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A Survey on Current Agro-Machinery Deployment Practices and Design an Appropriate Business Model: A Case Study of Amhara region; Ethiopia

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Abstract A survey was conducted to investigate agricultural mechanization, farm productivity and peasant food security in five potential districts of Amhara region. The purpose of this survey was to investigate the relationship among farm mechanization, farm productivity and social food security. Target population this study was peasants and union farmers in five potential districts (Merawi, Dangila, Bure, Jabi Tana and Woreta) of the region from which sample was determined through using judgmental sampling method. Enquired data was collected using a survey questionnaire and linear regression analysis was made to check the relationship among the leading variable. As a result it was found that farm productivity and social food security are being influenced by agricultural mechanization.

Keywords Mechanization, Farm productivity, Social food security, Economic stability

1. Introduction

The agricultural sector in Ethiopia provides employment to 85% of the population (of which women constitute 49.5% according to the 2007 census data), contributes 44% to the country's GDP and 85% of the country's export earnings [1]. Tools, implements and powered machinery, are essential and major inputs to agriculture; and is argued that they are one of the most important to raise agricultural productivity. The term *"Mechanization"* is generally used as an overall description of the application of these inputs. Basic sources of farm power utilized for agriculture are tools, machines and equipment, manual (human) and animal draft, and motorized power. In many developing countries up to 80% of farm power is provided by human beings [2]. In most developed countries human beings are used less and less as a source of power and more for machine operation and control.

The level, appropriate choice and subsequent proper use of mechanized inputs into agriculture has a direct and significant effect on achievable levels of land productivity, labour productivity, the profitability of farming, the environment and, last but not least, on the quality of life of people engaged in agriculture.

In the past, misunderstood concepts and inappropriate selection and use of certain mechanization inputs (mainly tractors and heavy machinery) have, in many parts of the world, led to heavy financial losses and lowered agricultural production as well as contributed to environmental degradation. In many developing countries, ambitious politically motivated tractor schemes have often become a burden to the national budget and the farming community rather than being a productive input. This has also been the case in some centrally planned economies, where mechanization was heavily subsidized through the provision of government planned and operated machinery services. Similar models of government provision of services have been tried in many developing countries. In every case these government run services have failed to provide timely and profitable mechanization inputs to farmers.

The application of “appropriate” or "intermediate" machinery, tools and equipment is also a favoritefor agricultural productivity. The purpose of this project is to investigate agricultural mechanization, farm productivity and food sustainability on five potential woredas (Merawi, Dangila, Bure, Jabi Tana and Woreta) found in Amhara region.

2. Literature Reviews

2.1. Introduction

Agricultural mechanization can be defined as the development, introduction and use of mechanical assistance of all forms and at any level of technological sophistication in agricultural production. It should be noted that agricultural mechanization is not the same as tractorization. Tractorization simply means the use of tractors for farm work. Further defined agricultural mechanization as the use of a machine, any machine to accomplish a task or an operation involved in agricultural production [3]. Such tasks or operation include reduction in human drudgery, improvement of timeliness and efficiency of various agricultural operations, bringing more land under cultivation, preserving the quality of agricultural products, providing better rural living conditions and markedly advancing the economic growth. Thus, the need for mechanization of agriculture in Amhara Region has become more acute in recent years due to, among other reasons, the urgent need to accelerate food and fiber production for the teeming urban and rural population through increasing both labour and land productivity, as well as expanding the existing cultivated area. Also crucial is the need to create the necessary awareness of the immense potentials of agricultural mechanization technology to the economic development of the region.

2.2. Traditional Agricultural Mechanization Technologies

These are the simplest and most basic technology for agricultural mechanization in use in Amhara Region. These technologies range from the traditional cutlasses and hoes, to the developed stick and stone tools which are the only means to enhanced labour productivity in the pre-historic times. These hand tool technologies use man as a power source; and are inefficient and ineffective. However, almost in all parts of the region where arable farmers are predominantly peasants, traditional technologies are in use [4].

