegayehu and Mmatlou, 2017). Financial institutions may be weakened due to COVID-19 pandemic and may be unable to lend money to the farmers. Resources may be diverted to support prevention of COVID-19 efforts, affecting budgets for agricultural production. In the absence of credit, farmers could experience financial shortage to purchase agricultural inputs and services on time, which in turn could lead to lowered production. It is also expected that the prices of inputs be hiked due to movement restriction and farmers may need

better financial services and government incentives. Strengthening financial access to small and medium scale farmers will enhance their capacity to increase production per unit time and space, and also improve quality of their produce and market access and thereby enhance their income. To enable the smallholder farmers, have access to inputs and other services, the government needs to systematically inject money to the financial institutions so that they can be able lend money to the farmers. Relaxing payback period from the beneficiary farmers and establishing agriculture banks/ insurance companies are also possible long-term mitigation measures.

**Cooperatives and unions:** Cooperatives and unions are critical instruments in implementing the objectives of the various development programs and strategies such as the rural development strategy, poverty reduction programs, and food security programs. Movement restrictions between cities and rural areas due to the pandemic may negatively affect their effectiveness. Such restriction could also hamper activities such as generation of input demand data. On the other hand, cooperatives (whether primary or multipurpose) and unions, in Ethiopia have much experience in activities such as seed production and marketing. It is feared that they may be overburdened (in terms of finance, human resource etc.) due to the COVID-19 pandemic. Interventions such as increasing the number of access points for input distribution and collaborating with DAs for better data exchange are some suggested mitigation measures to be implemented so as to enhance their capacity to be able to effectively serve the farmers.

**NGOs:** NGOs help farming community by providing inputs and technical support. The COVID-19 pandemic restricts movement of technical staff of NGOs, which negatively affects crop and livestock production and productivity. The pandemic could cause budget cut and restricts of movement of staff of NGOs, which negatively affects implementation of the planned activities. Therefore, re-planning of NGO operations, as per COVID-19 prevention guidelines, are required. Where possible, virtual communication of NGO staffs can be implemented to run the activities during their limited movement due to the pandemic. Since there could be duplication of activities by many NGOs, harmonization of their tasks will make effective resource mobilization at this time of scarcity. On the other hand, where NGOs fail to achieve what is expected of them due to this pandemic, government intervention is required to sustain these agricultural development activities. For instance, resource mobilization from other sources can be a possible mitigation approach.

**Grassroots community groups:** In traditional and local institutions (TLIs) such as Debo, people mobilize labor resource to overcome seasonal labor peaks. In Idir, members organize themselves to provide social and economic insurance in the events of death, accident, and damage to property. The current pandemic could weaken social bonds; disrupt a collaborative work of the traditional and local institutions (Debo, Wonfel, Idir, etc.). Therefore, concerned government bodies including local administrators, health extension workers (HEWs) and development agents (DAs) need to provide effective awareness creation to strengthen these traditional and local institutions while taking extra care to prevent potential COVID-19 spread. Rural communities with labor intensive activities are advised to focus on family labor by mainly utilizing the opportunity of school closure so that students can participate in agricultural activities of their family.

**Research:** Research activities in Ethiopia could be disrupted as COVID-19 continues to spread. Resource could also be diverted from agricultural research to COVID-19 prevention. Nevertheless, researchers in the Ethiopian research system can contribute through making their latest research findings and analysis on COVID-19 available to support authorities and the public in making informed decisions during the current crisis (CGIAR, 2020). Researchers are expected to prepare rapid response evidence on impact of the pandemic on agriculture. Recognizing relevance of agriculture in achieving food and nutrition security, agricultural and food research activities should not be disrupted and there must also be proper budgeting for running the designed problem-solving research activities sustainably. Choularton and Mallory (2020) have pointed out the following four major focus areas, among others, that the research and development community can start to take now: (i) increasing assessments of the effects of COVID-19 on agriculture and food systems. Just as increased testing for COVID-19 is critical for public health, so too is measuring its impact on agriculture and food systems, (ii) Supporting farmers to continue producing and marketing food. The research system can help farmers adopt labor-saving practices that compensate for reduced labor availability, for example, by sick family members, limitations on collective labor, and restrictions on the movement of people to producers' fields, (iii) Accelerating the deployment of relevant agricultural technologies and digital agriculture solutions. Agricultural technologies, especially digital agriculture solutions, offer a range of important opportunities to address the impacts of COVID-19 on agricultural production, labor availability, input supply, and logistics, and (iv) Assessing the impact of COVID-19 on agriculture-based livelihoods and food security using a gender lens. Approaches to address COVID-19 that carefully consider the gender dimensions of food security, labor, health, and vulnerability are essential.

### 3.1.6. Effects on local administration

As a short-term effect, the COVID-19 pandemic has negative effects on local administration decision making. During this pandemic period loose linkage is being observed among the various government bodies, for example between zonal and district administrators, and among relevant stakeholders. Moreover, more emphasis is being given to COVID-19 control than food security (i.e., resource diversion). Planting period will start in the coming months for the main agricultural season while the COVID-19 epidemic is forcing government to cut agricultural expenses and to prioritize health related expenditures. Consequently, in the long-term, this pandemic will reduce agricultural production due mainly to less attention and resource given to agriculture. The probable short-term solution for the loose linkage among various government bodies is strengthening the linkage; define clear task and decision-making role of each actor. It is also good to enhance communication using existing IT (e.g., Woreda Net). As long-term solutions allocate budget and give due attention timely and effectively engage relevant government bodies in facilitating agricultural activities.

### 3.1.7. Effect on desert locust control

The current COVID-19 pandemic occurred while desert locust swarm is hitting East African countries including Ethiopia. The desert locusts are currently active in Ethiopia because of cross-border movements of immature swarms along the borders of Kenya and Somalia (FAO, 2020). Unless properly controlled, the locust invasion will cause large-scale crop, pasture, and forest cover loss, especially for pastoralists and households relying on short rains (February–May) for crop production in the country. According to the Ethiopian Ministry of Agriculture (MoA) media briefing, 3.6 million quintals of grain was lost due to locust infestation. Restriction of movement as a prevention of COVID-19 may distract the effort of desert locust control and result in devastation of crops, pasture and forest cover loss worsening food and feed insecurity. Therefore, restriction of movement should be relaxed or totally lifted for the campaigns of desert locust control and there should be coordinated effort among federal and regional governments, community and development institutions such as FAO. Furthermore, the Ethiopian government should scale up survey and control measures by closely monitoring the desert locust situation, providing forecasts, early warning, regular updates and alerts through the global Desert Locust Information Service (DLIS) of FAO and scale up the areal and ground control operations. On the other hand, though it may not be culturally commendable to the Ethiopian population, locusts are studied to be rich in proteins, fatty acids and minerals that boost immunity, fight cancer and prevent inflammation of body organs if creatively incorporated into food and feed products (Clarkson et al. 2018).

### 3.8. Restriction of pastoral movement

Pastoralists represent 12 percent of the 100 million Ethiopian populations (FES, 2017). In addition to limited access to schools, hospitals or political decision-making processes, pastoralists are suffering because of recent developments in climate change and ongoing insecurity in the border regions. Pastoral and agro-pastoral communities around the world are building on centuries-old coping strategies and adopting complementary means of livelihood. Restriction of pastoral movement is expected to have more impacts on pastoral community as it exacerbates the already existing feed and water shortage in the area. Pastoralists come together for efficient utilization of the deep well water. They manually carry water from the deep well to the surface in a series of labor intensive system and provide their animals. The low infrastructure, frequent climate change and conflict in pastoral areas combined with the current expansion of locust outbreak in their localities need a special attention. As a short-term strategy, pastoralists should be provided feed and food stock (safety nets), advised to focus on small ruminants than large animals, and given awareness against the pandemic using the community structure by the combined effort of health extension workers and development agents. In the long-term, selecting drought tolerant varieties of plants for feeds, developing water wells and establishing feed banks could be alternative strategies. The pastoral community in Ethiopia also suffers from lack of market access for livestock /products and the illegal smuggling of live animals to the neighboring countries that affect the local market price. Therefore, establishing market linkage for their products to the local market as well as diversifying export of their animals and animal products can be suggested as long-term strategies.

## 4. Probable Impact of COVID-19 on Handling and Storage of Agricultural Products, Food Systems, Industries and Mitigation and Adaptation strategy

Roughly one-third of all food produced in the world is lost or wasted (FAO, 2019). Non-optimized handling (drying, cooling, cleaning, sorting, transportation etc.) and storage during supply chain processes are responsible for high share of the postharvest losses (Yahia et al., 2019). The pandemic is expected to hamper the handling and storage operations and consequently the extent of postharvest losses could only get worse. One of the causes of postharvest losses of agricultural produce during the COVID-19 pandemic is a labor shortage for undertaking handling and storage operations. In the short-term, harvesting and handling activities are affected due to unavailability/ unaffordability of hired labor. For instance, the traditional labor sharing institutions in practice for centuries, such as Debo, Guza, and Wonfel are banned due to the social distancing principle of containing the pandemic. In normal years smallholder farmers solve labor shortages by participating in these labor sharing schemes. These labor shortages result in more products to be left unharvested. The labor shortage can be alleviated if local administrations mobilize local communities to help at farm level handling activities while taking extra care to prevent potential COVID-19 spread. Government and the private sector can also supply harvesting machinery or technologies. In the long-run, seasonal agricultural labor migration will face barriers. Ensuring safety and availability of labor force in the field, in the packinghouse, or the store needs to be given emphasis.

When the news of travel restrictions emerged, people have started stockpiling food, sometimes more than what they need. This may lead to quality deterioration of the stored food (e.g., flour caking and insect infestation e.g. flour mites). The losses due to stockpiling could be minimized by encouraging people to buy only amounts they need and guaranteeing the availability and accessibility of food during the peak periods of the pandemic. In the long-run, consumers should be encouraged to use improved postharvest technologies (e.g., hermetic bags for grain products).

When perishables (fruits, vegetables and flowers) are stored under improper storage conditions, a significant loss can be recorded. Temperature is the most critical factor influencing storability of perishables and absence of low-temperature storage facilities leads to high losses. To solve this in the short-run, the government can rent cold rooms from commercial flower farms to store fruits and vegetables, which lead to storage life extension thereby ensuring continuous supply, stabilizing market price and promoting the health of citizens. Additionally, access to low-cost handling and storage technologies (e.g., evaporative coolers, crates) can be improved. In the long-run, the country needs to work aggressively to have cold storage rooms for perishables and establish efficient postharvest handling and storage systems with improving temperature and ethylene management. It is also good to encourage private investors to open more vendors and malls in main towns so that there will be more market for the perishables.

Even if grains are naturally less perishable than fruits and vegetables, significant loss can be encountered due to improper storage technologies. These losses could be of qualitative (e.g., aflatoxin development) and quantitative (e.g., damage by weevil) in nature. In the coming few months, the government could optimize the use of public and private storage facilities that could be used for emergency food stockpiling. It can also set up and operate temporary warehouses (distribution centers) to store, and distribute the food applying physical distancing measures. Food stocks received earliest should be delivered first, the principle is known as FIFO (first in, first out). Similarly, cooperatives, unions and development partners can improve access to handling and storage technologies (e.g., storage bags, metal silos). In the long-run, the government may enhance the accumulation of food reserves and support construction of community or large warehouses.

Once the COVID-19 has been declared a pandemic, a sudden drop of consumer demand is noticed at the destination market; for some products, orders have been cancelled (e.g., flowers for mothers' day, poultry products, milk etc.). The demand for Ethiopian flower export drops by 70 percent (Addis Fortune, 2020). These cancellations have made farms to downsize or halt entirely handling, and storage practices and some farms have disposed of harvested flowers and milk as a waste. The food loss farms are encountering will have a financial consequence where later on they may not have sufficient money to run the farms. Consequently, farms face significant lay-off of workers which means no work force for grading, packing, storage and shipping of the produce. A high rate of unemployment could have social, political and economic implications. Local marketing of food products is an alternative option and farms may give a paid leave of absence to their employees with financial support from the government. Milk collection to some processing centers will stop or minimized due to closure of cafés and restaurants, and this will lead to dumping milk with high production cost on smallholder dairy producers. A short-term financial incentive mechanism for smallholder farmers and processors as well as long-term ultra-high temperature (UHT) processing of milk for longer storage at bigger cities are among the important mitigation methods.

