

Contemporary Policy for Agriculture Extension Education in India: Inclusion of Demography in Agriculture Education

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ABSTRACT

World is experiencing demographic changes due to various factors. These factors are vital events, socio-economic, political and environmental phenomenon. Demographic changes in any geographic region are influencing agriculture and cropping pattern directly and indirectly. Food production and its supply directly linked with demographic pattern. Keep in mind that Indian demographic patterns have changed and are changing gradually, in this case agriculture professional, students and farmers should be aware about the demographic changes happening in the locality and whole India as well. Hence demography or population studies should be included into agriculture education system (syllabus) that is the main aim of this paper. Two specific objectives of this paper- to know the population trend of India; and to link demography with agriculture discipline to introduce new discipline as agriculture demography. Census of India and NSSO are the major source of data to analyse demographic trends. This paper recommends that agriculture student should be taught demography as discipline. Agriculture University, research centre, KVK should have one professional demographer for sustainable agriculture and rural development. Agriculture and demography is not mutually exclusive in the race of agriculture and rural development. Extension Education and Home Science have compatibility with demography in terms of teaching, research and extension. Thus, "Agriculture Demography" in agriculture education and research system is the demand of time.

Key words: Demography; Vital events; Education; Migration; Urbanization; Labour market; Gender in mainstreaming; socio-economic; Sustainable development;

“Any research in agriculture sector without knowing of demographic trends in any geographic area is like letting loose an arrow in the darkness (Prasad and Das, 2016)”.

Malthus (1798) was the first proponent of population and agriculture growth. In his essay on "Principle of Population" he expressed connection with population growth and their survivorship. According to him, population and agriculture are increasing with different growth rate i.e., geometric and arithmetic rate respectively. He conceptualized that one day population would be died due to shortage of food supply. Thus Malthus is called as pessimistic thinker of agriculture and population. In contrast to him, Boserup (1965) is known as optimistic proponents of population and agriculture. She linked population, environment and technology. Malthus emphasised that after some time,

population will be dying due to shortage of food grains whereas Boserup focus of new technology in agriculture if needed for increasing food supply. Thus Boserup idea was based on "need is the mother of invention". Boserup had argued that in case population pressure will be high for food supply, people will be searching new methods or ways for increasing the production of food by increasing workforce, increased mechanization in agriculture and applied fertilizers to get high yield. She also proposed relationship between arable and fallow land with population density. Marquette (1997) has mentioned that Malthus's concept was "invention-pull" population growth whereas Boserup's idea was "invention-push" agriculture growth. Boserup argued that if population density increases the land use increases proportional and cropping patterns changes accordingly. Marx and Durkheim also proposed population growth

and labour division for more efficient production. *Cain (1985)* has studied “on the relationship between landholding and fertility” and stated that fertility is influenced by land holding and land holding is influenced by family size. He has given two hypotheses these are related to landholding and fertility i.e., land security hypothesis and land-labour demand hypothesis. A response to *Cain, Stokes et al., (1986)* stated that “the fertility behaviour of landowners, tenant farmers, communal landholders and landless labourers is influenced by their respective rights in land is supported by the emerging theoretical and empirical evidence”. Thus, demographic theories are interrelated theory of agriculture growth and development.

Indian agriculture is characterising labour intensive and it has tremendous opportunity for creating jobs for millions of hands. Agriculture/fields operations required labour according to its nature of operations. Some works are required skilled labour and some are not. For example, pre harvest crop can be managed by non skilled and semi skilled labour but post harvest management required skilled and trained labours. Labour requirement is varying crop to crop and geographical factors of the region. Cultivation is a natural phenomenon and one cannot change its operation in any way. Labour supply and demand gap is increasing year by year due to socio-economic factors and demographic factors. Agriculture Labour market is changing due to socio-economic, political (policy) and biological (Birth & Death/health) factors.

Movement (Migration) of people from rural to urban or from agriculture to non agriculture sector due to Liberalization, Privatization and Globalization (LPG) raised many pressure on agriculture scientists and farmers for food supply. Food supply and demand is depending upon consumers’ behavior and their residences. Globalization is fundamentally changing the nature of our everyday experiences and societies in which we live and the way we are connected with others. It is forcing people to live in more open, reflexive ways, respond to and adjust with changing environments. Globalization led economic growth has brought structural changes in the job market. There has been a shift in labour from agriculture to other high value added manufacturing sector and service sector. As a result of adoption of policy of LPG, the changes in agriculture have been taken place at four different levels- global, national, sectoral, and local. And the scenario of WTO,

quality food products should be concerned.