2.3. Draught Animal Technology

As a step further in the traditional agricultural mechanization technology, animal muscle power is substituted for human power, a process which already started in ancient civilization. A large variety of implements and machines have been developed which use animals as the principal power source. Draught animal technology refers to a range of implements, machines and equipment with animal power as the major energy source; animals such as donkeys, horses, camels, oxen, buffalos are employed for this purpose [4].

2.4. Engine Powered Machinery Technology

The most sophisticated of the three levels of agricultural technology is the engine powered machinery technology. It involves the use of a range of tractor sizes as the sole prime mover. Engines or motors using petrol or diesel fuel or electricity are used to power machines such as threshers, mills, irrigation pumps, grinders, and aircraft for spraying and self-propelled machines for production, harvesting and handling of a wide variety of crops [5].

For commercial farming to succeed, agricultural production, processing and utilization must necessarily move from the present subsistence nature to a commercial one through the use of agricultural mechanization technologies which must be environmentally friendly. Efforts are being geared towards there placement of human operator with mechanical systems including automated ones as human operations are inconsistent and less efficient [4].

2.5. Appropriate Mechanization Technology

The term Technology means many things to several people and these depend on the setting or the context. Broadly defined, however, technology implies any practical art which utilizes scientific knowledge. The objective is usually to advance and enhance human society and conditions. Technology is used to harness the forces of nature and transform the resources that nature has bestowed on man, into goods and services for better quality life. Appropriateness of technology refers to the level of mechanization and how it is used in relation to crop production and agricultural processing. Appropriateness can only be determined after a careful consideration of the technical, economic and social characteristics of each situation. New and improved

technologies to be adopted for agricultural mechanization in Amhara region must be appropriate and acceptable both in terms of farmers' social economic environment as well as resources and technical suitability of the technologies.

2.6. Problems in Mechanization

Mechanization in the country is always associated with some inherent drawbacks like, fragmented lands, poor buying capacity of farmers, lack of quality machines for farm operation, inadequate knowledge of the users about machines and insufficient awareness building activities

2.6.1. Fragmented lands

In 1980, the average farm holding was 0.91 ha which decreased in 2000 to 0.68 ha [1]. It has been found that many farmers cultivate only about 1.0 decimal land by traditional method. Further, the total holding of land is not located in one place, rather, it is found in split plots in several places. This restricts power operated tilling, seeding and harvesting machines to perform at optimal efficiency. Even two wheel tractors, reapers and combines face tremendous problems from frequent turnings in such fragmented lands.

2.6.2. Poor buying capacity of farmers

The rural people are mostly poor and hardly can buy a costly machine individually. Some moneyed farmers having a large quantity of agricultural lands possess some costly machines like, tractors, power tillers, power tiller operated seeders, combines etc. They use these machines in their own lands and also operate them on hiring basis in others' lands and earn a substantial return. But, the number of such farmers is very limited.

2.6.3. Lack of quality machines

Due importance was not given to farm mechanization until the beginning of the century. Earlier, only a few manufacturers came up to fabricate simple manually operated machinery like weeder, thresher, winnower etc. With the growing needs for foods, the decision makers got the realization that Bangladesh agriculture will have no other alternative than to adopt mechanized cultivation to feed her ever growing population. This helped grow some agricultural manufacturing workshops in the country. Presently, more than 40,000 small and medium sized local metal working workshops have grown up to manufacture agricultural machinery all over the country [6]. Many small workshops are manufacturing sub-standard machinery creating adverse impact among the farmers. These small workshop owners, in general, do not use jigs and fixtures and produce different standard machines. They get the prototype from the designers/researchers and multiply them. While copying these machines, they do not use exact quality materials and specifications thus producing low quality machines.

2.6.4. Lack of knowledge and skill of users, artisans and traders

The machine users, artisans and traders are mostly illiterate and don't have substantial knowledge and skill about machine operation, repair and maintenance. The manufacturers do not provide 'after sale service' to the users. From field experience it has been found that machines are left without working for minor and easily repairable faults. On availability of an artisan or a mechanic, the farmers get them repaired at the expense of high charges. But in other cases, where mechanics are not readily available, they leave the machine without operation. The village artisans are rarely trained and lack adequate knowledge and skill about machines [7].

