Vol III Issue IX June 2014

ISSN No : 2249-894X

Monthly Multidisciplinary Research Journal

Review Of Research Journal

Chief Editors

Welcome to Review Of Research

RNI MAHMUL/2011/38595 **ISSN No.2249-894X**

Review Of Research Journal is a multidisciplinary research journal, published monthly in English, Hindi & Marathi Language. All research papers submitted to the journal will be double - blind peer reviewed referred by members of the editorial Board readers will include investigator in universities, research institutes government and industry with research interest in the general subjects.

Address:-Ashok Yakkaldevi 258/34, Raviwar Peth, Solapur - 413 005 Maharashtra, India
Cell : 9595 359 435, Ph No: 02172372010 Email: ayisrj@yahoo.in Website: www.ror.isrj.net

Review Of Research
Vol. 3 | Issue. 9 | June. 2014
Impact Factor : 2.1002 (UIF)
ISSN:-2249-894X
Available online at www.ror.isrj.net

ORIGINAL ARTICLE

AGRICULTURAL MECHANISATION AND SUSTAINABLE DEVELOPMENT IN INDIA

Rukhsana and Jumafuddin Sheikh

Assistant Professor, Department of Geography, Aliah University, Kolkata , West Bengal, India.
Ph. D. Research Scholar, Department of Geography, Aliah University, Kolkata , West Bengal, India.

Abstract:

Agricultural mechanization is the application of machinery, technology and increased power to agriculture, largely as a means to enhance the productivity of human labour and often to achieve results well beyond the capacity of human labour. There are three sources of farm power utilized for these tools, machines and equipment, manual and animal draft, and motorized power. Mechanization also includes irrigation system, food processing and related technologies and equipment. The main problems of Indian agricultural system are lack of mechanisation, small land holding, small and marginal farmers which results in huge wastage of human labour and in low yields per capita labour force. So, Implementation and action needed to increase the availability of mechanization inputs and identification of the components of a programme to increase investments in mechanization and make plan for sustainable agricultural development. However, the full benefit achieved through the use of many advanced crop husbandry inputs such as improved seed, fertilizer, and pesticides, as well as increased use of irrigation, use of improved tools and machines. Only under certain conditions, where production increases achieved through the use of other improved inputs has come to its limits, can improved tools and equipment by themselves lead to production increases, cost reductions or improvements in the environmental sustainability of farming.

KEYWORDS:

Agricultural Mechanisation availability of mechanisation and agricultural development.

INTRODUCTION

The extensive use of machinery in farm production activities, thereby reading the amount of labour input necessary to produce a given level of output (A modern dictionary of geography). The term “Mechanization” is generally used as an overall description of the application of these inputs.

As major increase of agricultural production and rural development, mechanization aims are increase the power inputs to farming activities, hence putting more land into production. Agriculture machinery implements are an important factor in agricultural production and productivity enhancement. There are direct and as well as indirect effects of agricultural machinery and implement on productivity through better use of others inputs more efficient and timely completion on agricultural operations and increase in cropping intensity (Venugopal, 2004). Agricultural mechanization and conservation agriculture refers to interjection of improved tools, implements and machines between farm workers and materials handled by them. Independent India ushered in a process of agricultural mechanization and revival of rural agro processing which got acceleration during post-green revolution period. Irrigation pump sets, power

Title: “AGRICULTURAL MECHANISATION AND SUSTAINABLE DEVELOPMENT IN INDIA” , Source: Review of Research [2249-894X] Rukhsana and Jumafuddin Sheikh yr:2014 | vol:3 | iss:9

threshers, tractors, power tillers and matching implements, including for 65 million draft animals have became popular (Naresh, et al, 2012). It has been observed that farm power availability and food grain yield have a direct relationship. States with higher farm power availability have, in general, more productivity. India has a long history in the development and promotion of tractors and a tractor industry India is now the number one producer of four wheeler tractors in the world, and its exports are growing with markets in the USA expanding (Radjou, 2009). Today, there are over 20 factories producing nearly 300,000 tractors per year with an estimated total population of four wheeler tractors of 2.8 million (Singh and Roy 2008). Interestingly, India's agriculture is far less mechanised than its neighbours Bangladesh and Sri Lanka, where Chinese engines and equipment are used. While India has 22% of its area under mechanised tillage Bangladesh and Sri Lanka both have about 80% mechanised (Kulkarni 2009). However, the full benefit achieved through the use of many advanced crop husbandry inputs such as improved seed, fertilizer, and pesticides, as well as increased use of irrigation water cannot be realized without the use of improved tools and machines. The development of 'appropriate' or 'intermediate' machinery, tools and equipment is also a favourite subject for development assistance.