Food habits and consumption pattern are varying among urban and rural dwellers in various ways. In one hand urban residents need processed foods in shortest time with low cost and on the other hands food growers are declining in rural areas due to wage differentials and other factors. Most of agricultural labours and cultivators turned towards industrial sectors and resultant of this labour shortage in agriculture and growers reduced. Agricultural operational land holdings are decreasing due to population growth and urbanization and expansion of urban areas. Still India’s population growth is higher, literacy & income are improving that led demands of quality food with sufficient quantity would be increased simultaneously year by year.

Population growth influences agriculture and agriculture growth influences population size, structure, distribution and their socio-economic and health status. Demographers can understand the concurrent situation of the population and agriculture labour market at present and can be projected for future. Now India is passing its demographic dividend and agrarian society (professional, student, farmer, and agriculture labour) should study demography in details for agriculture and rural development, because, situation analysis is the first step of research and development programmes.

Due to changing of demography of India, now challenges in front of agricultural scientists and agrarian societies are as –They

- have to think about sufficient quality food for all
- should introduce short duration High Yielding Varieties.
- should introduce low labour intensive crop production technology.
- should introduce post harvest management techniques.
- should encourage processed foods and its supply chain management.

Without knowing of demographic situation (or situation of producer and consumption) in India, it would be difficult to implement food security programmes. If population is low/optimum then agriculture professional should be promoted quality food production and vice-versa. An agriculture expert should have proper knowledge and understanding of demographic trends and techniques otherwise agriculture scientist ‘try’ to

raise food production to feed mass and demographers would ‘cry’ for controlling over population. The differences between try and cry will go into different path of development. Demography is also dealing occupational health and maternal health with family planning methods and agriculturist should know the disease pattern among the agrarian society. Department of Extension Education and Home Science in Agricultural University are compatible with Demography in terms of teaching, research and extension contents and methods. Demographic transition is teaching to agriculture under graduate students in rural sociology, whereas family planning methods are teaching in home Sciences. Table 1 shows the compatibility of demography with agriculture and home science discipline. If, there are – Economic Demography (in IITs, IIMs); Social Demography (in Sociology); Historical Demography; Health/medical Demography (in AIIMS, NIHFV); Health Extension Education (NIHFV), then why not Agriculture Demography in Indian education system. Agricultural Sciences are the combination of natural sciences, physical sciences and social sciences. To understand the contemporary situation of agrarian society and agriculture, understanding of demography is must. Therefore this paper has been planned with two specific objectives- to know the demographic/population trend of India; and to link demography with agriculture discipline; and to introduce agriculture demography in Agriculture Universities and colleges.

METHODOLOGY

Census of India and NSSO are the major source of data to analyse demographic trends. To established relationship between agriculture and demography, these analysis have been done- Population Growth rate- and projection; Sex Ratio-Rural & Urban; Work Participation Rate (%); Migration Rate–In, Out and Net migration; Change of population over time; and Dependency ratio (R/U-Rural-Urban). To know the contemporary situation of agriculture and agrarian society, and linking demography with agriculture discipline, the following methods have been used-

$$KL (\%) = \frac{\text{No. of known items}}{\text{Total no. of items}} \times 100$$

KL=Knowledge level (of Innovation)

$$AL (\%) = \frac{\text{No. of items or methods adopted}}{\text{Total no. of items or methods}} \times 100$$

AL=Adoption level (of technology)

$$MR = \frac{\text{Total no. of migrants at specific period of time}}{\text{Total population at that time (mid year)}} \times K$$

MR=Migration Rate (R/U) (K=1000 or 100)

Net Migrants = In-migrants – Out-migrants or

Out-migrants = In-migrants – Net Migrants or

In-migrants = Out-migrants + Net Migrants

$$NMR = \frac{\text{In-migrants} - \text{Out-migrants in time T}}{\text{Total mid year population at time T}} \times 100$$

Net Migration rate (Time T)

$$PC = \frac{NP \text{ in } T2 - NP \text{ in } T1}{NP \text{ in } T1} \times 100$$