2.6.5. Tariff difference on machines and spare parts

Low tariff on imported machines and high tariff on spare parts and materials have discouraged the local manufacturers. Since, there is no quality control system of the imported machinery, a huge number of machines are being imported and distributed directly by the local importers to the users. Also, many of the imported low quality machines have already made the farmers reluctant to use them. Once these farmers decide not to use the machines, it becomes hard to convince them for a new machine. Further, the high tariff has restricted the imports of spare parts making them unavailable in the local market [8].

2.7. Ethiopian Current Mechanization Issues

Ethiopian current government agricultural sector has got better attention and emphasis. The sector has got a recognition that the overall economic growth in the country depends on the performance of this sector. Accordingly, a number of agricultural development strategies and plans have been formulated and implemented. As the major contribution of agriculture comes from smallholder farmers, the government put a clear agricultural development strategy focusing on enhancing technology generation and use by smallholder farmers

to close the productivity gap in major crops. However, smallholder agricultural mechanization hasn't got equal attention to other yield improving inputs/technologies like improved seeds and fertilizers [9].

In 1992, the tractor assembling plant established during the preceding government was renamed as Adama Agricultural Machinery Industry (AAMI). In 2010, it was transferred to the Metals and Engineering Corporation (METEC) that manages a number of sister industries. AAMI assembles and manufactures tractors, water pumps and various agricultural combines and products. Products from this corporation are used by government, farm unions, and state owned enterprises for agricultural, water irrigation, construction and transportation related projects (www.metec.gov.et). AAMI also trains tractor operators and tractor pulled implements [10].

In 2004, under regulation No. 97/2004, the Council of Ministers issued a regulation for the establishment of Agricultural Mechanization Service Enterprise (AMSE). The Enterprise was established with an initial capital of 20.5 Million Birr with multiple objectives to render agricultural mechanization services on rental basis, provide maintenance services on rental basis, sale farm implements and spare parts manufactured domestically or imported, provide transportation services to farm produce and farm inputs, introduce the utilization of modern farm implements by being the transmission belt of modern agricultural technology, provide training and consultation service on a better ad effective utilization of farm machineries in consideration. In addition to the government owned AMSE, there are also private companies importing agricultural machineries (combine harvesters, large and small tractors, farm implements, etc.) and providing rental services to smallholder farmers particularly in wheat based Arsi and Bale highlands [11].

2.8. Ethiopian Agricultural Mechanization Strategy

Strategy is basically a plan of how to move from one situation to a new situation. It is therefore fundamentally important that everybody is clear what the new situation should be. A typical formulation of Agricultural Mechanization Strategy will be comprised of several logical steps.

The first step to be carried out is an analysis of the existing national farm mechanization situation. This will include national inventories, domestic manufacturing and assembly (tools, implements, tractors etc.), importation of farm tools and machinery, as well as descriptions of farming systems in relation to the use of farm power and their respective changes over time. This should lead to a statement of the existing situation**.**

Secondly, *policy issues* which impact on farm mechanization are identified and an analysis of problem areas and constraints is made. This work is generally carried out in close co-operation with officials from the Ministry of Agriculture as well as other Ministries. Thus, awareness can be created of the implications of political measures on agricultural mechanization and further on agricultural production [12,13].

Thirdly, prior to formulating a strategy, it is important to define an (ideal) *future situation*. The resulting strategy will be the definition of the actions required to move from the existing situation to the future situation. This will generally be divided into defining the respective roles of the private and government sectors. This is dealt with in more detail later in the paper.

Finally, the strategy document should clearly define *follow-up actions and activities* to assist policy makers and planners to implement the strategy. These follow-up activities generally consist of policy adjustments to correct distortions in the sub-sector, investment plans to develop manufacturing, commercial companies and farm mechanization, and definition of realistic and realizable government actions and activities required for the development of the sub-sector. For all the interested and involved parties involved in mechanization, there are several fundamental requirements for a thriving and sustainable sub-sector [14].