Currently, local transport is somehow restricted because people are encouraged to stay at home. As travel is discouraged or hampered, commercially matured or harvested perishable products are more likely to be lost. In such instances, it is better to encourage farming households to sell/eat more locally instead of sending the product to the market (Haddad et al., 2020). Gradually lifting bans on local movement and adopting the 'green channel' model for transport of perishables may also work. Food safety concerns on fruits and vegetables increase since these produces could be touched by hand at the different stages of handling, which may lead to cross-contamination and spread of the virus. Education should be given to the public about the health benefits of increased hygiene, especially during handling of food products, and safe food. We need to also work on improving microbial management of food in handling and storage. In the long-run, investment towards shops/malls with food safety standards shall be encouraged.

Food safety concerns may also increase on meat products due to claims of the zoonotic nature of COVID-19. In the short-run, awareness creation to consumers that there is no established evidence whether consumption of animal source food is associated with infection by COVID-19. Additionally, implementation and control of national food safety standards are necessary. In the long-run, more research and policy action on zoonotic diseases is required, especially for "wet" markets, and more generally on food safety.

## 5. Probable Impact of COVID-19 on Processing and Packaging of Agricultural Products, Food Systems, Industries and Mitigation and Adaptation Measures

Ethiopia is working strongly to explore the untapped agro-processing industries potential to boost its economy. Food and beverage processing industries are dominating the agro-processing industry in Ethiopia. Meat, fish, milk and dairy products, edible oil, fruits and vegetables, starch and starch products, pasta products, flour milling industries and different type of beverage products are the major products produced in the country. The sector has high potential to supply food to the local market, generate hard currency and create employment opportunities. In addition, it minimizes postharvest losses caused due to lack of sufficient storage places, and to produce shelf stable food products, diversify diet options and facilitate distribution and marketing system. It also sustains consistent market for producers through supply of raw materials and other inputs throughout the year. The sub sector helps to transform the country's economy from agriculture based to a light or medium industry-based economy. However, the current global pandemic is a treat to transform the sub sector as planned through hindering the normal practice and activities. Possible negative and positive impacts of the pandemic on food processing and packaging industries are briefly discussed below.

### 5.1. Impact on dairy and fish industry

According to Ethiopia Country Commercial Guide (2020), in the last 15 years, the volume of milk production has tripled, and the government aims to double its production by 2020. An increase in production is a good opportunity for expansion of dairy processing industries to be able to supply nutritious dairy products to the public. However, due to the occurrence of COVID-19, the local dairy demand and consumption has critically declined. This is mainly because of perception not to consume raw and chilled animal products with the assumption that such foods are the main routes for the transmission of the virus. As a result, consumers in major market destinations have either reduced the amount they buy or completely avoided consumption of raw fish, meat and chilled dairy products. This negatively affects the livelihood of producers, processors and value chain actors involved in the businesses. Restriction of movement, social distancing and closure of restaurants further limits the demand for milk and fish products.

The impact of the pandemic is overlapped with declined consumer demand for milk and fish products associated with the main fasting season of the Ethiopian Coptic Orthodox Church. Believers are restricted from consumption of animal-based products (meat, milk and egg-based products) between March 1 to April 25, 2020. According to personal

communication (Ethiopian Milk Processors Association), in previous years (before the occurrence of the disease) there has been no such a case, except slight reduction of demand for milk and milk-based products during the fasting period. The current reduction of demand for milk and fish, associated with the pandemic, significantly affects the interest of processing industries in that collection of milk from collection centers could as well be reduced, which critically affects the suppliers than processors. The high perishable nature (short shelf life) of milk and fish products means, the effect of the disease is more on producers than processors, as well other actors along the value chain. Based on guidelines of FAO and WHO (2020), there is no evidence as to whether food or food packaging are associated with the transmission of the disease and that no food recalls are anticipated if a person who works in a food or beverage production facility is diagnosed. Reduced production capacity of the fish and dairy industries could significantly hamper long-term growth of the sector due to high labor cost, especially if the work force is to be maintained for long period. This ultimately could lead to cessation of production and collapse of the industry (Figure 2) which can be manifested in terms of layoff of labor force, which in turn could aggravate food and nutrition insecurity, and depression of the country's economy at large.

The short-term mitigation strategy can accommodate the following points. (i) According to recommendation set by Chinese Centre for Disease Control and Prevention (CDC), Chinese Medical Doctors Association, government and NGOs, milk and other dairy products are an excellent source of high quality protein, vitamin B2, vitamin A, calcium and other nutrients essential for the human body to boost the immune system to fight the virus (Anonymous, 2020). Furthermore, coronaviruses cannot multiply in food; they need an animal or human host to multiply (FAO and WHO, 2020). Therefore, the government of Ethiopia should make a massive public awareness creation to show fish and dairy products are safe to consume after proper heat treatment or pasteurization, as these food products are importance to boost public immune system to control the disease. (ii) Food industries need to include good hygiene practices, cleaning and sanitation, zoning of processing areas, supplier control, storage, distribution and transport, personnel hygiene and fitness to work all the basic conditions and activities necessary to maintain a hygienic food processing environment. (iii) One of the control mechanisms of the spread of the virus is avoiding public gathering, which leads to unprecedented contraction of hotels, restaurants and coffee houses. Therefore, the dairy industries and their distribution system need to switch the supply efforts from food service areas to retail channel or home to home delivery in large market potential areas, like condominiums and apartment buildings. A door-to-door milk delivery from processing industries through the existing distribution channels better to be accomplished along with awareness creation activities to restore back the trust and confidence of consumer. Local government authorities and experts in agricultural office should encourage producers to convert excess milks to other relatively better shelf life dairy products (e.g. local butter or butter cream). (iv) The government needs to establish subsidy mechanisms to support both producers and processors so as to sustain the dairy industry. Immediate technical advises and facility support need to be offered to producers to convert raw milks or fresh fish to other relatively shelf stable products like production of butter and cheese from milk and dried fish meat.

Extended lack of demand for dairy products and fresh fish ultimately enhances the production costs with less or no income to cover feed and other operation costs. This will lead to hampering or completely halting the dairy and fish value chains and eventually leads to the collapse of the industry, worsen unemployment due to labor layoff, enhance economic crises, and aggravate food and nutrition insecurity gaps. In the long-run, to sustain the dairy and fish supply, the following points could be forwarded as a recommendation: (i) A mechanism need to be developed to consult professional societies and relevant civil associations before media advertisement or advise of food products in order to avoid spillover effect from one advertisement to the other. For instance, a professional advice and advertisement from ministry of health may overlook the short- or long-term impact on agriculture sector. (ii) Dairy processing industries could consider the production of shelf stable milks (UHT milks) to cope up with the current market gap where excess milk is supplied to the industry and temporary decline in demand of milk occurred. (iii) Market and product diversification can be considered as an option. The government needs to establish incentive and subsidy mechanisms to the dairy industry in terms of share of production cost, tax exemption, loan payment extension, interest rate cancellation etc.

## 5.2. Impact on meat exporting abattoirs

Despite shortage of cattle for abattoirs due to restriction of movements in major cattle markets (pastoral, agro-pastoral communities), the volume of fresh meat exported to different Middle East countries is increasing as compared to the previous years. Middle East countries as net importer of food items import and stock enough food to meet the demand of their nation at least for six months. The pandemic has resulted in decline of global supply/export of meat and meat products to the Middle East countries but has opened good opportunity to abattoirs in Ethiopia. Particularly the volume of meat exported to UAE and Saudi Arabia is increasing during early the time of the disease (March and April). This can be an opportunity to narrow down the hard currency gap created due to lack of export of flower to Europe.

It is better to forward the following recommendations to enhance the available opportunity to boost export of meat to Middle East countries. (i) Develop a mechanism to increase the supply of live animals to modern abattoirs so as to enhance the volume of meat to be exported (i.e., to meet increasing demand in the Middle East). During such pandemic and natural disaster period, food is always on the top list of consumers as compared to other non-food items. This is an opportunity to establish and strengthen good market links with net importer countries. Therefore, creating conducive system for supply of live animals to modern abattoirs could sustain production and supply of the meat. Therefore, relaxing restriction of movement, including in pastoral community areas, and as well creating conducive legal issues associated with supply of live animals needs due consideration, especially at this time wherein the country-imposed state of emergency. (ii) Easing or lifting of existing production and export barriers for the abattoirs could enhance the supply of products and generation of hard currency for the country. Supporting the handling and transportation sector could play important role to enhancing the efficiency and capacity of the exporter. (iii) Additional market destination needs to be sought to diversify market outlets.

In the long-term, the government policy and incentive direction need to incline (i) to support food-processing sector as compared to non-food processing industries. (ii) Market diversification also needs consideration to enhance the supply of meat and meat related products to diverse markets than only limited to Middle East countries. (iii) Financial and technical support from the government, long-term tax exemption and provision of loan, exploring joint venture opportunities deserve due attention.

### 5.3. Impact on industries producing shelf stable products

Shelf stable products that comprise, cereal-processing industries like flour millers, oil seeds processors, bakery industry, pasta and macaroni producers, and coffee processing warehouses. These agro-processors are less affected by current pandemic as compared to those produce perishable products. In general, demand of processed food from such food industries is rising with change on consumption behavior of the nation, price advantages, convenience and other issues. However, at this pandemic moment, the demand and price of these products is increasing alarmingly with the intention of stockpiling of extra foods by panic buyers. In the short-term, such industries can sustain production and supply levels of their processed products. However, with an increase in disease pressure, in the long-term, the industries could experience shortage of supply of packaging and raw materials.

From coffee processing point of view, the country exported 3.98 million 60-kg bags of coffee in 2017/18 generating \$897 million revenue and is expanding the production to reach \$2 billion in sales by 2019/2020 (Ethiopia Country Commercial Guide, 2020). In recent months (January to April 2020, before early impact of COVID-19) the country has been processing and exporting coffee as planned because of pre-signed contract agreement with buyers. However, the future trend may change because of decline of demand on international markets due to closure of coffee retail shops like Starbucks, restaurants and cafés. In Ethiopia, Coffee processing and grading companies are labor intensive, engaging large number of women per unit area, which probably could be challenging to implementing social distancing and avoiding public gathering as preventive measures of a potential virus spread. This necessitates to creating safe working condition for the workers to accomplish their regular activities. If this condition could not be met, the volume of coffee supplied to international market could be hampered due to pressure of the disease at processing sites. In addition to this, the international market is also expected to decline due to closure of coffee stores, restaurants and cafés. For instance, according to Starbucks CEOs (Kevin and Partick, 2020), during month of February 2020, in China market the Starbucks comparable sale was 78 percent down as compared to same month sale in 2019. Perhaps more of such decline is expected at this time and even in near future in USA and other European countries. However, close to 90 percent of the Starbucks stores in China are back to normal work and the same trend hopefully could continue on other COVID-19 affected potential markets as well. However, persistent market search and strong link with existing customers are necessary to maintain at least the planned export volume of coffee. Therefore, the anticipated gain in foreign currency may not meet for the fiscal year if there is a loop to miss potential customers. This will also have a spill over effect for the sector in the long-term to loss potential customers and position of the country in global coffee market.

The following points can be considered as short-term strategies to lessen the impact of the pandemic on shelf stable processed agricultural products. (i) The current less pressure of the pandemic in the country is an opportunity to enhance the production capacity of the industries to compensate decline in supply of the products at time of the pandemic high pressure. (ii) The government together with processing industries needs to ensure the supply of packaging and raw materials through sustaining the current supply chain either from local markets or through import. (iii) Financial support and other incentives from the government are important to maintain and sustain full production capacity of the industries. (iv) The industries should develop a strategy to maintain their production even during high pressure of the disease in collaboration with the government. (v) Implementation of laws, rules and regulations as well as guidelines in line with the current state of emergency needs to be drafted so as to support the smooth production and flow of food and packaging materials, while implementing preventive measures of the disease. For example, the federal government could exempt food processors from rules that prevent the gathering of more people until the coronavirus emergency is over. It is necessary to keep food processors or manufacturers as part of essential services to ensure food and nutrition security during and even after the pandemic. This means a critical consideration upon implementation of the guidelines or rules and regulations of the current state of emergency is important to be well aligned with food processing industries.