PC= Population Changes (%)

Table 1. Compatibility of demography and agriculture

Item	Extension Education/Home Science	Demography
Objective	-To improve social status through teaching, education and vocational training -To increase food production by changing KAS. -Transfer of technology from lab to land and response from land to land	-To improve mortality and check fertility by teaching family planning methods -To improve balancing of population and control of population by FP methods -Transfer of knowledge about FP, RCH and study of labour market
Area of Study	-Knowledge (K) of -Attitude (A)-Skill (S) -HYVsProduction -Adoption (Ad) tech Self -Diffusion (Df) employment	-Knowledge of -Attitude -Birth (Fertility) -Skill/Practice Death -Adoption (Mortality Migration)
Tools	Information, Education & Communication Technology (IE&CT)	IE&CT
Target	High growth rate	Low growth rate
Subject	Social Sciences	Social Sciences

NP= No. of population

$$DR = \frac{\text{Population < 15 years and 60 and above}}{\text{working age population (15 to 59 years)}} \times 100$$

DR=Dependency ratio (R/U) (%)

$$\text{Diff.} = \frac{\text{No. of male (M)} - \text{No. of female (F)}}{\text{No. of Female (F)}} \times 100$$

Diff.=Differential (M/F) (%)

Relationship between agriculture extension and demography have discussed follows-

- Agriculture Extension Education and Demography
- Population growth and Agriculture Growth
- Migration and Agriculture: Remittances and Labour market, Exposure of new technology in agriculture
- Fertility, Landholding and Agriculture
- Demographic Dividend and Agriculture
- Knowledge, Attitude and Skill/Practice in Population and Agricultural Studies
- Population and Food Security
- Population Policy and Agriculture Policy

Agriculture professionals either in technical, managerial, or in agriculture social sciences should be heed on increasing food production and preservation but they must know the number of consumers and consumers' behaviours of both rural and urban residents and demand of food items in the market.

RESULTS AND DISCUSSION

Presentation of results of this paper has been divided into various segments. Each segment has qualitative and quantitative explanation. Table 2 shows demographic trends by sex. Share of male population in total has declined by -0.51% in which -0.17% in rural and -1.48 in urban areas. But female population share has increased almost similar trends in both residences during 2001 to 2011. The total female work participation rate has declined in rural areas by -2.50 per cent but it has increased in urban areas by 32 per cent. Female main work participation rate has increased. Number of cultivators has declined but female work participation rate as agricultural workers have gone up. It clearly indicates the feminization in agriculture. Structural changes in population of India have appeared. These changes appear due to demographic events mainly fertility and migration. On one hand population share has decreased in rural areas; on the other hand urban population share has increased. Though, the fertility rate of urban area is lower than rural area. Thus, main reason

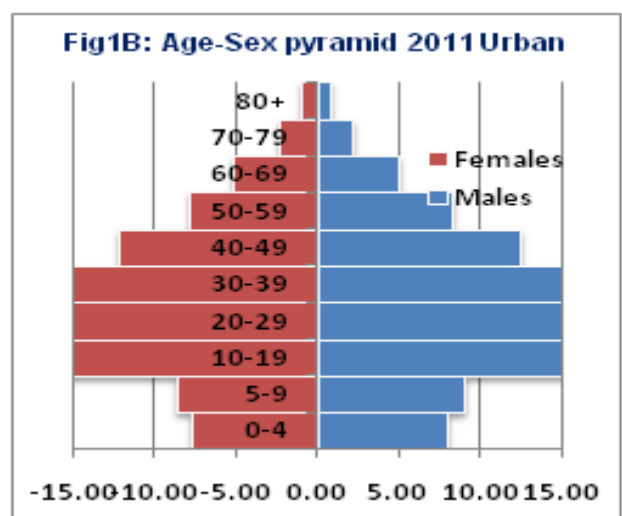
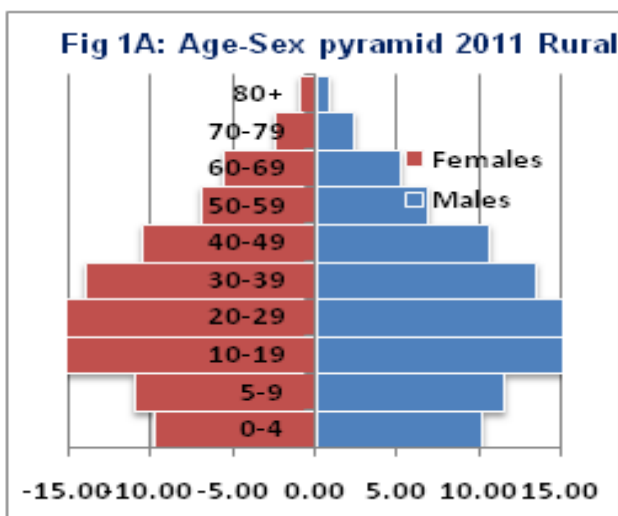
of urbanization in India is internal migration (rural to urban) as well as external migration.