In the country, there was no clear agricultural mechanization strategy till the recent draft developed by the Ethiopian Agricultural Transformation Agency (ATA) and Ministry of Agriculture (MoA). The draft mechanization strategy is a comprehensive document that puts different agricultural mechanization options for different farm sizes. The draft document also frames agricultural mechanization strategy looking from value chain's perspective starting from designing machineries, importing machineries/spare parts, assembling, distribution, ownership, and after-sale services [15].

3. Methodology

3.1. Description of the Study Area

The study was conducted in Bahir Dar district of private banks located at ,North west Ethiopia, west Gojjam Zone of Amhara Region which is found 564km far from Addis Ababa and capital city of Amhara region.

3.2. Research Design

The purpose of this survey is to identify potential entrepreneurs and promoting the technology of agricultural mechanization in Amhara Region. In the mean while this study followed a positivism paradigm with a survey type research design. A survey design provides a quantitative or numeric description of trends, attitudes, or opinions of a population in the target area.

3.3. Sampling technique and sample size

The purpose of this survey is focused at promoting mechanized agriculture in potential entrepreneurs of Amhara Region. Therefore target population of this project was five potential districts (Merawi, Dangila, Bure, Jabi Tana and Woreta) which were be selected based on secondary data result from current records of representative stock holders, enterprises, technology transfer experts, agriculture extension workers, cooperative unions and financial institutes.

Researcher used purposive/judgmental sampling to determine the sample size of the research. Researchers prefer this sample design to include all potential entrepreneurs in the study areas as respondents because it was assumed that these individuals have better knowledge and interest to promote the technology. Therefore target audiences of this project peasants and union farmer found in five potential districts (Merawi, Dangila, Bure, Jabi Tana and Woreta) in Amhara Region.

3.4. Data sources and data Collection Instruments

This study investigated mechanized agriculture, farm productivity and food sustainability using survey data. Researcher used both primary and secondary data. Primary data was collected from stock holders, enterprises, technology transfer experts, agriculture extension workers, cooperative unions and financial institutes using survey questionnaire. Secondary Data was collected from records, industry trends, journals, booklets of the regional agricultural office.

Survey questionnaire used to gather the relevant quantitative data from the respondents. Researcher also conducted interview for the key informants from ANRS agriculture and TVET beauro representatives, NGO representatives, enterprises owners, technology transfer experts, agriculture extension workers, cooperative unions and financial institute's representatives. Focused group discussion and video recording for managers and leaders of the union/entrepreneurs collect qualitative data which were used to construct research framework.

3.5. Methods of Data Analysis

In this study, researcher was referring mixed approach hence both quantitative and qualitative data analysis techniques was employed. Linear regression analysis was used to measure the relationship between the dependent variables/productivity and independent variables/mechanization in agriculture. Researcher used qualitative data to triangulate the structure of the study. The study also investigated the cause and effect relationship between the independent and dependent variables.

4. Result and Discussion

In this section of the project, the data collected from primary sources using survey questioner is analyzed and presented using linear regression analysis of a statistical package for social science (SPSS) simple and understandable manner. For simplicity and clarity purpose, both the results and discussions are presented side by side. As explained in the methodology part, questionnaire was distributed for peasants and union farmer in the study area.

4.1. Data Sample Information

A survey was conducted to analyze and investigate the relationship between agricultural mechanization and farm productivity using technological, natural, economic and socio-cultural forces as a determinant factors. The purpose of this study was to identify basic determinant force that limits the issue of mechanization and recommend appropriate solution that can boost mechanized agriculture by developing a business model that can encourage usage rate of mechanization in five woredas (Merawi, Dangila, Bure, Jabi Tana and Woreta) of

Amhara Region. In doing so researchers gathered the inquired data from three target groups; technology producers, Union/ sect oral facilitators and final technology users/ farmers with which statistical analysis was done whose output are given below independently for each case.

4.2. Regression analysis of survey data

In this study researcher collected inputs data from technology producers, sector facilitators and final technology users so that the accuracy research output can be boosted. Therefore the analysis result of data gather from final technology users is offered as follows which was the key for research initiation.