In the long-run, the government could consider the following points to overcome a potential severe impact of the disease in food processing subsector. (i) The current scenario (crisis period) showed that, food industries for shelf stable products being less affected as compared to perishable food industries. This is mainly because of high demand for shelf stable products by urban consumers to stock foods for extended period to ensure household food security. The government needs to promote the establishment of large number of such types of food industries throughout the country. Such types of food industries are more resilient to such type of natural or artificial disasters and meet public food demand as compared to perishable foods. This ought to be the same for packaging industries to sustain constant supply of packaging materials for the industries. (ii) A sustainable supply of raw materials for the industries is necessary to maintain the work force and supply of food for long period. Experiences indicate that in Ethiopia very often medium and large-scale food processing industries suffer from lack of raw materials and inputs to perform in full capacity. Restriction of movement and social distancing might further disrupt the normal supply chain of raw materials and other inputs like packaging materials. This could lead to scaling down or cessation of production and in the long-run it could result in labor force layoff and shortage of the products. This will eventually push the industries out of the system unless and otherwise coping strategies are brought into effect ahead of time. Therefore, the supply side needs to work efficiently to maintain constant supply of raw materials and other inputs for the industries. (iii) Long-term financial support from the government side, product and market diversification, import substitution for certain ingredients and efficient supply chain system are few of the points

that need to be addressed by the government to transform the current small and medium industries to large scale ones. (iv) There is a need to seek sufficient fund from different international sources to support the food processing industries. The food industry should get priority and robust support from the government and other lending agencies / donors as compared to industries involved in non-food items. An emergency rescue package that would enable poorly performing industries to provide cash grants or bail out of vulnerable small businesses is also important.

In addition to mitigation strategies indicated above, the following points are forwarded as a general remark (short and long-term) for all food processing industries to cope up with a probable impact of COVID-19 and other similar disasters in the long-term.

- a. As a short-term strategy, existing food processing industries need to follow and apply “COVID-19 and food safety: guidance for food businesses” of Food and Agriculture Organization and World Health Organization of the United Nations (FAO and WHO, 2020).
- b. Recent research evaluated the survival of the COVID-19 virus on different surfaces and reported that the virus can remain viable for up to 72 hours on plastic and stainless steel, up to four hours on copper, and up to 24 hours on cardboard (van Doremalen et al., 2020). To avoid the transmission of the virus the products can be hold for a maximum of 72 hours before distributing them to avoid a possible cross contamination during distribution if there is a suspect of positive case in food processing industries or cross contamination from Personal Protective Equipment (PPE). Surface decontamination of the packaging materials could also be an alternative option for immediate distribution of the packed foods. A continuous training on personal hygiene, possible routes of cross contamination, symptoms and identification of the disease and care during handling, transportation and marketing of the products should be given to the work force in the supply chain of the product.
- c. In the context of rising demand for processed food products, medium- and large-scale food processing companies in Ethiopia often reflect lack of raw material inputs as a main constraint hindering their ability to work at full capacity. This is a critical problem to avoid food self-insufficiency even in good time. Therefore, the supply side needs critical consideration to produce, store and deliver enough raw materials for all food processing industries.
- d. Food industry should have Food Safety Management Systems (FSMS) based on the Hazard Analysis and Critical Control Point (HACCP) principles in place to manage food safety risks and prevent food contamination. Implementing these food safety measures in all food industries during good days will insure production of safe foods at time of disaster.
- e. Ethiopia is establishing Integrated Agro- Industrial Parks (IAIPs) with potential investment of USD 1.5 billion for estimated 400 business opportunities to employee 400,000 jobs (Ethiopia Country Commercial Guide, 2020). As a long-term intervention, the current efforts of the government to establish IAIPS in 17 selected target areas need be hasten to transform the current low contribution of agro processing industries to the maximum potential of the country.

## 6. Impact of COVID-19 on Distribution and Marketing of Agricultural Products, Food Systems, Industries and Mitigation and Adaptation strategy

Due to the COVID-19 pandemic outbreak, food distribution and marketing of the country would be hard hit. Given that the food distribution and marketing system is not well developed due to underdevelopment of infrastructure and shortage of skilled human power, the pandemic will have adverse effects on food supply chains – supply side as well as the demand side. On the supply side, the most important short-term effect is food scarcity in the urban and peri-urban areas due to reasons such as movement restrictions, increased frustration or withdrawal of value chain actors (producers, rural/urban food collectors, wholesalers, retailers or consumers) (Reardon et al., 2020). The food supply chain in Ethiopia is labor intensive. In essence, producers transport food crops and animal products from rural areas to nearby urban settings using their family labor, draught animals, and carts. As a result, they can only transport a small amount of food commodities, which requires a large number of people or draft animals to come to the marketplace to transport a significant amount. On the other hand, the restrictions on movement make it difficult for rural and urban collectors to move from place to place or market to market freely. Furthermore, the restrictions on movement, together with the frustration of value chain actors, not to be infected by the virus, could reduce the amount of food commodities arriving at urban areas leading to temporary food shortage.

The possible solutions to increase food availability in the urban areas in response to the above challenges include, enhancing the capacity of producers cooperatives, by providing them with clear orientation on COVID-19 prevention mechanisms to collect food from producers by establishing handwashing locations, using disinfectants, and communicating time table to the suppliers, while keeping also proper physical distance from one another. They can systematically schedule in such a way that farmers from the same village can supply on the same date to minimize congestion of food suppliers at the cooperatives’ sites. Besides, local administrators can arrange many food-collection points in the villages where cooperatives can collect food commodities from suppliers. Given that most of these cooperatives are closer to all-weather roads, and that they can have better access to a truck, they can transport food to urban areas. It is also possible that consumer cooperatives in urban areas can purchase food from producer cooperatives, transport to urban areas and distribute to consumers. This will have multiple benefits: first, it reduces the spread of the virus if carefully managed – only a few people operate at producer cooperative level; altering the date traders come to reduce congestion at the cooperative site; arranging places for handwashing; shipping using large truck where only a few people need to come. The same can be used at consumption end – only a few people operate at consumer cooperatives based on schedules for consumers. Second, it increases employment opportunities, especially if the unemployed youth can support in handling crops at consumer cooperatives. Third, it reduces the income loss of farmers that might arise due to difficulty to move commodity to towns and cities. Evidence shows that farmers, especially vegetable producers, have lost income due to less

movement and lower prices (Tamru et al., 2020). Fourth, consumer cooperatives can transport processed products such as oil from urban to rural areas, which can be distributed to rural consumers through producer cooperatives. To capacitate the efficient operation of both producer and consumer cooperatives, financial support by the government and financial institutions needs to be prioritized. Another short-term supply-side impact is related to reducing overcrowd of buyers and sellers in rural and urban market areas. This also limits the availability of and access to food items and other commodities among buyers and sellers. The possible solution for this is that local administrators can open up new marketplaces, alter market dates, allow people to transact by keeping their social distance and applying all the possible prevention mechanisms. Such solutions are supported by International Food Policy Research Institute (IFPRI) (Resnick, 2020). Opening up additional marketplaces and altering market dates give additional room to disinfect the marketplaces on the off days.

Other options that can enhance food availability might include reducing the export of staple food items, importing food in bulk and requesting emergency food aid. Literature shows that under normal situation, 7-14 million people in the country are estimated to be food insecure (OCHA, 2020), which needs emergency food aid. Adding the effect of COVID-19, which can reach up to 10 million people, would increase the need for food donation from international donors. In the long-run, if the spread continues for the coming production season, food shortage will continue to be a challenge. As part of the preparedness, relaxing travel ban as the awareness of people on the virus will increase and reorienting the marketing and food distribution system – the need for the emergence of big companies and supermarkets in vending food; and specialized food transporters could help. Further strengthening the capacity of producer and consumer cooperatives to enhance their bargaining power and thereby stabilizing the prices are important measures that can be put in place to transform the food supply chain from traditional and transitional to modern supply chains. Furthermore, it is important to encourage small and micro enterprises to emerge and distribute food, to look for alternative genuine and reliable individual distributors and entrepreneurs.

The other important short-run effect is information asymmetry among the suppliers. Suppliers might hoard crops in their store, fearing for long-term effects of the pandemic, if they do not have clear information. And some countries might induce export ban even though they are surplus producers. E.g., Uzbekistan and Vietnam have already induced export ban on rice while they are suppliers of a large amount of rice to the global market (e.g., 16 percent of the global rice comes from Vietnam) (Glauber et al., 2020). This negatively affects the food import of the country. The short-term solution is ensuring transparent, stable and reliable source of information regarding food supply and negotiating with exporting countries, in collaboration with all concerned stakeholders, to increase food supply to the world market. Literature shows that there is no immediate food shortage in the global market for the coming 10 to 13 months (Glauber et al., 2020); hence, opening up markets will be an advantage. At the same time, the country can introduce the Chinese "green chain" model where an import is opened up for medical and food commodities, keeping all transactions to be audited after the crisis. In the long-run, the government can open up trades by reducing import tariffs to reduce the negative effects of the import ban on food availability.

Most of the above reasons combined with adulterations by unethical traders, and rising producers and traders' expectations will lead to food price hikes in the short-term and absence of some food crops from the market in the long-run and leaving the poor behind from getting access to food. Literature shows food price increase in some African countries following the pandemic outbreak (Resnick, 2020). Capacitating urban micro-enterprises or consumer cooperatives can manage such effects. Kebele level consumer cooperatives should be capacitated to store and distribute foods. Access to credit /financial resources for consumption smoothening would also help. Local administrators should also control illegal traders (wholesalers and retailers) from adulteration and artificial price increase. It is also important to take this opportunity and upgrade sanitation in wholesale and retailers' markets, maintaining its long-term effects even after COVID-19. Better preparedness is also needed; awareness rising among the producers to produce more productive food crops (e.g., maize vs teff) and among consumers to shift their consumption to the more productive crops.

The demand side effects are also important. As constraints on logistic continue, many value chain actors withdraw from food trade, unemployment and income loss increases, which can even lead to crisis and unrest in the towns and cities due to inability to get access to food (Bellemare, 2015 cited in Reardon, 2020). Literature shows that due to lockdown, China has lost over \$100 billion from rural migrant labor (Rozelle et al., 2020). Local administrators can give safety net (cash for work) for those who are unemployed and engage them in emergency food distribution and give cash vouchers for disabled people. In the long-run, it is pertinent to work with financial institutions, enhance credit services, and lend more money to micro and small enterprises so that they can employ more people. Also, it is important to take this opportunity to legalize the informal food traders and support them. This will have a positive impact on the economy of the country in the long-run. Food price hikes can also be induced from the demand side due to bulk demand by consumers-consumers' stockpiling, which emanates from rising consumer expectations about the future. This probably will leave many poor people behind getting access to food; enhance hunger and food insecurity in the long-run. The immediate solution is creating and raising awareness by providing reliable information about food availability. Also monitoring and controlling food prices is of paramount importance. In the long-run, enhancing food reserve and redistribution to the community, upgrading consumers' awareness about food quality and safety, upgrading their sanitation in food purchase-especially the perishable ones- is very important.