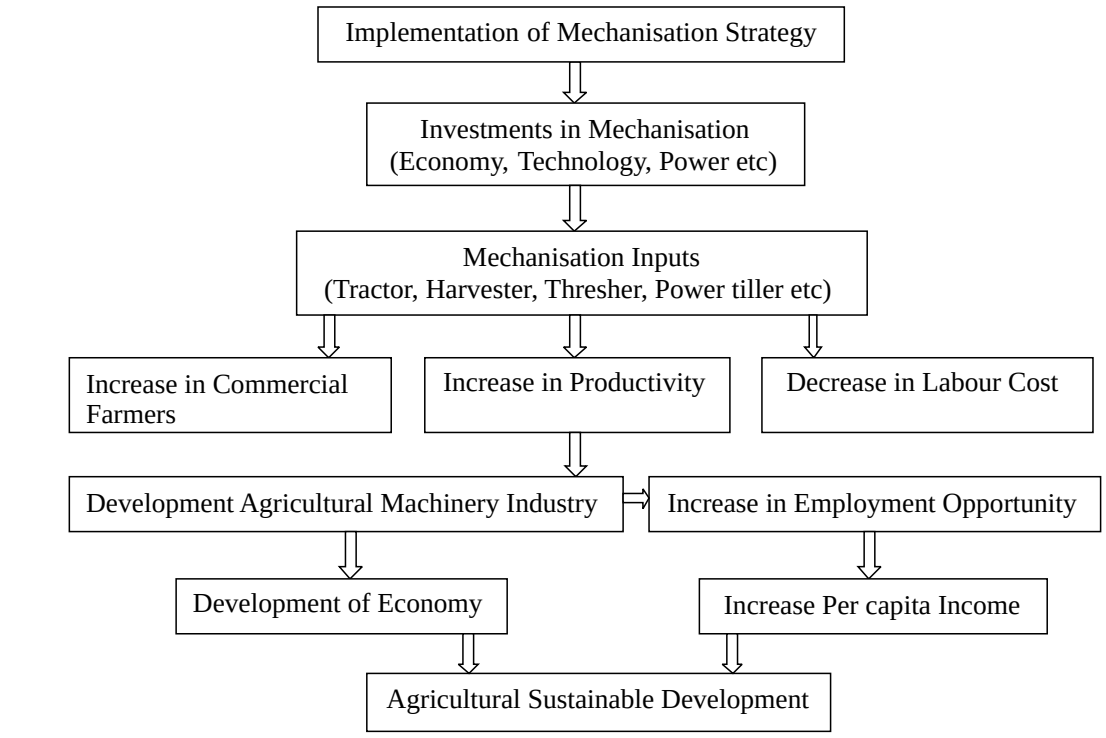
The present work is concentrating on the correlation between agricultural mechanization and sustainable agricultural development in the Indian context. Here an attempt has been made to portray the dynamics of agricultural mechanization on overall Indian performance amidst the other nations of the world. So this can be mentioned that it is a national level study depicting the overall progress in mechanization scenario with the passage of time.

OBJECTIVES

The main objective of this paper is to establish an overview of agricultural mechanization strategy (AMS), to implementation and action needed to increase the availability of mechanization inputs, to identify of the components of a programme to increase investments in mechanization, to make plan for sustainable agricultural development.

DATA BASE AND METHODOLOGY

The present study is based on the secondary data which has been collected through the census of India, Census office and uses of statistical handbooks. The present work has been accomplished with both quantitative as well as qualitative technique. This research paper has been go through based on some indicators in term of implementation of mechanisation, power source, productivity, net crop area, irrigation, size of land holding, fertilizer, HYV seeds, cropping intensity, banking loan facility, labour efficiency, entrepreneurs, farmers market knowledge etc and all the research process go through by the suitable chart diagram which have been below.