Table 1: Regression analysis of the first dependent variable in relation with independent variables N=39

Independent variables	Method	Correlation with dependent variable one
Independent variable one	Pearson Correlation	0.087
	Sig. (2-tailed)	0.598
	N	39
Independent variable two	Pearson Correlation	-0.058
	Sig. (2-tailed)	0.728
	N	39
Independent variable three	Pearson Correlation	-0.167
	Sig. (2-tailed)	0.309
	N	39
Independent variable four	Pearson Correlation	-0.336*
	Sig. (2-tailed)	0.037
	N	39
Independent variable five	Pearson Correlation	-0.271
	Sig. (2-tailed)	0.095
	N	39
Independent variable six	Pearson Correlation	0.259
	Sig. (2-tailed)	0.111
	N	39
Independent variable seven	Pearson Correlation	0.104
	Sig. (2-tailed)	0.530
	N	39
Independent variable eight	Pearson Correlation	-0.233
	Sig. (2-tailed)	0.153
	N	39
Independent variable nine	Pearson Correlation	-0.399*
	Sig. (2-tailed)	0.012
	N	39
Independent variable ten	Pearson Correlation	-0.006
	Sig. (2-tailed)	0.972
	N	39
Independent variable eleven	Pearson Correlation	-0.084
	Sig. (2-tailed)	0.609
	N	39
Independent variable twelve	Pearson Correlation	-0.070
	Sig. (2-tailed)	0.673
	N	39
Independent variable thirteen	Pearson Correlation	-0.356*
	Sig. (2-tailed)	0.026
	N	39

(Source: Survey Result on March 2018)

Table 1 reveals the regression analysis result of reduction of labor based farm production in relation with limitation of tool based farm production in terms of lack of government support, natural landscape, existence of limited natural resource, lack of coordination to buy and use technology products in group, ineffectiveness of previous technology users, lack of promotion, lack of technology input suppliers, lack of adequate spare parts at affordable price, lack of confidence on quality of current technology outputs, lack of trained technician, lack of finance, lack of lending institutions, lack of confidence on quality of local technology products. The result

reveals that labor based farm production is positively related with limitation of tool based farm production in terms of lack of government support, ineffectiveness of previous technology users and lack of promotion while the remaining variables are negatively related with labor based farm production. Therefore expansion of farm mechanization if being influenced by lack of government support, ineffectiveness of previous technology users and lack of promotion.

Table 2: Regression analysis of the second dependent variable in relation with independent variables N=39

Independent variables	Method	Correlation with dependent variable two
	Pearson Correlation	0.087
Independent variable one	Sig. (2-tailed)	0.598
	N	39
	Pearson Correlation	-0.058
Independent variable two	Sig. (2-tailed)	0.728
	N	39
	Pearson Correlation	-0.167
Independent variable three	Sig. (2-tailed)	0.309
	N	39
	Pearson Correlation	-0.336*
Independent variable four	Sig. (2-tailed)	0.037
	N	39
	Pearson Correlation	-0.271
Independent variable five	Sig. (2-tailed)	0.095
	N	39
	Pearson Correlation	0.259
Independent variable six	Sig. (2-tailed)	0.111
	N	39
	Pearson Correlation	0.104
Independent variable seven	Sig. (2-tailed)	0.530
	N	39
	Pearson Correlation	-0.233
Independent variable eight	Sig. (2-tailed)	0.153
	N	39
	Pearson Correlation	-0.399*
Independent variable nine	Sig. (2-tailed)	0.012
	N	39
	Pearson Correlation	-0.006
Independent variable ten	Sig. (2-tailed)	0.972
	N	39
	Pearson Correlation	-0.084
Independent variable eleven	Sig. (2-tailed)	0.609
	N	39
	Pearson Correlation	-0.070
Independent variable twelve	Sig. (2-tailed)	0.673
	N	39
	Pearson Correlation	-0.356*
Independent variable thirteen	Sig. (2-tailed)	0.026
	N	39