Another important impact is related to confusion among consumers about some food items. Some evidence shows [though not confirmed] that COVID-19 originate from Chinese wet market links it to the consumption of raw products. This has brought about frustration on consuming some plant and animal products that are rich in vitamins and minerals. Though consuming raw is not recommended at all for some products, consumers must get the right information and decide the mode of consumption for such products without destroying its nutritional value. Avoiding consumption of raw meat, especially for Ethiopians after Easter fasting period is a caution; consumers should consider not only avoiding possible

contamination with COVID-19 but also due to potential risk of tapeworm. There is a reduction in the number of customers in the restaurants, cafés and small and micro-enterprises such as roadside cultural coffee markets. This, in the long-run, can even result in the withdrawal of some of the restaurants and cafés from the economy. To encourage such businesses to keep operating, it would be helpful if the local tax and revenue authorities give them tax exemptions. In the medium and long-run, it is helpful for them to change their mode of delivery-delivering food at the door of their customers. Finally, the country loses hard currency as there will be low demand in the international market for high-value crops such as flowers, fruits and vegetables that Ethiopia exports. For instance, according to the ministry of agriculture flower export has fallen by 70 percent due to the COVID-19 in the last three months. The country will face a further shortage of hard currency. Reducing taxes, opening up trades, market segmentation and diversification are (searching for new markets) especially in countries where COVID-19 is not highly prevalent and where it is diminishing can help the country to get hard currency. Moreover, the export of coffee has received more demand from the global market as the consumption of coffee increases as people stay at home. The coffee authority also reports the highest revenue from the coffee export in the last couple of months. Therefore, the country can empower coffee cooperatives and exporters to increase foreign currency earnings from coffee export.

## **7. Probable Impact of COVID-19 on Consumption of Agricultural Products, Food Systems, Industries and Mitigation and Adaptation strategy**

This section presents the probable impacts and potential mitigation strategies of COVID-19 pandemic on food consumption, including high-value food items (fruits and vegetables, animal products, sea food and fish products), food and nutrition security, food prices and purchasing power, and on service providers such as restaurants.

### **7.1. Impact on consumption of fruits and vegetables, animal products, seafood and fish products**

As a result of COVID-19 related misinformation, the consumption of fruits and vegetables, animal products, seafood and fish products will be reduced in the short-term. The COVID-19 virus appears to have originated with animals, possibly pangolins and spread to humans, but there is no evidence that the virus has spread through the livestock sector or by consuming animal products. It is necessary to provide the public with a transparent, stable, and reliable source of information regarding national markets, food supply and the safe consumption of such food items. In the medium and long-term, the availability of these food items might decline in the market due to less supply as producers are hard hit from the loss of previous low prices. The government can ensure the continuous availability of such high-value food by making efforts at national and international levels.

### **7.2. Impact on food and nutrition security**

There are high foods and nutrition insecurity of vulnerable communities in the East Africa region, including Ethiopia (FSNWG, 2020) due to climatic effects, economic challenges induced by high food prices, an outbreak of livestock pest and diseases, desert locust outbreak, regional conflicts, and population displacements. In particular, for the current agricultural seasons, the ongoing desert locust outbreak demands increased concerns about further food security deteriorations. On top of this, the current COVID-19 crisis could significantly increase the food and nutrition insecurity of the vulnerable communities, both in the short, medium and long-term time frames bringing increased dependency on food aid. The government structure should make close monitoring in the most vulnerable areas, give emergency shelter and food assistance through donation and resource mobilization, strengthen social safety net mechanisms to maintain food and nutrition security of the poor and the most vulnerable. In the medium and long-term, the government needs to work on the rehabilitation of the displaced people, create more employment opportunities, and strengthen the small-and-medium-sized enterprises.

### **7.3. Impact on food prices**

Government media briefs indicate that COVID-19 has significantly affected the prices of food items following panic buying; hoarding by traders, and disruptions along the food value chain (e.g., processing, transportation between rural and urban areas and regionally) could drive higher prices in certain areas, limiting food access for poorer households. This price hikes due to a shortage in the supply caused by movement restriction can be tackled in the short-term by taking control measures to lessen shocks to the food supply chains. The control of wholesale and retail markets to minimize artificial price increases and the use of cooperatives and unions for doorstep supply of basic needs during the emergency/lockdown can also be among the necessary measures. In the medium and long-term, there will be less food availability due to lag in production seasons; hence, leading to a shortage in the supply and further price hikes. This needs measures to lessen shocks to the food supply chains, for instance, through injection from food reserve.

### **7.4. Impact on purchasing power**

Consumers will have low purchasing power due to travel restrictions, layoff, low income and other crises resulted from COVID-19 (Kufuor and Beddington, 2020). The authors also indicated that during the economic crisis of 2007 to 2012, poorer consumers responded to price spikes by reducing purchases of nutritious foods while prioritizing the consumption of lower quality staple foods. Mobilization of food banks and efforts by charities and NGOs to deliver food can play critical roles to reduce the impact of this crisis. The organization and strengthening of daily laborers in the group under cash for work to vender food post-COVID-19 might also be essential to reduce the impact on the purchasing power.

## 7.5. Impact on restaurants

In the short-term, closure of restaurants in the steps to fight the COVID-19 crisis could affect readymade food availability. This mainly affects those people who are not cooking at home and entirely dependent on restaurants. The government should encourage restaurants to continue their service by ensuring the safety of food and food-system workers through local administrators and health workers. The Chinese “green channel” approach for innovative basic needs distributors at door front can also help as a mitigation strategy in this regard. The number of restaurants might decrease due to hard-hit during COVID-19 in the medium- and long-term impacts. It is vital to promote the safe preparation of food at home and change in lifestyle and consumption behavior. The government can take measures such as financial injection into the system for selected restaurant service providers.

## 4. CONCLUSION

Following the COVID-19 outbreak in China and spread to almost all countries in the world, governments and all concerned stakeholders are paying maximum attention on containing spread of the virus. Developing countries in general and Ethiopia in particular are implementing different policy measures including diverting large proportion of resources to the health sector, partial lockdowns, state of emergency, social distancing and avoiding crowds. Though the measures can help to reduce health crisis due to the pandemic, they could divert attention from agriculture sector and adversely affect the food and nutrition security of the country by disrupting food supply chains.

The current assessment (experts' opinions and desk review) by the multi-disciplinary team of experts at Haramaya University highlights, in a comprehensive manner, the probable effects of COVID-19 and their respective adaptation and mitigation strategies on different functions and stages of food supply chains including production, handling and storage, processing and packaging, distribution and marketing, and consumption. At production level, the pandemic outbreak is expected to negatively affect crop and livestock production inputs, labor, psychological aspects of producers, agricultural extension support system, supporters/service providers, local administration, control of desert locust, and pastoral movement. At the level of handling and storage, it can result in labor shortage, loss due to stockpiling, improper storage technologies, and cancellation of orders, transport restrictions and food safety. Processing and packaging are affected through reduction or cessation of production, labor layoff, production and supply of less safe and poor-quality product, shortage of running capital, absence or shortage of key technical personnel, and psychological implication. At distribution and marketing level, it could result in scarcities of food in the urban due to movement restriction, withdrawal of value chain actors, slow down trading, import and export bans, food price hikes, reduced supply and demand for some food items due to information asymmetry and loss of hard currency. At the consumption level, the pandemic is expected to negatively affect the consumption (due to perceived misinformation) of some products such as fruits and vegetables, animal products, seafood and fish products; households' food and nutrition security, food prices and purchasing power, and restaurant services.

Based on the experts' opinions and desk review by the multi-disciplinary team, the following short-term and medium- and long-term adaptation and mitigation strategies have been forwarded. To minimize disruptions to farm input supply, ensuring availability and timely delivery of agricultural inputs with affordable prices should be prioritized in the next few months. Labor shortage can be reduced through careful movement of labor to areas of labor-intensive production. It is also important to encourage returnees from cities and towns, and students to work on family farms. In the long-term it is important to encourage technical innovations and contract farming to come up with labor saving technologies. Labor layoff from commercial farmers can be reduced through encouraging farms to operate safely and through government subsidy so that they can maintain their labor and linking them to markets through multilateral negotiation among the countries that purchase the farms' products. Agricultural extension support systems can focus on family extension in the short-term and IT based extension system in the long-term. Enhancing rural financial access, support of cooperatives and unions to farmers, NGOs, grass root organizations, and paying attention to agricultural research and development to come up with long-term solutions are crucial.

Proper post-harvest management practices should be implemented to minimize quantitative and qualitative post-harvest food loss and waste through community mobilization, using combine harvester at potential areas, ensuring the safety of workers in the field, pack houses and store; improving postharvest technologies and ensuring food safety. At processing and packaging, ensuring the availability of raw materials and labor, subsidizing the companies to maintain their workers, giving them tax exemption, enhance better storage and distribution capacity, encourage product and market diversification, and putting in place quality control and monitoring are very important. Distribution and marketing should be strengthened through capacitating producers and consumer cooperatives; supporting value chain actors to function properly, opening new market places, controlling and monitoring prices, enhancing food availability through imports and probably reducing the export of staple food commodities and food aid, enhancing access to food by vulnerable community through creating cash for work schemes. Food utilization should be revitalized by providing transparent reliable and stable information on food safety, controlling prices, enabling cafés and restaurants to diversify their services with food and workers safety, and encouraging door to door food vending services.

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Research Article

# The Gap in Economic Growth from Foreign Investment and Domestic Investment across Provinces in Indonesia

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## ABSTRACT

The study aims to determine the effect of Foreign Investment (FDI) and Domestic Investment (PMDN) on Cross-Province Economic Growth in Indonesia in 2014-2018. This study uses secondary data with Panel and Poled data consisting of 34 provinces in Indonesia, and use the 5 years time-series data during 2014-2018. The analytical method used is the panel regression analysis method with the Fixed Effect model and poled model. The results showed that foreign investment and domestic investment had a positive and significant effect on economic growth across provinces in Indonesia. Furthermore, the results of the study show that foreign investment and domestic investment have a significant and positive effect on economic growth in 8 provinces in Indonesia, and the foreign investment has a significant and positive influence on economic growth in 9 Provinces in Indonesia. However, only North Maluku, where foreign investment has a significant and negative effect on economic growth, and domestic investment significantly and positively affects economic growth in 6 provinces in Indonesia.

**Key Words:** Foreign Investment, Domestic Investment, Economic Growth

## 1. INTRODUCTION

Increased economic growth is an indicator of successful development in Indonesia, with the development of productive businesses in the real sector, thus creating jobs and increasing people's income. Efforts to accelerate the development of the real sector are by encouraging investment growth, both domestic investment (PMDN) and foreign investment (FDI). (Iamsiraroj & Doucouliagos, 2015) reinforces the positive influence of FDI in the economic growth process for selected developing countries. Investment can contribute to various real sector developments in Indonesia. According to the Investment Coordinating Board (2018), there are 3 business sectors with the largest amount of investment, namely transportation, telecommunications and construction, industry, and the food sector.

The turmoil of world economic development, the escalating trade war between the United States and China as well as an error in the investment licensing mechanism carried out by the government, this has an impact on the growth of foreign investment in Indonesia, according to the Investment Coordinating Board (BKPM) (2018). \$ 2,932 million in 2018 was the largest amount for the past 5 years. However, the opposite occurred in domestic investment in Indonesia according to the Investment Coordinating Board (2018), it was noted that in 2018, it amounted to Rp.66,254 billion, with an increase of 25.32% from 2017. The increase in domestic investment was caused by a weakening of the purchasing power of money. rupiah, high domestic currency circulation, and most economic actors divert their business activities domestically.

According to the Investment Coordinating Board (2018), it is seen that the overall foreign investment (FDI) is larger, namely 62.9% in 2017, with domestic investment only 37.9%. Meanwhile, in 2018 the amount of foreign investment was 54.5%, with domestic investment amounting to 45.6%. The spread of foreign investment and domestic investment to 34 provinces in Indonesia, however, there is a striking difference that there is an inequality in the distribution of investment, wherein DKI Jakarta, West Java, Central Java, East Java, and East Kalimantan, investment has increased, by 56.2% (2018) ), while in other areas, namely the island of Sumatra, parts of Kalimantan, Sulawesi and Papua, the investment amount is smaller, amounting to 43.8% (Investment Coordinating Board, 2018), this also has an impact on uneven economic growth.

## 2. LITERATURE REVIEW

The aim of increasing foreign investment and domestic investment in Indonesia is to increase real sector growth, increase production, create jobs, and increase national output which has an impact on increasing economic growth as the goal of economic development. (Arsyad, 2010) states that the factors that can affect economic growth consist of; (1) capital

accumulation, in which economic growth occurs with an increase in investment; (2) population growth that can increase the number of workers; and (3) technological advances that can increase the mobility and skills of labor, as well as production factors in increasing yields. Meanwhile, Nurske said that poverty in developing countries can be stopped by increasing capital, with additional capital, the availability of tools and machines will increase production and ultimately increase national income from the increased output produced (Jhingan, 2016).