India is the country of youth and passing through demographic dividend. Figure 1 clearly shows age-sex composition in rural and urban in 2011 that indicates demographic dividend. At present Indian population growth is increasing with decreasing rate and it varies from different geographic region. Population growth is also varying in social group and religion as well as different socio-economic class. There are 18 per cent population has increased during 2001 to 2011 with annual exponential growth rate of 1.64 per cent in India. In which 12 per cent in rural and 32 per cent in urban areas population has gone up. Total Fertility Rate (TFR) in 2001 was 3.4 and 2.3 in rural and urban that has declined in 2011 by 2.8 and 1.9 respectively (*SRS, Registrar General, 2013*). India has reached its fertility near to replacement (2.1) level (TFR 2.5) though fertility of urban is below replacement level (1.9). If exclude fertility of six major Indian states then country's fertility reached below replacement level. Male and female work participation rate differentials are two to three times high in all working categories. Total Male worker are 102 per cent more than female counterparts whereas male cultivator and agricultural labour are 188 and 71 per cent higher than female. Thus, even today females far behind of the male for work participation. These trends should be known to the agrarian scientist with factual statistics.

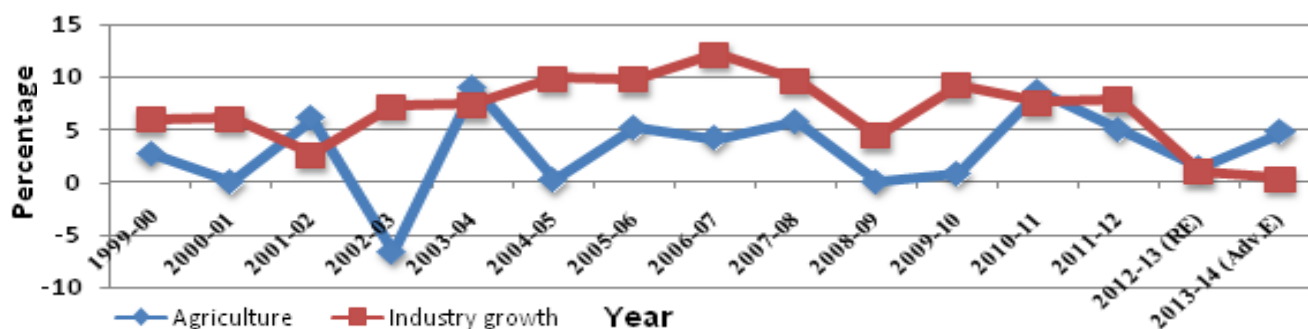
Indian economy is mixed and still more than 60 per cent of the population are depending upon agriculture for their livelihood. As mass are engaged in agriculture and allied activity then there should be pro-agriculture policy in India. Fig 2 indicates that growth rate of agriculture is fluctuating year by year. It has passed negative growth rate (in 2000 and 2003) to about 9 per cent (in 2004 and 2010) growth rate. Agriculture policy should be formulated based on the structure and composition of Indian population if all the conditions are constant. Even today Indian agriculture is rain fed and depends on monsoon. It is clear that population growth and agriculture growth are the result of socio-economic processes, biological processes and environmental processes. States with TFR 3 and above are Bihar, UP, Jharkhand, Chhattisgarh, MP, and Rajasthan and other states have TFR below replacement level in 2010 estimates (*SRS, 2012*). Agriculture growth is fluctuating with wider gap due to rainfed nature (fig 2).