Source: Chart Prepared by Researcher, 2014

Overview of agricultural development and mechanization in India
Implementation of Mechanisation

Table 1 Distribution of Agricultural Machinery in India, 2010

Name of Machinery	Approximate Market Size (in units annually)
Tractor	370000
Combine Harvester	4000
Thresher	20000
Rotavetor	80000
Zero Till Seed Drill	15000
Multi Crop Planter	400
Power Tiller	70000
Leser Land	2000
Rice Transplanter	800
Power Spray	1000
Manual Spray	100
Power Weeder	25000
Drip Irrigation Equipment	275
Sprinkler	275

Source: Economy Survey of India, 2010

Table 1 shows the distribution of agricultural machinery in India. The highest number (370,000) of Tractor has been recorded during in 2001 -2010 among all machineries in India which is used for tilling purpose in agricultural land. Second highest machinery i.e., Rotavetor 80,000) which is used for stubbles and residues of previous crops are chopped into pieces and mixed in the soil to form organic manure. While the lowest number of manual spray (100) has been counted in said year follow to the Drip irrigation equipment (275), and Sprinkler (275). Power tiller which is used for tilling purposes in crops is counted 70000 in 2010. The number of power weeder (25,000), thresher (20,000), zero till seed drill (15,000),

combine harvester (4000) etc machinery has been used in various purpose of crop field. Leser land (2,000) and power spray (1,000) is important machinery which has been use for levelling of land. It is concluded that all machinery in said table (table 1) are must be increased to increase level of agricultural development.
Farm machinery industry

Table 2 Distributional pattern of farm machinery industry in India, 2010

Equipment	Number of manufacturer industry
Threshers	6000
Ploughs and harrows	5000
Seed drills	2500
Pumps	600
Tractors parts and accessories	546
Plant protection equipment	300
Rice processing machinery	300
Diesel oil engines	200
Earth moving machinery and parts	188
Reapers	60
Combines	48
Drip irrigation system	35
Sprinklar sets	35
Agricultural tractors	13
Earth movers	3
Power tillers	2

Source: Economy survey of India, 2010

Table 2 reveals the distributional pattern of agricultural machinery industry in India in 2010. The highest number of industry of threshers (6,000) has been find out in India which used as the purpose to replace of crops while the lowest number of power tillers (2), earth movers (3) and agricultural tractors (13) manufacture industry are recorded which used for tilling purpose. The use of power tiller and earth mover are very few due to smaller size of land holding in India. On the other hand the medium number of industry of ploughs and harrows (5,000), seed drills (2,500), pumps (600) and tractors parts and accessories (546) manufacturing industry are counted in India which is used in various purposes for agriculture. For the development of agriculture it should be include different type of machinery and it must be maintain by the increasing of machinery based industry.

Power sources

Table 3 Percentage of distributional pattern of different power sources in India, 2010

Power Source	Percentage
Agricultural worker	5.09
Draught animal	6.37
Tractor	51.08
Stationary engine	37.46
Total	100

Source: Report of the Sub-Group on Agricultural Implements and Machinery for Formulation of 9th Five Year Plan, Govt. of India.

The table 3 shows the distribution of different power sources in India. The highest percentage of tractors (51.08) has been recorded in India among the all power source. The increase in power has been mainly through with the implementation of tractors, whose contribution has increased to 51.08 during the period of 2010. On the other hand the lowest percentage (5.09) of agricultural worker used in agricultural purpose as power source. Due to increase of machinery base power source used of agricultural workers decreases. The percentage of use of draught animal power source also low (6.37) in said period due to increase of used of stationary engine (37.46) in agricultural land. So it has been recommended that power should be increase in agricultural land.