Harrod-Domar assumes that the development process is a matter of increasing capital investment, with the problem of underdevelopment is a problem of lack of capital and if the capital is available and the capital is invested, growth will occur (Zakaria, 2009). (Law Number 25 of 2007) states that Foreign Investment is an investment activity to conduct business in the territory of the Republic of Indonesia which is carried out by foreign investors, either using foreign capital fully or in partnership with domestic investors. Foreign investors are individuals who are foreign citizens, foreign business entities, or foreign governments investing in the territory of the Republic of Indonesia.

The results of the study (Hussain & Haque, 2016) found that trade and FDI have a significant impact on the economic performance of Bangladesh. This study also shows a long-term relationship between the variables used in the model. The study concludes by recommending that the Mauritanian government should implement policies that have the potential to make the country's macroeconomic environment competitive and thus encourage FDI.

(Onakoya, 2012) By using a disaggregated dataset using a structural macro-econometric model consisting of four blocks, namely; supply, private demand, government, and the external sector to measure the impact of FDI on economic growth. The findings indicate that FDI contributes to the promotion of economic growth in Nigeria. However, the effects of FDI growth vary across sectors.

(Bakari, 2017b) The results determine that there is a positive impact of domestic investment, exports, and labor on economic growth in the long run; however, there is no relationship between domestic investment and economic growth in the short term (Bakari, 2018). The empirical results show that in the long term carrying out domestic investment hurts economic growth; However, exports and imports have a positive effect on economic growth. In the short term, only domestic investment and imports lead to economic growth in Algeria.

## Research Purposes

The research objective is to determine the effect of foreign investment and domestic investment on economic growth across provinces in Indonesia in 2014-2018.

## 3. RESEARCH METHOD

This study uses secondary data in the form of poled data which is sourced from the Investment Coordinating Board and the Central Bureau of Statistics for 5 years. The data analysis aims to simplify the data in a form that is easier to read to interpret. The data poled in this study have 3 methods to test the data, as follows:

Common Effect Model

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \mu_{it}$$

Fixed Effect Model

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 W_{it} + D_2 Z_{it} + \varepsilon_{it}$$

Random Effect Model

$$Y_{it} = \beta_0 + B_1 X_{1it} + \beta_2 X_{2it} + e_{it} + \mu_{it}$$

## Poled Model Regression Analysis

a. Model 1 is the additive model with the equation:

$$PDRB_{it} = \beta_{0i} + \beta_{1i} FDI_{it} + \beta_{2i} PMDN_{it} + \varepsilon_{it}$$

b. Model 2 is the sum model in 34 Provinces in Indonesia, with the following equation, for one of the Provinces to-j

$$PDRB_{j.it} = \beta_{j0} + \beta_{j1} * FDI + \beta_{j2} * PMDN + \varepsilon_{it}$$

## Data and Sources

The data used to assess the effect of foreign investment and domestic investment is the 2014-2018 panel data. Data on foreign investment and domestic investment are obtained from the Indonesian Investment Coordinating Board and data on the Gross Regional Domestic Product (GRDP) in provinces in Indonesia.

## 4. RESULTS AND DISCUSSION

In the selection of pooled data analysis with Chow test, Hausman test and LM test, which was selected in this study is the Fixed Effect Model. With the results and explanation of the pooled data regression in table 1.

**Table 1.** Fixed Effect Model Regression Test Results

Variabel	Coefficient	Std. Error	t-Statistics	Prob.
C	11.30872	0.086156	131.2583	0.0000
LOG(FDI)	0.033312	0.009834	3.387503***	0.0009
LOG(PMDN)	0.034736	0.005066	6.856167***	0.0000

\*\*\* Significant 1%

The results of the study are based on table 1, that a constant of 11.30872 indicates that if FDI and PMDN are (constant), then the GRDP in Indonesia is also 11.30%. The coefficient (FDI) has a value of 0.033, this indicates a positive relationship. This means that if FDI increases by 1%, then GRDP in Indonesia will also increase by 0.033%. The variable coefficient (PMDN) has a value of 0.034. This indicates a positive relationship. This means that if PMDN increases by 1%, then GRDP in Indonesia will also increase by 0.034%. There are several reasons that explain the influence of foreign investment and domestic investment, where from several provinces it is caused by abundant natural resources, quality human resources, developing and progressing MSMEs and ease of licensing to do business.

**Table 2.** Results of the Poled Data Regression Test and the Fixed Effect Model

Variabel	Coefficient	Std. Error	t-Statistic	Prob.
C	10.23675	0.109984	93.07484	0.0000
LOG(FDI_ACEH)	0.132754	0.035844	3.703660***	0.0003
LOG(FDI_BALI)	0.169877	0.052626	3.227990***	0.0017
LOG(FDI_BANTEN)	0.006077	0.209981	0.028940	0.9770
LOG(FDI_BENGKULU)	0.043377	0.027812	1.559667	0.1220
LOG(FDI_DIY)	0.106634	0.037453	2.847149**	0.0054
LOG(FDI_DKI)	0.336637	0.075391	4.465199***	0.0000
LOG(FDI_GRNTLO)	-0.078434	0.052243	-1.501324	0.1365
LOG(FDI_JABAR)	0.100352	0.105313	0.952893	0.3430
LOG(FDI_JAMBI)	0.170015	0.103054	1.649763	0.1022
LOG(FDI_JATENG)	0.037783	0.073914	0.511172	0.6104
LOG(FDI_JATIM)	-0.033187	0.144149	-0.230229	0.8184
LOG(FDI_KALBAR)	-0.006469	0.057900	-0.111720	0.9113
LOG(FDI_KALSEL)	0.036785	0.030596	1.202270	0.2321
LOG(FDI_KALTENG)	0.048343	0.028854	1.675417	0.0970
LOG(FDI_KALTIM)	0.115618	0.044655	2.589130**	0.0111
LOG(FDI_KALUT)	0.010659	0.053220	0.200290	0.8417
LOG(FDI_KBANGBIL)	-0.005496	0.044528	-0.123420	0.9020
LOG(FDI_KRIAU)	0.196363	0.023044	8.521347***	0.0000
LOG(FDI_LAMPUNG)	0.139362	0.036961	3.770554***	0.0003
LOG(FDI_MALUKU)	-0.011039	0.016922	-0.652378	0.5157
LOG(FDI_MALUT)	-0.043045	0.017724	-2.428646**	0.0170
LOG(FDI_NTB)	0.069878	0.020249	3.450984***	0.0008
LOG(FDI_NTT)	0.126514	0.029479	4.291644***	0.0000
LOG(FDI_PABAR)	0.069822	0.020474	3.410248***	0.0009
LOG(FDI_PAPUA)	0.188525	0.025854	7.291803***	0.0000
LOG(FDI_RIAU)	0.129624	0.118900	1.090194	0.2783
LOG(FDI_SULBAR)	0.004128	0.029237	0.141197	0.8880
LOG(FDI_SULSEL)	0.225116	0.038724	5.813284***	0.0000
LOG(FDI_SULTENG)	0.053334	0.019902	2.679747**	0.0086
LOG(FDI_SULTENGG)	0.124486	0.059692	2.085454*	0.0396
LOG(FDI_SULUT)	0.122072	0.035076	3.480201***	0.0007
LOG(FDI_SUMBAR)	0.145154	0.043182	3.361471***	0.0011
LOG(FDI_SUMSEL)	0.165760	0.035830	4.626303***	0.0000
LOG(FDI_SUMUT)	0.163350	0.104211	1.567495	0.1202
LOG(PMDN_ACEH)	0.077018	0.030289	2.542727**	0.0125
LOG(PMDN_BALI)	0.009058	0.070009	0.129389	0.8973
LOG(PMDN_BANTEN)	0.272482	0.232697	1.170974	0.2444
LOG(PMDN_BENGKULU)	0.013028	0.021575	0.603874	0.5473
LOG(PMDN_DIY)	0.065916	0.033478	1.968903*	0.0518
LOG(PMDN_DKI)	0.032765	0.080505	0.406999	0.6849
LOG(PMDN_GRNTLO)	0.042613	0.038243	1.114257	0.2679
LOG(PMDN_JABAR)	0.261268	0.114484	2.282140**	0.0246
LOG(PMDN_JAMBI)	0.046174	0.090195	0.511931	0.6098
LOG(PMDN_JATENG)	0.310029	0.074130	4.182246***	0.0001
LOG(PMDN_JATIM)	0.402031	0.137831	2.916839**	0.0044
LOG(PMDN_KALBAR)	0.169113	0.060018	2.817702**	0.0058
LOG(PMDN_KALSEL)	0.134985	0.031195	4.327117***	0.0000
LOG(PMDN_KALTENG)	0.081114	0.030404	2.667930**	0.0089

LOG(PMDN_KALTIM)	0.174891	0.046683	3.746394***	0.0003
LOG(PMDN_KALUT)	0.076253	0.055357	1.377477	0.1715
LOG(PMDN_KBANGBIL)	0.079362	0.042014	1.888921	0.0618
LOG(PMDN_KRIAUI)	-0.005213	0.025538	-0.204144	0.8387
LOG(PMDN_LAMPUNG)	0.114479	0.032012	3.576107***	0.0005
LOG(PMDN_MALUKU)	0.016128	0.019498	0.827128	0.4102
LOG(PMDN_MALUT)	0.020488	0.017481	1.172023	0.2440
LOG(PMDN_NTB)	0.078854	0.021487	3.669749***	0.0004
LOG(PMDN_NTT)	-0.014857	0.021094	-0.704312	0.4829
LOG(PMDN_PABAR)	0.030248	0.037120	0.814876	0.4171
LOG(PMDN_PAPUA)	-0.037132	0.037335	-0.994542	0.3224
LOG(PMDN_RIAUI)	0.173801	0.124377	1.397364	0.1654
LOG(PMDN_SULBAR)	-0.004386	0.022479	-0.195094	0.8457
LOG(PMDN_SULSEL)	0.039740	0.040026	0.992853	0.3232
LOG(PMDN_SULTENG)	0.090967	0.023155	3.928691***	0.0002
LOG(PMDN_SULTENGG)	-0.003040	0.068422	-0.044436	0.9646
LOG(PMDN_SULUT)	0.001380	0.034012	0.040570	0.9677
LOG(PMDN_SUMBAR)	0.082285	0.041959	1.961048*	0.0527
LOG(PMDN_SUMSEL)	0.068538	0.035267	1.943429*	0.0548
LOG(PMDN_SUMUT)	0.142905	0.113987	1.253694	0.2129
R-squared	0.996978	Mean dependent var		11.85301
Adjusted R-squared	0.994903	S.D. dependent var		1.142431
S.E. of regression	0.081565	Akaike info criterion		-1.882249
Sum squared resid	0.658632	Schwarz criterion		-0.599193
Log likelihood	227.1089	Hannan-Quinn criter.		-1.361522
F-statistic	480.3365	Durbin-Watson stat		1.976642
Prob(F-statistic)	0.000000			

\*\*\* Significant at 1%, \*\* Significant at 5%, \* Significant at 1%.

The results of the study based on table 2 were obtained, namely 8 provinces in Indonesia, namely the province of Aceh, DIY, Yogyakarta, East Kalimantan, Lampung, West Nusa Tenggara, Central Sulawesi, West Sumatra and South Sumatra foreign investment and domestic investment have a significant and positive impact on economic growth, indicating that the licensing bureaucracy for investment in these 8 provinces has been conducive and conditions productive economy, to encourage foreign investment and domestic investment. Furthermore, 9 provinces in Indonesia, namely the province of Bali, DKI Jakarta, Riau Islands, East Nusa Tenggara, West Papua, Papua, South Sulawesi, Southeast Sulawesi and North Sulawesi with significant foreign investment have a positive effect on economic growth, this means that natural resources are abundant in the province, which encourages foreign investment to do business and the local governments in the 9 provinces provide adequate bureaucratic permits. However, there is 1 province in Indonesia, which is North Maluku province, where foreign investment has a significant and negative effect on economic growth. This shows that foreign investment in the province has an impact on declining economic growth, due to the safety factor of investment that is not conducive so that investors lose.