Table 2. Changes in work participation rate (%) in 2001 and 2011 (Source: Registrar General, India-Census 2011)

Item	Total		Rural		Urban		% Changes 2001 to 2011		
	2001	2011	2001	2011	2001	2011	Total	Rural	Urban
<i>Total Population</i>									
Male	51.7	51.5	51.4	51.3	52.6	51.8	-0.51	-0.17	-1.48
Female	48.3	48.5	48.6	48.7	47.4	48.2	0.54	0.18	1.65
<i>Female</i>									
Total worker	25.6	25.5	30.8	30.0	11.9	15.4	-0.44	-2.50	29.99
Main	14.7	15.2	16.6	16.7	9.4	11.9	3.58	0.22	26.14
Cultivator	5.1	3.9	6.9	5.5	0.3	0.3	-23.96	-20.50	-9.41
Agricultural Lab	4.5	5.3	5.9	7.2	0.7	0.9	16.74	21.90	20.02
Household	0.9	0.8	0.9	0.8	1.0	0.9	-13.79	-17.02	-8.62
Others	4.1	5.2	2.9	3.2	7.3	9.8	27.38	10.61	33.30
<i>Male</i>									
Total worker	51.7	53.3	52.1	53.0	50.6	53.8	3.06	1.77	6.26
Main	45.1	43.8	44.3	41.6	47.2	48.7	-2.86	-6.05	3.10
Cultivator	14.7	11.7	20.0	16.5	1.2	1.3	-20.32	-17.73	7.64
Agricultural Lab	7.7	8.9	10.3	12.1	1.3	1.8	14.76	17.76	40.02
Household	1.4	1.2	1.3	1.0	1.6	1.7	-14.24	-26.11	4.96
Others	21.3	22.0	12.7	12.1	43.0	43.8	3.56	-4.77	1.77
<i>Total</i>									
Total worker	39.1	39.8	41.7	41.8	32.3	35.3	1.76	0.19	9.47
Main	30.4	29.9	30.9	29.5	29.3	30.9	-1.61	-4.48	5.63
Cultivator	10.1	7.9	13.6	11.1	0.8	0.8	-21.41	-18.48	3.24
Agricultural Lab	6.2	7.1	8.2	9.7	1.0	1.4	15.30	19.17	32.64
Household	1.2	1.0	1.1	0.9	1.4	1.3	-14.16	-22.53	-0.41
Others	13.0	13.9	7.9	7.8	26.1	27.4	6.85	-2.13	4.94
<i>Male Female Differential in work participation rate (%)</i>									
Total worker	102.0	109.0	69.2	76.7	325.2	249.4			
Main	206.8	188.2	166.9	149.1	402.1	309.2			
Cultivator	188.2	200.0	189.9	200.0	300.0	333.3			
Agricultural Lab	71.1	67.9	74.6	68.1	85.7	100.0			
Household	55.6	50.0	44.4	25.0	60.0	88.9			
Others	419.5	323.1	337.9	278.1	489.0	346.9			



Source: Registrar General, India (Census 2011)



Source: CSO Release 30th May 2014 & 29th Nov. 2014, RBI, EAC to PM, Ministry of Finance; 31st May, 2014

Table 3. Population and worker by sex and residence and per centage changes during 2001 to 2011