Productivity

Table 4 Percentage of Average Annual Growth Rates of Area, Production and Yield of Principal Crops in India 2007-2012

Crops	Average Annual Growth (%) (2007 to 2012)		
	Area	Production	Yield
Rice	0.18	2.69	2.41
Wheat	1.31	4.64	3.29
Jowar	-5.71	-3.00	3.26
Bajra	-1.38	7.84	8.64
Maize	2.16	8.09	6.47
Ragi	0.41	8.11	6.66
Small Millets	-4.42	-0.13	4.08
Barley	0.61	6.32	4.64
Coarse Cereals	-1.59	5.68	7.27
Total Cereals	**-0.03**	**3.79**	**3.76**
Gram	2.32	4.62	2.27
Tur	3.13	4.84	1.51
Total Pulses	**1.36**	**4.28**	**2.78**
Total Foodgrains	**0.19**	**3.80**	**3.55**
Sugarcane	0.04	0.99	0.87
Groundnut	-0.86	15.82	13.91
Sesamum	0.04	0.99	0.87
Rapeseed & Mustard	-1.69	-0.37	0.76
Sunflower	-18.74	-14.46	6.20
Soyabean	4.00	7.71	3.90
Total Oilseeds	**-0.07**	**5.54**	**5.32**
Jute	0.49	1.26	0.62
Mesta	-7.00	-5.94	0.80
Mesta&Jute	-0.59	0.62	1.12
Total Cotton	**5.97**	**10.46**	**3.93**

Source: Directorate of Economics & Statistics, Ministry of Agriculture, 2013

Table 4 shows the percentage of average annual growth rates of area, production and yield of different crops during 2007 to 2012. The area under jowar, bajra, small millets, ground nuts, rapeseed and mustard, sunflower and mesta has witnessed a negative growth during 2007 to 2012. Table is shows that the average growth rate of Production of jowar, small millets, rapeseed & mustard, sunflower and mesta are negative with the negative growth of area. Yields of all the major crops have recorded positive growth during the same period. The increases in production in the case of wheat, bajra, maize, groundnut and total oilseeds can mainly be attributed to increase in yields, where as the growth in production in the case of gram, tur, total pulses, soyabean and cotton is driven by a combination of both expansion in area and increase in productivity/yield.

Cropping Pattern

Table 5 Distribution of Cropping Pattern in India (Area in Million Hectares), 2010

Years	2010
Total Area Under Crops	192.20
Net sown area	140.02
Cropping intensity (%)	137.26
Area under Food crops	141.06
Area under Non-Food Crops	51.14
Net Irrigated area	63.26
Total / Gross Irrigated Area	86.42

Source: Agriculture Census 2010-11.

Table 5 depicts the distribution of pattern of different crops during the period of 2010 in India. The highest amount of area (192.20 million hectors) has been find out under crops during the period of 2010 while lowest amount of area (51.14 million hectors) has been recorded under non-food crops during said period. So it may be point out that in India food crop area (141.06 million hectors) increases but non-food crop area decreases due to high demand of food. It has been counted that the total net sown area in India is 140.92 million hectors. In India net irrigated area (63.26 million hectors) is less than the total gross irrigated area (86.42 million hectors) and this condition occurred due to lack of irrigation facility. So, irrigation facility must be increase for the development of agriculture in India.

Size of Land Holding

Table 6 Group Wise Distribution of Average Land Holdings in India, 2010

Size Groups	Area in hectors
Marginal (Below 1 hector)	0.38
Small (1-2 hector)	1.42
Semi-Medium (2-4 hector)	2.71
Medium (4-10 hector)	5.76
Large (Above 10 hector)	17.38

Source: Agriculture Census, 2010-2011

Table 6 shows the group wise distribution of average land holdings in India. As per Agriculture Census 2010-2011, it has been recorded that the highest percentage (17.38),of land under large land holdings, on the other hand lowest percentage (0.38) of land under marginal land holdings due to poor economic condition. It has been counted that the average size of land holdings for operational classes i.e., 1.42 percent under small, 2.17 percent under semi-medium and 5.76 percent under medium land holdings. Due to increasing demand for industrialization, urbanization, housing and infrastructure is forcing conversion of agricultural land to non – agricultural uses; the scope for expansion of the area available for cultivation is limited. So, it must be maintain cultivation land for available production for rapid growing people of India.