Furthermore, according to table 2, it is explained that there are 6 provinces (West Java, Central Java, East Java, West Kalimantan, South Kalimantan, and Central Kalimantan) in Indonesia with significant domestic investment and positively affecting economic growth, this shows that domestic investment is sufficient. developing in small and medium enterprises (UMKM) in the province of West, Central, and East Java. Meanwhile, in the provinces of West, South, and Central Kalimantan, more domestic investment is in the oil and rubber plantation sector and the mining sector.

## 5. CONCLUSION

Based on the results showed that foreign investment and domestic investment had a positive and significant effect on economic growth across provinces in Indonesia. Furthermore, the results of the study show that foreign investment and domestic investment have a significant and positive effect on economic growth in 8 provinces in Indonesia, and the foreign investment has a significant and positive influence on economic growth in 9 Provinces in Indonesia. However, only North Maluku, where foreign investment has a significant and negative effect on economic growth, and domestic investment significantly and positively affects economic growth in 6 provinces in Indonesia

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## Research Article

# An Analysis of Pakistan's National Curriculum of Mathematics at Secondary Level

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### ABSTRACT

The purpose of the study were to analyze the curriculum document of National Curriculum of Mathematics of secondary grades. The study employed qualitative research paradigm within it the discourse analysis technique was used to analyze the mathematics curriculum document. Discourse analysis helps in understanding the written, spoken and signs language used in any document analysis. The sample of the study were foreword, introduction, objectives, reviewer's notes and list of reviewers, the sections of mathematics in the national curriculum of mathematics (2006) for secondary grades. The findings of the study revealed that the National Curriculum of mathematics (NCM) 2006 was focused on transfer of Knowledge. However, it neglected the conceptual understanding of essential subject matter. It has been also discovered that the content of the mathematics is not taught according to the prescribed curriculum. Moreover, standard were not implemented properly. The role learners were recipient of knowledge and that of teachers is transmitter. Thus, it neglected the participatory and constructive approach of teaching and learning mathematics. Moreover, the curriculum ideology was not considered while developing the mathematics curriculum. It is suggested that the curriculum developers should revisit the policy on social constructive approach so that curriculum can be taught conceptually rather than standard based. Moreover, formative assessment should be included throughout the year rather taking annual examinations. It is recommended that teachers should impart mathematics education by linking math to social context and encourage students to construct meanings socially.

**Key Words:** Curriculum Ideology; National Curriculum of Mathematics; Secondary education; Pakistan

## 1. INTRODUCTION

The curriculum is a document that includes an overall program of education including experiences whichever individual learners have in school. The purpose of the curriculum is to provide a roadmap with clear goals and specific objectives. These things are planned according to a framework or research which present a professional practice (Kelly, 2009). Mathematics is an important subject at all levels of education. It is being taught from class one up to university level. In Pakistan, the curriculum of mathematics is designed at the national level (Government of Pakistan, 2006). Moreover, more importance has been given to elementary and secondary mathematics because these are the foundations for the future success of students. It is considered the mother of all sciences because mathematics is involved in every field. Generally, Mathematics is not liked by Pakistani students due to its rough, dry and hard nature (Aijaz, 2001). Students feel much difficulty in learning mathematics. The students in Public sector schools in Pakistan are unable to solve two-digit addition and subtraction. Only 48% of students can solve the basic arithmetic problem (Dubash, 2018; Pakistan, 2015). The curriculum of mathematics subject comprises of conceptual understanding which not only requires analytical but also involves logical thinking. The student's efforts play a vital role in the learning of mathematics (Ellis, 2011). However, the teachers of public and private schools failed to impart analytical skills among students due to lack of knowledge about curriculum (Gulzar, & Mahmood, 2019).

The documents of the National Curriculum of Mathematics 2006 is standard-based which means it is based on the social efficacy ideology. Social efficacy ideology focuses on the skills and specific abilities of an individual. This ideology advocate for performance-based education because it believes that human life is based on the principle of performing specific abilities. Thus, Education should prepare students for specific abilities and skills (Harb & Thomure, 2020; Schiro, 1978). In the modern era, the curriculum based on the social construction ideology will improve the students learning outcomes because whenever students are allowed to construct their meaning of the world around them their understanding improves. Social construction ideology believes that knowledge, skills and intelligence can be utilized to solve the problems for the betterment of society (Kumar, 2019). Therefore, the study aimed to analyze the National Curriculum of Mathematics (NCM) which has been implemented from 2006-2007 educational year at the secondary level to find the gaps

in the ideology and suggest a way forward for policymakers and curriculum developers. Also, this study aims at exploring the mathematics curriculum goals, teaching strategies, assessment and evaluation dimension of Curriculum.

The purpose of the current study is to critically analyze Pakistan's national curriculum document of mathematics for secondary grades. Mathematics is a core subject that has been taught from primary to secondary level in Pakistan. Mathematics is considered as one of the imported subjects and it has been emphasized in the national education policies of Pakistan. It enables learners to solve real-life problems. Mathematics also stimulates the cognitive functions of the brain and increases the thinking ability of the learners. It also enhances the rational thinking of students. Moreover, Mathematics skills have become necessary for meeting the demands of fast-forwarding technological society. The progress in STEM (Science, technology, engineering and Mathematics) is only possible by improving the mathematical skills of learners. Thus, the Government of Pakistan has introduced a standard based national curriculum for mathematics to meet the needs of a technologically advanced society. However, when it comes to implementation, Pakistan has a long history of not properly implementing education policies. The main concerns of this study are to find out the gaps in the curriculum through in-depth analysis. After reviewing the curriculum document of the national curriculum of mathematics (NCM) 2006, the researcher has found major gaps in the curriculum. First of all, the curriculum was designed on the inappropriate curriculum ideology. Secondly, it was more focused on skills rather than the understanding of the basic concepts. Thirdly, the curriculum document has not given a road map for the implementation of reasoning and justifying skills. So, these skills are missing in NCM 2006. Furthermore, although proper teaching strategies was given in the curriculum, yet proper instructions were missing in the National Curriculum of Mathematics 2006 for secondary grades. Therefore, this study is an attempt to explore the gaps and missing linking of teaching and learning of mathematics at the secondary level.

In education, the change is considered as part of intention and implementation of teaching and learning skills within a developed system. Change in the curriculum occurs due to difference in intended goals of learning and the implemented aspects of curriculum. Various researchers have studied the innovation in mathematics curriculum in different contexts (Clarke; 1997; Memon ,1997; Anderson & Piazza ,1996; Mumme & Weissglass ,1991 ) cited by (Khan, Farooqi, & Mehmood, 2018) In the context of Pakistan, there are various factors that need to be considered for curriculum change and innovation in mathematics because it depends upon the interests and controversies existing in the development of education system within a country. The purpose of changing curriculum is to align it with national ideology, goals and developing a framework which may reduce the risk of failure while implementing the academic framework (Khan, Farooqi, & Mehmood, 2018). The national curriculum of mathematics in Pakistan consists of five standards .The standards were developed by keeping the competencies of teachers and students in mind as per the broader and flexible framework of education. In Pakistan, students mathematics achievement is measured through these five standards set for secondary level students. The five mathematics standards are: 1) Numbers and operations 2) Algebra 3) Measurement and geometry 4) Information handling 5) reasoning and logical thinking (Gulzar, 2019; Government of Pakistan, 2006).

Literature has suggested four ideologies of curriculum namely Scholar academy ideology, Social efficiency ideology, learner-centered ideology and Social reconstruction ideology (Alazani, 2016; Apple, 2004). The researcher has chosen the social construction ideology (lens) for the analysis of the Mathematics curriculum because this ideology advocates that curriculum should be designed according to the social perspective. This ideology assumes that society is unhealthy and the survival of society is threatened, the traditional mechanisms which are developed by society to deal with the social problems are incapable of performing their jobs. Social reconstruction ideology assumes that society must be reconstructed so that the destruction of society can be prevented. In the social perspective, ideology education should be mean to solve the problems faced by society, to provide awareness through education, in-depth understanding of the problems of society. Besides, through education, society can develop a world based on the vision of social justice (Cotti & Schiro, 2004). This ideology enhances the use of intelligence knowledge and skills so that social problems can be resolved ( Schiro, 2008).

## 2. RESEARCH METHOD

The qualitative approach is used within it a document review was conducted in this study. The data were analyzed through a discourse analysis approach because it helps in understanding the written, spoken and sign language of any document. Discourse analysis is used by many social science researchers to review curriculum documents (Johnstone, 2017). Therefore, this methodology is suitable to determine the curriculum ideology of the National curriculum of mathematics 2006 for secondary classes (9th & 10th). The education purposes that has been investigated by the researcher including the nature of the student, how the learning takes place, what is the role of teacher, what is the most indispensable knowledge and its nature that the curriculum should be concerned with and what should be the nature of assessment. The sample of this study is the foreword, introduction, objectives, reviewer's notes and list of reviewers, the sections of mathematics in the national curriculum 2006 with special emphasis on the syllabus of mathematics for secondary education.

## 3. RESULTS AND DISCUSSION

### 3.1 Critical Analysis of National Curriculum of Mathematics

Firstly, the NCM 2006 is developed based on Academic standards but the holistic development of students is ignored and they are not provided with the opportunity to construct meaning, think critically and logically. Secondly, this curriculum has neglected the instructional process according to the three domains of learning i.e. cognitive, affective and psychomotor. Thirdly, the role of the learner is passive in learning mathematics. Moreover, teachers are the transmitter of knowledge rather than enabling students to construct their meaning. Also, this curriculum is of more mechanical, however, a humanistic approach is missing. While students as social beings and construct meaning socially.

### 3.2 Analysis of content area of Mathematics Curriculum

The National Curriculum of mathematics (NCM) 2006 is based on the five standards including numbers and operation, algebra, measurement and geometry, information handling and reasoning and logical thinking. However, the learners must be provided with a conceptual understanding of essential mathematical skills. In addition, reasoning and logical thinking skills must be promoted in the curriculum at all levels along with some integration of all the standards. It has been revealed through document review that the content of the mathematics is not taught according to the prescribed curriculum. Moreover, the three standards have been implemented to some extent but the important two standards i.e information handling and logical and reasoning are missing at the secondary level. Teachers used to deliver content in the traditional way because they are not aware of the curriculum of mathematics. Besides, the constructivist approach is not implemented in the secondary mathematics curriculum. Hence, the students, content and strategies were implemented in the context of the classroom. This is because the ideology of curriculum development was not considered while developing the mathematics curriculum.

### 3.3 Gaps in National Curriculum of Mathematics 2006

In the National Curriculum of Mathematics 2006, the social efficacy ideology is used in mathematics curriculum which is not appropriate because it focuses on the performance of skills and abilities. In social efficacy ideology, students neither construct meanings nor solve problems. Therefore, social construct ideology was used in the analysis of curriculum which advocates that learners should use their knowledge, intelligence and skills to solve the problems of society. This is the major gap in the ideology of mathematics curriculum 2006 which needs to be changed

The current curriculum is a standard based which focus on skills. However, it has neglected the humanistic perspective. Thus, the NMC 2006 should be redesigned according to the reconstruction ideology. Although there is mention of enhancement of critical skills of the student in the curriculum document. However, its implementation is missing at classroom level because teachers are not allowing students to create knowledge by themselves rather the focus is on content delivery and skill improvement.

The mathematics curriculum document 2006 emphasizes skills rather than understanding basic mathematic concepts, content is delivered through the standard-based program. However, the implementation of reasoning and justifying skills is missing at schools. The instructional process focuses on the procedural fluency and strategic competency but proper instruction process is missing in the NC 2006 and teaching strategies are mentioned but are not implemented in a proper way. In both ideologies students have a central role .however, social construction ideology gives more importance to the learner.NC 2006 talks about the construction of knowledge but in actual it never happens in actual classroom settings. The assessment process is based on yearlong because the summative assessment is more focused while formative assessment is neglected and only students memory is tested not the knowledge.