Item	Total		Rural		Urban		% Changes 2001 to 2011		
	2001	2011	2001	2011	2001	2011	Total	Rural	Urban
Total Population	1028610328	1210569573	742490639	833463448	286119689	377106125	17.7	12.3	31.80
Total worker	402234724	481743311	309956070	348597535	92278654	133145776	19.8	12.5	44.29
Main	313004983	362446420	229186552	245749270	83818431	116697150	15.8	7.2	39.23
Cultivator	103626068	95841357	101345252	92737696	2280816	3103661	-7.5	-8.5	36.08
Agricultural Lab	63497114	86166871	60517788	80958300	2979326	5208571	35.7	33.8	74.82
Household	12206084	12331464	8330814	7244556	3875270	5086908	1.0	-13.0	31.27
Others	133675717	168106728	58992698	64808718	74683019	103298010	25.8	9.9	38.32
<i>Female</i>									
Total Female	496453556	587447730	360887965	405830805	135565591	181616925	18.3	12.5	33.97
Total worker	127220248	149877381	111116917	121834467	16103331	28042914	17.8	9.6	74.14
Main	72857170	89297061	60085301	67714557	12771869	21582504	22.6	12.7	68.98
Cultivator	25367090	22823252	24909455	22267845	457635	555407	-10.0	-10.6	21.36
Agricultural Lab	22378045	30911944	21387471	29319234	990574	1592710	38.1	37.1	60.79
Household	4697071	4791343	3294467	3074203	1402604	1717140	2.0	-6.7	22.43
Others	20414964	30770522	10493908	13053275	9921056	17717247	50.7	24.4	78.58
<i>Male</i>									
Total Male	532156772	623121843	381602674	427632643	150554098	195489200	17.1	12.1	29.85
Total worker	275014476	331865930	198839153	226763068	76175323	105102862	20.7	14.0	37.97
Main	240147813	273149359	169101251	178034713	71046562	95114646	13.7	5.3	33.88
Cultivator	78258978	73018105	76435797	70469851	1823181	2548254	-6.7	-7.8	39.77
Agricultural Lab	41119069	55254927	39130317	51639066	1988752	3615861	34.4	32.0	81.82
Household	7509013	7540121	5036347	4170353	2472666	3369768	0.4	-17.2	36.28
Others	113260753	137336206	48498790	51755443	64761963	85580763	21.3	6.7	32.15

Source: Registrar General, India (Census 2011) Why Agriculture Demography should be introduced in New Education Policy for rural and agriculture development discussed below:-

Agriculture extension/home science and demography : Agricultural statisticians measure the quantitative analysis without knowing of knowledge level, attitude, skill and perceptions of the farmers regarding real farm problems. Demographers and agriculture extension specialists are focusing on the study of attitudes of the youth, farmers and general population towards family planning methods and agriculture innovations respectively followed by adoption of methods and

innovations. Agriculture scientists and population scientist are focusing on the real cause of poverty and hunger across the social group. Thus demography should be introduced in department of extension education/home science rather than department of agricultural statistics. Adoption of high yielding varieties and fertility, family size, remittances, exposure of innovation, fertility and chemicals etc., are research interest of both agriculture extensionist and demographers. There are

five broad courses of agriculture extension education in Agriculture Universities recommended by ICAR. These are dimension of Agriculture Extension, Rural sociology and educational Psychology, extension or communication methods for transfer of technology, vocational development and communication skill, and research in Extension Education and management. All these courses are compatible to demographic study of agrarian society in India. It is important to introduce new course in extension education for overall knowledge of agrarian society and its development.

Growth of population and agriculture : If there is high population growth but low land availability, then agriculture scientist should be developed methods of intensive cultivation of crops. High population growth rate forced to the farmers to cultivate crops those are short duration and high yielding and intensive use of agriculture input in general and land in particular. Population growth (high or low) influence demand of food grain, fruits & vegetables, milk & milk products, etc. and also affects export and import of agricultural output. Urbanization is increasing quarterly very high not annually due to rural to urban migration, thus food demand and habit will be different in different economic or income groups.

Migration and agriculture: remittances and labour market, exposure of new technology in agriculture: There are three demographic events- birth, death and migration. Current demographic scenario is changing due to migration in the world and in India as well. Migration affects labour market at both places of origin and place of destination. Rural to urban migration is more prevalent in India due to economic reasons followed by socio-political. Rural to rural migration is process of socio-cultural reason (marriage). Out-migration affects agriculture negatively and positively by loss of productive member of households and receiving remittances from migrant member respectively. Rural out-migration is one of the main causes of labour shortage in agriculture (Prasad, 2013). Migrant households are more exposed to new agriculture technology, new agricultural products, new varieties, new inputs and new methods of cultivation of crops. Prasad (2014) found that most of migrant households (MHs) members were more aware about the new methods of cultivation of crops than the members of non migrant households (NMHs). Most of

MHs were adopters (known as Innovators, early adopters, early majority) and have used new innovation in agriculture and none of MHs were late majority and laggards. Ramachandran (2008) rural market changes due to seasonal internal migration of agricultural labour and external migration and trade (p, 222). When rural labour market shrinks then urban labour market expands in the internal migration streams.