(Source: Survey Result on March 2018)

Table 2 displays the regression analysis result of farm productivity and better production process in relation with limitation of tool based farm production in terms of lack of government support, natural landscape, existence of limited natural resource, lack of coordination to buy and use technology products in group, ineffectiveness of

previous technology users, lack of promotion, lack of technology input suppliers, lack of adequate spare parts at affordable price, lack of confidence on quality of current technology outputs, lack of trained technician, lack of finance, lack of lending institutions, lack of confidence on quality of local technology products. The result reveals that farm productivity and better production process is positively related with limitation of tool based farm production in terms of lack of government support, ineffectiveness of previous technology users and lack of promotion while the remaining variables are negatively related with labor based farm production. Therefore expansion of farm mechanization if being influenced by lack of government support, ineffectiveness of previous technology users and lack of promotion.

Table 3: Regression analysis of the third dependent variable in relation with independent variables N=39

Independent variables	Method	Correlation with dependent variable three
Independent variable one	Pearson Correlation	-0.051
	Sig. (2-tailed)	0.758
	N	39
Independent variable two	Pearson Correlation	-0.315
	Sig. (2-tailed)	0.051
	N	39
Independent variable three	Pearson Correlation	-0.355*
	Sig. (2-tailed)	0.026
	N	39
Independent variable four	Pearson Correlation	-0.192
	Sig. (2-tailed)	0.243
	N	39
Independent variable five	Pearson Correlation	-0.256
	Sig. (2-tailed)	0.115
	N	39
Independent variable six	Pearson Correlation	-0.070
	Sig. (2-tailed)	0.674
	N	39
Independent variable seven	Pearson Correlation	0.184
	Sig. (2-tailed)	0.263
	N	39
Independent variable eight	Pearson Correlation	-0.081
	Sig. (2-tailed)	0.625
	N	39
Independent variable nine	Pearson Correlation	-0.242
	Sig. (2-tailed)	0.139
	N	39
Independent variable ten	Pearson Correlation	0.056
	Sig. (2-tailed)	0.733
	N	39
Independent variable eleven	Pearson Correlation	-0.136
	Sig. (2-tailed)	0.410
	N	39
Independent variable twelve	Pearson Correlation	-0.152
	Sig. (2-tailed)	0.357
	N	39
Independent variable thirteen	Pearson Correlation	-0.260
	Sig. (2-tailed)	0.109
	N	39

(Source: Survey Result on March 2018)

Table 3 displays the regression analysis result of enhancing product quality and competitiveness in relation with limitation of tool based farm production in terms of lack of government support, natural landscape, existence of limited natural resource, lack of coordination to buy and use technology products in group, ineffectiveness of previous technology users, lack of promotion, lack of technology input suppliers, lack of adequate spare parts at affordable price, lack of confidence on quality of current technology outputs, lack of trained technician, lack of

finance, lack of lending institutions, lack of confidence on quality of local technology products. The result reveals that enhancing product quality and competitiveness is positively related with limitation of tool based farm production in terms of lack of promotion and availability of trained technicians while the remaining variables are negatively related with labor based farm production. Therefore expansion of farm mechanization if being influenced by lack of promotion and availability of trained technicians.

Table 4: Regression analysis of the fourth dependent variable in relation with independent variables N=39

Independent variables	Method	Correlation with dependent variable four
Independent variable one	Pearson Correlation	-0.288
	Sig. (2-tailed)	0.075
	N	39
Independent variable two	Pearson Correlation	-0.377*
	Sig. (2-tailed)	0.018
	N	39
Independent variable three	Pearson Correlation	-0.233
	Sig. (2-tailed)	0.154
	N	39
Independent variable four	Pearson Correlation	-0.033
	Sig. (2-tailed)	0.843
	N	39
Independent variable five	Pearson Correlation	-0.141
	Sig. (2-tailed)	0.393
	N	39
Independent variable six	Pearson Correlation	0.032
	Sig. (2-tailed)	0.845
	N	39
Independent variable seven	Pearson Correlation	0.241
	Sig. (2-tailed)	0.140
	N	39
Independent variable eight	Pearson Correlation	0.002
	Sig. (2-tailed)	0.989
	N	39
Independent variable nine	Pearson Correlation	-0.212
	Sig. (2-tailed)	0.196
	N	39
Independent variable ten	Pearson Correlation	-0.290
	Sig. (2-tailed)	0.073
	N	39
Independent variable eleven	Pearson Correlation	-0.258
	Sig. (2-tailed)	0.112
	N	39
Independent variable twelve	Pearson Correlation	-0.276
	Sig. (2-tailed)	0.089
	N	39
Independent variable thirteen	Pearson Correlation	-0.154
	Sig. (2-tailed)	0.349
	N	39