### 3.4 Reorienting the Curriculum of Mathematics

The new approach should be used while developing curriculum because in this era the students need to be more creative, analytical and critical to solve the complex issues of the world. Moreover, the children should be taught to adopt according to the new situations. Students should learn effectively by using cognitive skills. They must develop ability to solve the complex problems of society through constructing their knowledge. There is need to develop more effective and efficient classrooms for students so that teachers can teach them by using modern gadgets. Teachers can teach by putting students in real life situation. In this approach, students should be allowed to make the meaning of the world they live by using mathematics. A mechanism should be designed to implement the curriculum as it is designed and teaching strategies should be implemented because in NCM curriculum it was missing. The instruction process and activities should be designed as per constructivist approach .Moreover, assessment strategies could be changed to shorter period of time so that students can absorb the knowledge.

## 4. CONCLUSION

To conclude, mathematical and reasoning skills improve understanding of the world. Therefore, the content of mathematics should be regularly updated so that it should align with the goals and objectives set in the Nation curriculum. Moreover, the need to participate with students during math class to enhance teaching instructions. Examinations should be taken twice or thrice in a year from specific chapters for assigning grades. Assessment should be integrated according to the requirements of the mathematics subject. The curriculum should be designed and implemented by the schools under the benchmarks set by the Education department. Education with knowledge and skills should be provided to students so that they live their life confidently and successfully. To conclude, the curriculum is a guiding document which must be updated according to the needs of society. There should be a mechanism of constant feedback so that curriculum could meet the challenges of the new era. It is suggested that the curriculum developers should revisit the policy on social constructive approach so that curriculum can be taught conceptually rather than standard based. Moreover, formative assessment should be included throughout the year rather taking annual examinations. It is recommended that teachers should impart mathematics education by linking math to social context and encourage students to socially construct meaning of the world.

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## Research Article

# Improving Students' Problem Solving Ability and Mathematical Communication through the Application of Problem Based Learning

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### ABSTRACT

The purpose of this study was to determine the improvement of students' mathematical problem solving and communication skills using problem-based learning better than ordinary learning; to determine the interaction between learning and early mathematical abilities to increase students' mathematical problem solving and communication skills; to find out how the process of answers made by students in solving problems in problem-based learning and ordinary learning. This type of research is quasi-experimental. The population in this study were all grade VII students of SMP Lhokseumawe who were accredited and the samples were randomly selected, namely: SMPN 10 consisted of class VII-4 (experimental class) and class VII-2 (control class), SMPN 11 Lhokseumawe consisted of class VII- 3 (experimental class) and class VII-1 (control class). Data analysis was performed using two-way ANOVA. The results of this study indicate that there is an increase in the problem-solving ability and mathematical communication of students using problem-based learning better than students who receive regular learning; there is no interaction between learning and the level of students 'ability to increase students' problem-solving abilities and mathematical communication; the process of solving the problem of students' answers to learning using problem-based learning is better than ordinary learning.

**Key Words:** problem-based learning, problem solving abilities, students' mathematical communication

## 1. INTRODUCTION

Mathematics is one of the subjects taught at every level of education both in elementary, junior high, high school and university, the science that underlies the development of scientific and technological advances so that mathematics is seen as a structured and integrated science, the knowledge of patterns and relationships, and science. about how to think about making sense of the world around you. This is emphasized within the Government of the Republic of Indonesia through the Regulation of the Minister of National Education (Permendiknas) Number 22 of 2006 concerning Content Standards for Primary and Secondary Education Units (Depdiknas, 2006) that mathematics underlies the development of technological advances, has an important role in various disciplines, and advances human thinking, mathematics is given early in school to equip children with the ability to think logically, analytically, systematically, critically, creatively, and the ability to work together. All these abilities are important provisions and assets needed by children in pursuing a life in a future that is full of challenges and changes rapidly.

However, it is unfortunate that today many students have difficulty learning mathematics. Students do not have the desire to try and think at high levels to find solutions to every difficulty found in learning mathematics but instead, as much as possible, always avoid the difficulties they experience, as a result of low student learning outcomes in mathematics. One of the reasons for the low learning outcomes of students' mathematics is because many students consider mathematics to be difficult to learn and mathematical characteristics are abstract so that students consider mathematics to be a frightening specter, reinforced by Sriyanto (2007) who states that mathematics is often considered a frightening specter and tends to be considered difficult lesson by most of the students. Russefendi (1991) also added that mathematics for children is generally a subject that is not liked, is considered a difficult and complicated science, and Abdurrahman (2003) said that of the various fields of study taught in schools, mathematics is the field of study that is considered the most difficult. difficult by students, both those who do not have learning difficulties and even more so for students who have difficulty learning.

Many factors influence students to think mathematics is difficult to learn, one of which is the lack of students' ability in problem-solving and mathematical communication. Even though the 2006 KTSP has emphasized explicitly the objectives of learning mathematics, one of which aspects of problem-solving skills and mathematical communication are very important components that must be possessed by students. Problem-solving is the process of applying previously acquired knowledge into new, unfamiliar situations so that students are more challenged and motivated to learn it. Hudojo (1988) states that problem solving is a very essential thing in teaching mathematics, because (1) students become skilled at selecting relevant information, then analyze it and finally examine the results, (2) intellectual satisfaction will arise from within, (3) the intellectual potential of students increases. However, the facts in the field show that students' problem-solving abilities are still low, one of which is based on the results of the Program for International Student Assessment (PISA) test. Indonesia is one of the PISA participating countries. The distribution of students' mathematical abilities in PISA is level 1 (as many as 49.7% of students), level 2 (25.9%), level 3 (15.5%), level 4 (6.6%), and levels 5 - 6 (2,3%). At level 1, students are only able to solve math problems that require one step. Proportionally, out of every 100 junior high school students in Indonesia, only about 3 students reach levels 5 - 6.

In addition to problem-solving skills, students also need to master mathematical communication skills because in education it is inseparable from the role of communication. Baroody (1993) explains there are two reasons why communication in students' mathematics plays an important role and needs to be improved in learning mathematics. firstly mathematics as a language, meaning that mathematics is not only a tool for finding patterns, solving problems, or drawing conclusions, but mathematics is also a valuable tool for communicating various ideas in a clear, precise, and accurate manner. Second, mathematics learning as a social activity, meaning that mathematics is a social activity in learning, mathematics is also a vehicle for interaction between students, and also communication between teachers and students.

However, the facts in the field based on the results of observations of the teacher in the process of implementing mathematics learning, show that the teacher is only looking for convenience and is always being pursued by a target time to complete each subject regardless of the competence possessed by students, the questions given by the teacher are The questions in the textbook result in students not understanding mathematical problems related to real-life around students, and the examples of problems given are first resolved by a demonstration then students are given questions according to these examples, the teacher still thinks that doing so will improve students' abilities even though on the contrary students only imitate what the teacher does because in solving these problems students only do as exemplified by the teacher without the need to use their abilities in solving right. The teacher in assessing a problem only looks at the result and rarely pays attention to the problem-solving process towards the final result. This can be seen from the survey results of each question that was tested on each student, it was found that the process of completing student answers was not different, so that students could not increase their mathematics learning activities to improve their development of abilities.

Addressing the problems that arise in school mathematics education, it is necessary to find a learning model that can improve students' mathematical solving abilities. According to Arends (2008), the instructional objectives of problem-based learning are to help students develop investigative skills and problem-solving skills, provide experiences of adult roles, and allow students to gain confidence in their abilities, to think and become good learners. independently. Based on this opinion, it appears that problem-based learning has the aim of helping students develop problem-solving skills. In addition to improving problem-solving abilities, the problem-based learning model can also improve students' mathematical communication skills. Piaget (Arend, 2008) said problem-based learning where teachers provide various situations (problems) so that children can experiment, try various things to see what will happen, manipulate objects, manipulate symbols, ask questions and find their answers, compile what is found and compare it with the findings of other students.

According to Arends (2008), problem-based learning has the essence of presenting various real problematic conditions, which will be solved by students through various investigations and investigations. So that the role of the teachers is to present various contextual problems to motivate students, arouse student enthusiasm, increasing student learning activities, learning focused on solving problems so that students are interested in learning, discovering concepts, and sharing knowledge between students and students. with the teacher.

Based on the description above, the problem that will be resolved and sought for a solution is "What is the increase in students' problem solving and mathematical communication skills through the application of problem-based learning (PBM)?"

## 2. RESEARCH METHOD

To answer these problems, the type of research used is quasi-experimental. The design chosen was the pretest-posttest control group design. In this design, the research subjects were grouped randomly. The experimental group was given problem-based learning (X). The control group with learning is usually carried out at the school, then each is given a pretest and posttest (O). The population in this study were all accredited junior high school students in the city of Lhokseumawe. As for the samples of this study are schools that have a middle level. According to Saragih (2010), middle-level schools have heterogeneous academic abilities, from the lowest to the highest that can be represented. Of the nine schools that had an intermediate level, two schools were taken with a sampling unit of two classes from each school. By randomly selected SMP Negeri 10 and SMP Negeri 11 Lhokseumawe as research samples.

Data in the form of scores obtained from tests of students' problem-solving abilities and mathematical communication were grouped according to the learning groups. The relationship between the independent, dependent, and control variables is presented in the Wainer model in Table 1.

**Table 1.** Weiner's table about the relationship between independent, dependent, and control variables.

Measured ability		Math problem solving		Mathematical communication skills	
Learning approaches		PBM (A)	Conventional (B)	PBM (A)	Conventional (B)
Students' initial ability (C)	High	KPACT	KPBCT	KKACT	KKBCT
	Modium	KPACS	KPBCS	KKACS	KKACS
	Low	KPACR	KPBRCR	KKACR	KKBCR
		KPA	KPB	KKA	KKB

Description:

KPACT means the problem solving ability with problem-based learning of students who have high initial abilities.

### 3. RESULTS AND DISCUSSION

Descriptively the results of research relating to the improvement of students' mathematical problem-solving and communication abilities in problem-based learning and mathematical communication are shown in Tables 2 and 3.

**Table 2.** Average Gain of Problem Solving Ability for PBM Group and PMB Group Based on Students' Mathematical Ability

Teaching	Students' Mathematical Abilities	Problem solving skill			
		$\bar{X}$	Std	Min	Max
KPA	High (9)	0,29367	0,043831	206	357
	Medium (26)	0,24946	0,062792	171	429
	Low (5)	0,23460	0,073663	147	323
	Total (40)	0,25755	0,062666	147	429
KPB	High (9)	0,20644	0,065660	125	348
	Medium (25)	0,19560	0,050348	118	286
	Low (6)	0,21817	0,032096	118	273
	Total (40)	0,20142	0,051450	118	348

**Table 3.** The Average Gain of Mathematical Communication Ability in the PBM Group and the PMB Group Based on Students' Mathematical Ability

Approachs	Students' Mathematical Abilities	Mathematical Communication Skills			
		$\bar{X}$	Std	Min	Max
KKA	High (9)	0,56822	0,195504	0,364	1,000
	Medium (26)	0,44512	0,131836	0,182	0,750
	Low (5)	0,35220	0,065990	0,267	0,429
	Total (40)	0,46120	0,154167	0,182	1,00
KKB	High (9)	0,48156	0,056040	0,417	0,583
	Medium (25)	0,37612	0,130830	0,154	0,636
	Low (6)	0,28717	0,063060	0,231	0,400
	Total (40)	0,38650	0,123933	0,154	0,636

Based on the Table 2. above, it is found that the increase in student problem-solving abilities using problem-based learning (KPA) has an average value and standard deviation for the high group 0.29367 and 0.043831, moderate 0.24946 and 0.062792, low 0.23460 and 0.073663. Meanwhile, to increase problem-solving abilities using ordinary learning, namely: the high group has a value of 0.20644 and 0.065660, the medium group is 0.19560 and 0.050348, the low group is 0.21817 and 0.032096. Based on the increase in the average problem-solving ability, problem-based learning is higher than ordinary learning.