Modern economic pattern such as liberalization, privatization and globalization (LPG) linked local labour market to the world labour market through migration process. Open economy provide opportunities for agrarian societies to seek job outside rural areas that led to labour migration and result of this increased of real wage rate in domestic agriculture sector (Karunagoda, 2004). Demographer has categorized migration process under LPG as internal migration and external migration. Migrants under this process are known as out-migrants and in-migrants (Table 4). Remittances of migrants can be used in agriculture for boosting production and to gain high income from agriculture. It means researches in agriculture and in demography are compatible to each others. Agriculture scientists would be able to increased food supply corresponding to demographic phenomenon, and demographers take interest on research on food supply and fertility. Decadal growth of cereal demand 13 per cent and growth of demand of fruits, vegetables, eggs, chicken and milk is much more corresponding to population and income growth (Alagh, 2010). If extension specialists got to know that migrant households are more aware about the agricultural innovation, they are interesting on new agriculture technology, then they easily identify progressive farmers' household that is the target beneficiary of agricultural scientists. Agriculture professional should aware about the migrant and non-migrant household characteristics. Migrants' household would be innovators in adoption of innovation stages. Thus agriculture student should have thorough knowledge of demography.

Fertility, landholding and agriculture: High population growth is enhancing demand of food, fibre, furniture, fodder, and fuel (5F) with decreasing size of landholding. Landholding size is decreasing due to high population growth and that led mechanization in agriculture. Average landholding size is 1.16 hectare that is the big challenge for Indian agriculture (Agriculture

Table 4. Number of rural in-migrants, rural out-migrants and rural net-migrants, during 1991 to 2001

Region	Total rural population	Number of migrants and migration rate			Rate*
		Out	In	Net (4-3)	
UTs	9,61,954	98,402	7,27,069	6,28,667	653.53
North	8,82,90,448	27,90,170	35,33,946	7,43,776	8.42
South	14,84,78,814	19,29,335	12,52,766	-6,76,569	-4.56
East	18,40,67,619	32,22,426	29,20,666	-3,01,760	-1.64
West	8,81,05,257	11,30,062	16,41,224	5,11,162	5.80
Central	19,87,52,702	38,54,414	31,61,097	-6,93,317	-3.49
NE	3,30,03,499	6,41,094	4,29,135	-2,11,959	-6.42

Source: Registrar General, India (2001)

*Rate = $(5/2) \times 1000$

Census, 2010). Agricultural professional and demographer can develop new dimensions in the field of extension research that would directly link with population and agriculture.

Demographic dividend and agriculture : Dependency ratio is 49.79 per cent and it indicates that half of the population is in working and rest is dependent population. Due to city bright light effects and higher literacy rate now rural youth is not interested in agricultural work. The negative attitude of the youth towards agriculture is one of the causes labour shortage in agriculture (Prasad, 2015) that influence labour intensive cropping pattern and cropping intensity negatively. That challenges would be in front of agriculture scientist and try to develop low labour intensive technology in crop production. Agriculture scientist should be well aware about the demographic dividend in different geographic location. Is demographic dividend suitable and available to agricultural works? or are youth ready to go abroad for foreign exchange? Agricultural professional and farmers should know and developed technology accordingly.

Knowledge, attitude and skill/practice in population and agricultural studies: The main aim of agriculture extension education is the development of individual and similarly demographer targets newly couple for reproductive and child health (RCH) as well as family planning. Both agriculture extension specialist and population scientists are interested on knowledge/awareness level, attitude scale and skill level towards agriculture innovation and contraceptives or family planning methods respectively. There is an extension approach of family planning methods. The awareness level and adoption quotients are positively correlated in pulse production technology (Awasthi and Prasad, 2010).

Rural fertility is higher than urban due to low awareness and acceptance of contraceptive methods (NFHS-3). Both agriculture extension specialist and population scientist are studying new methods of agriculture and reproductive and child health. Agriculture professional should be aware about the occupational health in agriculture sector as Demographers are concerned on family health (including indoor health and occupational health) and food security. Most of the demographers are studying on nutritional status of children and mother under ICDS. Agriculture sector consumes huge amount of chemicals as pesticide and weedicide or fertilizers and health of farmers and agricultural labour have been affecting. Thus, agricultural scientist should know the disease patterns, incidence, etc., among the agrarian society. This knowledge would come from demographic study of farming societies.