(Source: Survey Result on March 2018)

Table 4 displays the regression analysis result of better farm productivity and market competitiveness in relation with limitation of tool based farm production in terms of lack of government support, natural landscape, existence of limited natural resource, lack of coordination to buy and use technology products in group, ineffectiveness of previous technology users, lack of promotion, lack of technology input suppliers, lack of adequate spare parts at affordable price, lack of confidence on quality of current technology outputs, lack of trained technician, lack of finance, lack of lending institutions, lack of confidence on quality of local technology products. The result reveals that better farm productivity and market competitiveness of farm product is positively related with limitation of tool based farm production in terms of ineffectiveness of previous

technology users, lack of promotion and lack of technology input suppliers while the remaining variables are negatively related with better farm productivity and market competitiveness of farm products. Therefore expansion of farm mechanization if being influenced by lack of government support, ineffectiveness of previous technology users and lack of technology input suppliers

Table 5: Regression analysis of the fifth dependent variable in relation with independent variables N=39

Independent variables	Method	Correlation with dependent variable five
	Pearson Correlation	0.261
Independent variable one	Sig. (2-tailed)	0.108
	N	39
	Pearson Correlation	-0.293
Independent variable two	Sig. (2-tailed)	0.070
	N	39
	Pearson Correlation	-0.522**
Independent variable three	Sig. (2-tailed)	0.001
	N	39
	Pearson Correlation	-0.298
Independent variable four	Sig. (2-tailed)	0.066
	N	39
	Pearson Correlation	-0.364*
Independent variable five	Sig. (2-tailed)	0.023
	N	39
	Pearson Correlation	-0.162
Independent variable six	Sig. (2-tailed)	0.323
	N	39
	Pearson Correlation	0.331*
Independent variable seven	Sig. (2-tailed)	0.039
	N	39
	Pearson Correlation	-0.056
Independent variable eight	Sig. (2-tailed)	0.737
	N	39
	Pearson Correlation	-0.320*
Independent variable nine	Sig. (2-tailed)	0.047
	N	39
	Pearson Correlation	-0.116
Independent variable ten	Sig. (2-tailed)	0.482
	N	39
	Pearson Correlation	-0.087
Independent variable eleven	Sig. (2-tailed)	0.599
	N	39
	Pearson Correlation	-0.333*
Independent variable twelve	Sig. (2-tailed)	0.038
	N	39
	Pearson Correlation	-0.354*
Independent variable thirteen	Sig. (2-tailed)	0.027
	N	39

(Source: Survey Result on March 2018)

Table 5 displays the regression analysis result of seasonal workload and fatigue reduction in relation with limitation of tool based farm production in terms of lack of government support, natural landscape, existence of limited natural resource, lack of coordination to buy and use technology products in group, ineffectiveness of previous technology users, lack of promotion, lack of technology input suppliers, lack of adequate spare parts at affordable price, lack of confidence on quality of current technology outputs, lack of trained technician, lack of finance, lack of lending institutions, lack of confidence on quality of local technology products. The result reveals that seasonal workload and fatigue reduction is positively related with limitation of tool based farm production in terms of lack of government support and lack of promotion while the remaining variables are

negatively related with labor based farm production. Therefore expansion of farm mechanization if being influenced by lack of government support and lack of promotion.