Irrigation

Table 7 Distribution of Irrigated Area in percentage, 2010

Total Irrigated Area	63.25
Total non Irrigated Area	36.75
Total	100

Source: Agriculture Census, 2010-2011

Table 8 Distribution of Sources of Irrigation, 2010

Source of Irrigation	Percentage
Tanks	3
Tube wells	46
Dug wells	16
Others	9
Total	100

Source: Agriculture Census 2010-11

Table 7 and 8 depicts the distribution of irrigated, non-irrigated area through different sources of irrigation and per cent of irrigated area during 2010.In India percentage of total irrigated area is about 63.25 percent and non irrigated area is 36.75 percent. The said table reveals that the highest percentage (46) of tube wells used in irrigation purpose among the all source of irrigation. On the other hand lowest percentage

(3) of tank irrigation systems used in irrigation purposes. Due to large temporal and spatial variation of irrigation source Indian agricultural system has been affected. So, there is a need to bring more cropped area under assured irrigation to increase agriculture productivity and production.

Fertilizers

Table 9 Distribution of fertilizer Consumption in India (Lakh tonnes), 2010-2012

Sl. No.	Consumption of Fertilizers	2010	2011	2012
1	Urea	266.74	281.12	295.65
2	DAP	104.92	108.70	101.91
3	MOP	46.34	39.32	30.29
4	NPK(Complex)	80.25	97.64	103.95
5	SSP	26.51	38.25	47.46

Source: State Governments, 2012-2013

Table 9 reveals the use of fertilizers in agricultural land which are the immediate source of nutrients in soils. It has been counted that the highest amount consumption of urea used in agricultural purposes during 20120-2012. Consumption of urea is always increasing from 266.74 lakh to 295.65 lakh tonnes during 2010 to 2012. On the other hand lowest amount of SSP (26.51 to 47.46 tonnes) consumption counted during 2010 to 2012 but consumption of SSP is increases from 26.51 to 47.46 lakh tonnes during said period. It has been counted that consumption of DAP has declined from 104.92 lakh tonnes in 2010 to 101.91 lakh tonnes in 2012. The obvious reason for this high uses of urea and lower uses of phosphatic and potassic fertilisers are the relative price of these fertilizers.

10. HYV (High Yielding Variety) seeds

Table 10 Requirement & Availability of Certified/Quality Seeds of Hybrids (Quantity in million tonnes), 2010-2012

Crop	2010		2011		2012	
	Req	Ava	Req	Ava	Req	Ava
Paddy	2.9	5.3	9.8	10.9	9.9	9.2
Maize	62.7	61.1	75.4	92.2	101.7	142.1
Jowar	17.2	19.9	11.5	13.9	13.1	13.9
Bajra	22.4	19.7	21.9	26.0	24.6	28.4
Sunflower	4.0	6.4	5.8	6.3	7.0	9.6
Castor	3.7	5.0	2.5	3.1	3.4	4.5
Cotton	1.1	15.8	14.5	15.6	19.5	22.5
Total	**124.3**	**133.4**	**141.6**	**168.1**	**179.1**	**230.1**

Source: State Governments, 2012-2013 Req: Requirement Ava: Availability

Table 10 shows the distribution of crop wise requirements and availability of hybrid seed during 2010 to 2012. The requirement of paddy, maize, sunflower and cotton continuously increases during 2010 to 2012. On the other hand requirement of jower, bazra and castor decreases during 2010 to 2011 but increases during 2011 to 2012. Requirement of paddy, maize, sunflower and cotton continuously increases due to high demand. So it has been concluded that the total requirement as well as total availability continuously increases during said period except paddy. Hybrid seeds in cross pollinated crops give higher yield; hence, greater emphasis is given to hybrid seeds to improve crops productivity.