Table 3 describes an increase in students 'mathematical communication skills in problem-based learning and ordinary learning, it is found that an increase in students' mathematical communication skills using problem-based learning (KKA) has an average value and standard deviation for high abilities 0.56822 and 0.195504, the medium ability is 0.44512 and 0.131836, the low ability is 0.35220 and 0.065990. Whereas for the category of mathematical communication skills using ordinary learning, namely: high ability has a value of 0.48156 and 0.056040, the medium ability is 0.37612 and 0.130830, the low ability is 0.28717 and 0.063060. The average increase in the two learning groups, namely the average increase in communication skills with problem-based learning is higher than ordinary learning.

To test the significance of the correctness of the above conclusions, it is necessary to calculate statistical tests. Statistical testing of the hypotheses in this study used two-way analysis of variance (ANOVA) techniques. The ANAVA test results are presented in Tables 4 and 5.

**Table 4.** Two-way ANOVA Test Summary to Gain Students' Problem Solving Ability  
Tests of Between-Subjects Effects

Dependent Variable:Gain						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	,082 <sup>a</sup>	5	,016	5,098	,000	,256
Intercept	2,928	1	2,928	912,186	,000	,925
Learning Factors	,037	1	,037	11,581	,001	,135
Student abilities	,010	2	,005	1,586	,212	,041
Learning Factors * Students' abilities	,009	2	,004	1,357	,264	,035
Error	,238	74	,003			
Total	4,533	80				
Corrected Total	,319	79				

a. R Squared = ,256 (Adjusted R Squared = ,206)

**Table 5.** Summary of Two-Way ANOVA Test to Gain Mathematical Communication Ability  
Tests of Between-Subjects Effects

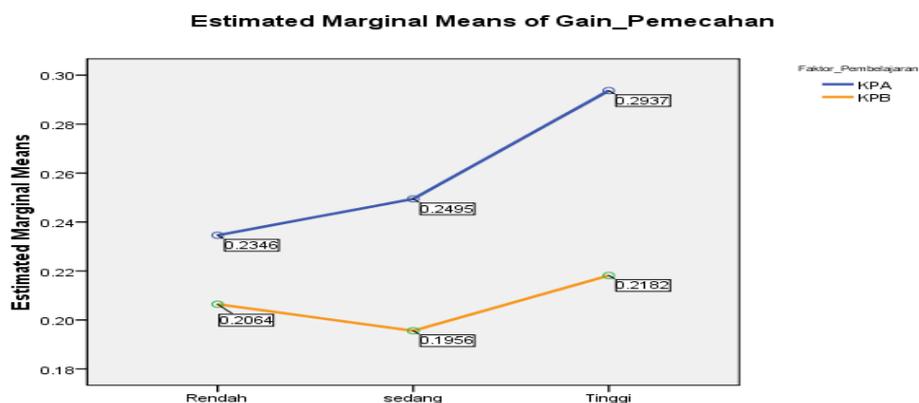
Dependent Variable:Gain						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	,424 <sup>a</sup>	5	,085	5,172	,000	,259
Intercept	9,443	1	9,443	575,854	,000	,886
Learning Factors	,073	1	,073	4,451	,038	,057
Student abilities	,311	2	,156	9,484	,000	,204
Learning Factors * Students' abilities	,001	2	,001	,037	,964	,001
Error	1,214	74	,016			
Total	16,009	80				
Corrected Total	1,638	79				

a. R Squared = ,259 (Adjusted R Squared = ,209)

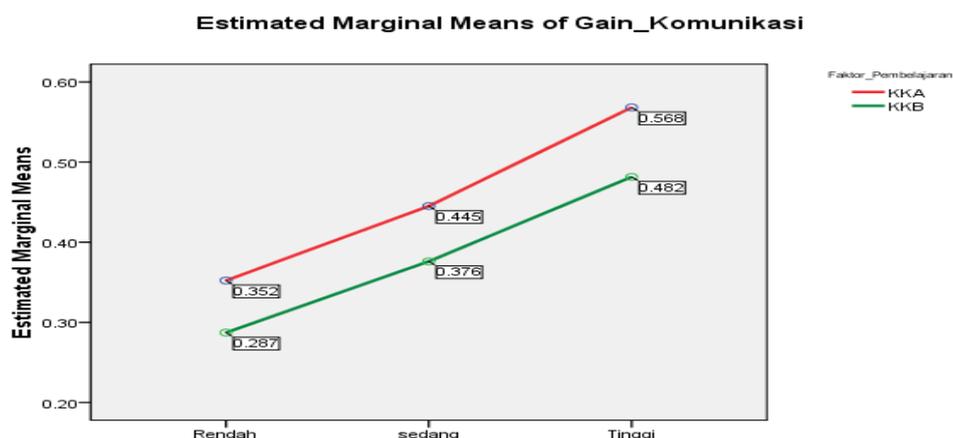
Based on Table 4, the results of hypothesis testing are presented. The first hypothesis is that the increase in the problem-solving ability of students who are taught by problem-based learning is better than ordinary learning. Based on Table 4, it can be seen that F on the learning factor (KPA and KPB) is 11.581 with a significance value of 0.001 smaller than the 0.05 significance level so that Ho is rejected. In other words, there is an increase in math problem-solving abilities between students who are given problem-based learning (PBM) compared to students who are given regular learning (PMB). Thus, it can be concluded that the increase in the problem-solving ability of students who use problem-based learning (PBM) is better than students who learn normally (PMB). The second hypothesis is that there is an interaction between learning and students' initial mathematics ability to increase students' problem-solving abilities. Based on Table 4, it is found that for learning factors related to student ability, the F value is 1.357 with a significance value of 0.264, greater than the significance level of 0.05, so that H0 is accepted. So it can be concluded that there is no interaction between learning (KPA and KPB) with students' initial abilities (high, medium, and low) on improving students' problem-solving abilities. In other words, the increase in problem-solving abilities is caused by differences in learning used not because of students' mathematical abilities. Graphically, this interaction can be seen in Figure 1.

The third hypothesis is that the increase in students' mathematical communication skills taught by problem-based learning is better than students who are taught using ordinary learning. Based on Table 5, it is found that the F value for the learning factors (KKA and KKB) is 4.451 with a significance of 0.038 which is smaller than the 0.05 significance level. Therefore, the null hypothesis which states that there is no increase in mathematical communication skills between students who are given PBM compared to students who are given PMB is rejected. In other words, there is an increase in mathematical communication skills between students who are given PBM compared to students who are given PMB. So it can be concluded that the increase in mathematical communication skills of students who are given PBM is better than students who are given PMB.

The fourth hypothesis is that there is an interaction between learning and students' initial mathematical abilities towards improving students' mathematical communication skills. Based on Table 5, it is found that for the interaction between the approach factor and the ability, an F value of 0.037 is obtained with a significance value of 0.964, this value is greater than the 0.05 significance level. Therefore, the null hypothesis which states that there is no interaction between learning and students' mathematical abilities on the improvement of students' mathematical communication skills can be accepted. In other words, the increase in communication skills is caused by differences in the learning used not because of the students' mathematical abilities. Graphically, this interaction can be seen in Figure 2.



**Figure 1.** The Interaction between Learning Factors and Students' Mathematical Ability Factors on the Improvement of Students' Problem Solving Ability



**Figure 2.** The Interaction between Learning Factors and Students' Mathematical Ability Factors on the Improvement of Mathematical Communication Skills

Based on the research results obtained above, the following will describe the factors involved in this research, namely the learning factors to increase students' mathematical problem solving and communication abilities. This research shows that the problem solving and mathematical communication skills of students taught by problem-based learning are better than ordinary learning. These findings are reinforced by the findings of Marzuki (2012) in his research which shows that the differences in problem solving and mathematical communication abilities of students who are given problem-based learning are better than students who are taught directly. Theoretically, the characteristics of problem-based learning have advantages compared to ordinary learning. Here are some of the advantages of problem-based learning based on the characteristics of the learning. First, problem-based learning (PBM) organizes learning around questions and social problems that are important to students and society. The problems given are real to students and do not have simple answers. According to Arends (2008) questions or problems must meet the following criteria: namely authentic, clear, easy to understand and in accordance with the learning objectives. Unlike the case with ordinary learning, according to Hadi (2005) states that several things that characterize mathematics learning in Indonesia so far are teacher-centered learning, teachers deliver lessons using the lecture method while students record them in notebooks.

Second, problem-based learning requires the teacher to motivate students to carry out investigations to find authentic solutions to the proposed problems. Whereas in ordinary learning, the teacher acts as a learning resource. Third, collaboration, in problem-based learning, student discussion groups are formed. Each group is given a student activity sheet (LAS) which contains authentic problems related to students' mathematical problem solving and communication abilities. Problem-based learning conditions students to complete learning tasks in the form of joint problem solving between students and their friends, in pairs or in small groups. Students discuss or ask questions with their friends, and consult with teachers. On the other hand, in normal learning, students act as recipients of full information from the teacher and students work together individually in solving problems. The methods of solving the questions depend on how the teacher solves the questions so that the students' mindset is formed according to the form of the teacher only. Thus, the active role of students is very small in learning.

The results of hypothesis testing show that the increase in problem solving and mathematical communication skills of students taught by problem-based learning is better than students taught with ordinary learning. The results also showed that there was no interaction between learning and students' mathematical students' ability to improve students' problem solving abilities and students' mathematical communication. Based on the difference in the average problem-solving ability,

it appears that students with the high KAM category get "greater benefits" from problem-based learning (PBM) with a score difference of 0.08666 while the difference in scores for students in the moderate KAM category is 0.069 and the KAM category is low 0, 06508, as well as students' mathematical communication skills also showed the same thing, namely with a score difference of 0.08666 while the difference in scores for students in the moderate KAM category was 0.069 and the KAM category was 0.06508. This means that there is no joint increase that is contributed by the learning and initial mathematical abilities of students to students' mathematical problem solving abilities. These findings are in line with research conducted by Napitupulu (2011) and Khayroiya (2012) which shows that there is no interaction between learning factors and students' initial ability factors on students' mathematical problem solving abilities.

#### 4. CONCLUSION

The improvement of students' problem-solving abilities taught through problem-based learning (PBM) is better than students who are taught using ordinary learning. Improved mathematical communication skills of students who are taught problem-based learning (PBM) is better than students who are taught with ordinary learning. There is no interaction between learning and students' initial mathematical ability to increase problem-solving abilities. There is no interaction between learning and students' initial mathematical abilities towards improving mathematical communication skills.

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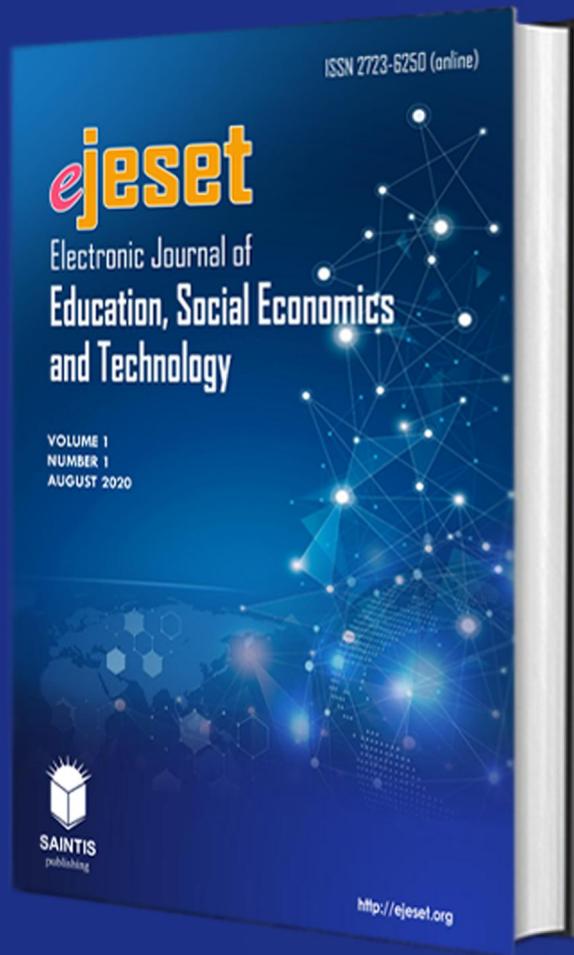
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