Table 6: Regression analysis of the sixth dependent variable in relation with independent variables N=39

Independent variables	Method	Correlation with dependent variable six
Independent variable one	Pearson Correlation	-0.233
	Sig. (2-tailed)	0.153
	N	39
Independent variable two	Pearson Correlation	-0.016
	Sig. (2-tailed)	0.923
	N	39
Independent variable three	Pearson Correlation	-0.137
	Sig. (2-tailed)	0.407
	N	39
Independent variable four	Pearson Correlation	0.073
	Sig. (2-tailed)	0.657
	N	39
Independent variable five	Pearson Correlation	-0.114
	Sig. (2-tailed)	0.490
	N	39
Independent variable six	Pearson Correlation	0.115
	Sig. (2-tailed)	0.485
	N	39
Independent variable seven	Pearson Correlation	0.092
	Sig. (2-tailed)	0.577
	N	39
Independent variable eight	Pearson Correlation	0.415**
	Sig. (2-tailed)	0.009
	N	39
Independent variable nine	Pearson Correlation	0.074
	Sig. (2-tailed)	0.655
	N	39
Independent variable ten	Pearson Correlation	0.081
	Sig. (2-tailed)	0.624
	N	39
Independent variable eleven	Pearson Correlation	-0.174
	Sig. (2-tailed)	0.288
	N	39
Independent variable twelve	Pearson Correlation	-0.259
	Sig. (2-tailed)	0.111
	N	39
Independent variable thirteen	Pearson Correlation	-0.055
	Sig. (2-tailed)	0.740
	N	39

(Source: Survey Result on March 2018)

Table 6 displays the regression analysis result improved life style and economic situation in relation with limitation of tool based farm production in terms of lack of government support, natural landscape, existence of limited natural resource, lack of coordination to buy and use technology products in group, ineffectiveness of previous technology users, lack of promotion, lack of technology input suppliers, lack of adequate spare parts at affordable price, lack of confidence on quality of current technology outputs, lack of trained technician, lack of finance, lack of lending institutions, lack of confidence on quality of local technology products. The result

reveals that improved life style and economic situation is positively related with limitation of tool based farm production in terms of ineffectiveness of previous technology users, lack of promotion and lack of trained technician while the remaining variables are negatively related with labor based farm production. Therefore expansion of farm mechanization if being influenced by ineffectiveness of previous technology users, lack of promotion and lack of trained technician.

4. Conclusions and Recommendations

4.1. Conclusions

This study was conducted to investigate agricultural mechanization, farm productivity and food sustainability. It was targeted on investigating agricultural mechanization farm productivity, identifying potential entrepreneurs and promoting mechanized agricultural technology that can enhance productivity and food sustainability of peasants in five potential districts (Merawi, Dangila, Bure, Jabi Tana and Woreta) of Amhara regions, Ethiopian which was based on the transformational strategy currently applicable in Country. Linear regression analysis was conducted using SPSS software and it was found that Farm productivity is positively related with availability of government support for agricultural mechanization, technology induction on farm equipments and agro equipments supplier locally and deficiency on equipment.

Farm product quality is being influenced by availability of government support for agricultural mechanization, technology induction and promotion to create awareness on farm equipments. Farm production efficiency is depend up on the availability of technology induction, awareness on farm equipments, government support for agricultural mechanization and adequate spare parts at reasonable price for technology product. Social food sustainability and economic stability are depend on the existence of government support for agricultural mechanization, technology induction and promotion technology awareness and price for technology product. Social economic stability is declining due to lack of productivity and increasing rate of unemployment which is the upcoming cause of political and social hostility.

4.2. Recommendation

Based on the finding and conclusion the researcher indicated the following recommendations to respected groups.

- The regional government should enhance its focus on agricultural mechanization, technology induction and promotion to create awareness on farm equipments so that tool based agriculture can be raised and farm productivity and production efficiency could be boosted.
- The regional government should strengthen the system on the expansion of agricultural mechanization so as to ensure peasant's food security, social economic stability and reduction of national unemployment rate.
- Agricultural mechanization is mandatory to ensure food security and economic stability of rapidly growing population of Amhara regional state.

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