CONCLUSION AND PROPOSED ACTION PLAN FOR SUSTAINABILITY

Apart from the discussion it has been concluded that the major reasons for the disappointing performance and low contribution of mechanization to agricultural development in India has been the fragmented approach to mechanization issues. This can be attributed to small land holding, poor planning by government agencies and overreliance on unpredictable or unsuitable, one-off aid-in-kind or other external mechanization inputs. Lack of teamwork or coordination within and between governments and the

inherent competition with private-sector business initiatives in mechanization services have not helped the situation. Formulation of national agricultural mechanization strategic and implementation plans has been seen as the solution, but even these have hardly come to fruition. Strategic national and regional plans would bring about the critical mass that is needed to make machinery contractual services viable, hence fertile ground for entrepreneurship. They would bring about holistic and system-based mechanization plans and processes where comparative advantages and roles of key players in the social, technical and economic environment would be clear and, therefore, effectively exploited. In most Indian states no serious planning for sustainable mechanization has taken place. In many cases where mechanization has made a positive contribution to agricultural development, it has been a question of getting the right machine on the right enterprise by chance, not by credible project or programme design.

The proposed action plan is to achieve substantial increases in agricultural productivity through:

Farmer empowerment and increased numbers of commercially active farmers and agriculture-related rural entrepreneurs (female farmers and entrepreneurs are included);
Improvements in mechanization patterns, including irrigation and special applications such as weeding and chemical application;
Increase in the power available to agriculture and stronger networks for input supply and technical support;
A major increase in land under cultivation and parallel increases in crop yields;
Development of agriculture sector and long-term improvements in soil fertility;
Increase in farm produce marketed and increase in cash flows to the rural communities;
Development of a viable agricultural machinery industry, including manufacture of a range of agricultural implements and, eventually, diesel engines, pumps, tractors etc.

Sustainability National Mission for Sustainable Agriculture (NMSA) is one of the eight Missions under National Action Plan on Climate Change (NAPCC). It seeks to address issues on 'Sustainable Agriculture' in the context of risks associated with climate change by devising appropriate adaptation and mitigation strategies for ensuring food security, enhancing livelihood opportunities and contributing to economic stability at National Level. National Mission for Sustainable Agriculture (NMSA) indentifies ten key dimensions for promoting suitable agricultural practices, which will be realized by implementing a Programme of Action that covers both adaptation and mitigation measures through four functional areas, namely, Research and Development, Technologies, Products and practices, Infrastructure and Capacity building. Sustainable agricultural production shall continue to remain key to ensure food and livelihood security and would require a multifunctional/ multi-tier institutional mechanism for ensuring convergence and establishing linkage at all levels. NMSA, therefore, proposes to formulate policies of national importance in consultation with the States in National Development Council.

REFERENCE

1.Clarke L. J. (2000), Chief, Agricultural Engineering Branch, Agricultural Support Systems Division, FAO, Rome, Italy
2.Justice, S., and Gurung, C. (2003), Report of the West Bengal Two-Wheel Tractors Stakeholders Meeting, 29 July, 2003 Park Hotel, Kolkata, W B.
3. Kulakarni S.D. (2010), Mechanization of Agriculture - Indian Scenario, Central Institute of Agricultural Engineering (CIAE) Bhopal - 462 038, India.
4.Kulkarni S.D. (2005), Country Report – India: Agricultural Mechanization – Present Scenario and Perspective Presented in Fourth Session of the Technical Committee of APCAEM held at New Delhi, India.
5.Naresh, R. K. et al, (2012). Role of Conservation Agriculture and AgriculturalMechanization on Productivity, sustainability and income generation in north west India,International Journal of Engineering, 5 (1).
6.Radjou, N. (2009). Polycentric Innovation: A New Mandate for Multinationals. The Wall Street Journal,
7. Singh, G., and K. C. Roy (2008). Agricultural mechanisation in Bangladesh, Agricultural Mechanisation in Asia, Africa and Latin America, 39,(2).
8. The Agriculture Mechanization in India Market Research, 2010.
9. State of Indian Agriculture, (2012-2013) Government of India Ministry of Agriculture Department of Agriculture and Cooperation Directorate of Economics and Statistics New Delhi.
10. Venugopal, P. (2004). Input Management, Under the Series: State of the Indian Farmer – A Millennium Study, Academic Foundation, New Delhi, Volume 8.

Rukhsana
Assistant Professor, Department of Geography, Aliah University, Kolkata , West Bengal, India.

Jumafuddin Sheikh
Ph. D. Research Scholar, Department of Geography, Aliah University, Kolkata , West Bengal, India.