Population and food security :Food security is the government's flagship programme under national food security act, and it is the major challenge for agricultural scientist. Agriculture student and researcher should aware the population distribution by age-sex and residence across the socio-economic class, caste and ethnicity. Because food habits the matter of socio-economic status of the households but food production is related to geographical and environmental factors along with socio-economic condition of the farmer and political factors of the region. Population scientist would find out the trends and patterns of population growth and correspondingly agricultural scientist would produce agricultural products. Thus agriculture scientists must be an agriculture demographer for comprehensive study of agrarian society. Quantity of food requirement is also varying with population age and residence. High fertility rate shows that high demand of milk and milk products for children whereas elderly or ageing population needs milk with fruits and vegetables. Modern economy, work culture and living style have tremendous scope of post harvest management and processing of food items such as ready to serve (RTS), packaged food, etc. Public distribution system (PDS) is failing due to lack of proper distribution and highly corruption. PDS should be monitored by agriculture scientist along with demographers. MGNREGA and migration are the best example of agricultural studies and demographic studies of the societies in India.

Population policy and agriculture policy : Renowned agriculture scientist Dr. MS Swaminathan was the chair of National Population Policy 2000. Population policy and agriculture policy are interlinked policy and an estimate indicates that per day 8000 adding in Indian population. The National Population Policy -2000, targeted to achieve the net replacement levels one (TFR=2.1) with the target of stable population by 2045. All round development of agriculture with support of farmers are the main aim of agriculture policy 2020. Thus policies of population and agriculture are the brain child of demographers and agriculture scientist. *Article of Gage (2009), Sharma (2007), and book by Solbrig (1980)* has explained Demography and Agriculture meaning fully.

CONCLUSION

All the Millennium and Sustainable Development Goals (MDGs/SDGs) are related to population and agriculture directly and indirectly. Any development programme would not be successes without analysing demographic situation and agriculture situation of the country. None of the agriculture universities, colleges have department of population studies or demography. Even demography is the part of home sciences and family studies, but it should be core discipline in agriculture universities and colleges. Without knowing of the demography of the country, student could not understand the problems of nation as whole and food security programme would not be successes.

Demographer and agriculture professional should be worked together for well being of society or for sustainable development of country. There are 160 or more credits courses are taught to agriculture undergraduates programme in four years. Atleast two (2) or three (3) credit course of agriculture demography should be included into their syllabus. Paper recommends that agricultural graduate should be studied demography as following headings:

Title of the course “Fundamental of Agriculture Demography” or “Principle of agriculture demography” or “Introduction of agrarian demography” or “Demography of agrarian society” etc. The subject matter must be as follows-

- Importance of demography in agriculture and rural development.
- Demographic methods: measurement of Fertility,

mortality, migration, population growth & projection, demographic transition, urbanization, agriculture work participation rate, producer and consumer ratio, cultivator and agriculture labour ratio, etc.

- Population Theories- By different thinkers (fertility and landholding, wealth theory, social capillary theory, economic theory, etc.)
- Demographic structure and population composition and distribution: Age, Sex, Rural-Urban residence, Caste, Religion, Region.
- Migration: Theories, Causes and Consequences of migration in rural and urban areas, impact of migration on agriculture, agrarian households, agriculture labour market, cropping pattern, impact of remittances on agriculture.
- Sources of demographic and agriculture data: Population Census, NSSO, NFHS, CSO, DLHS, SRS, ASI, Agriculture Census and Animal Census, etc.
- Population policies and strategies of population planning for sustainable development.
- Division of agriculture labour and Gender in agriculture: Working age population, dependency ratio, and demographic dividend.
- Feminization in agriculture and female work participation rate in agriculture
- Population and environment or population and climate change
- Food security and nutritional status of children and women
- Occupational diseases among the agrarian society: causes and consequences
- Settlement of agrarian society and livelihood.

In UG programme introductory course should be taught and at post graduate level – demographic research should be conducted by agriculture social scientist or rural sociologist or agriculture extension or home Science Scholars. Such as population growth and agricultural growth; studies of agrarian demography and adoption of innovation by migrant and non migrant household, cropping pattern and household size, cropping intensity and population size of households, etc.

This paper strongly recommended to all the academicians, policy maker, policy researcher, that in New Education Policy, agriculture demography should be introduced in Agriculture University system.

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