

Attracting and Retaining Youth in Agriculture (ARYA) and its Components : A Review

K. N. KALYANA MURTHY, M. R. ANANDA, H. D. SHIVA KUMAR AND H. M. ATHEEKUR REHMAN

Department of Agronomy, College of Agriculture, UAS, GKVK, Bengaluru - 560 065

E-mail : anandmruas@gmail.com

ABSTRACT

Youth are the most potent segment of the population of a country. They are the hopes of tomorrow and the backbone of rural community. Youth possess dynamic energies, creative activities and adventurous spirit by virtue of their age and enthusiasm. India is a land of youth and constitutes a numerically dominant, resourceful and also adventurous segment of the population. At present, 35 per cent of the total population is in the age group of 15-35 years, out of which 75 per cent of them live in rural areas. The migration of rural youth to the cities is around 45 per cent, which is quite alarming. The major reasons for youth moving to urban center include: lack of basic amenities, unemployment and lack of interest in farming since agriculture suffers from several factors such as natural disasters (drought, storms, etc.), smaller land holdings (that are unable to compete against more commercialized agriculture of larger holdings) and not getting suitable market price for agriculture produce. The future of agriculture depends on the contribution of youth. In this context, to prevent the exodus of farmer and rural people to cities and towns, the ICAR has recently designed four programs namely, Farmer First, Student READY, Mera Gaon Mera Gaurav and ARYA. Realizing the importance of rural youth in agricultural development especially from the point of view of food security of the country, ICAR has initiated a programme on 'Attracting and Retaining Youth in Agriculture'. ARYA project is being implemented in 25 States through KVKs selecting one district from each State. The Purpose of ARYA is to establish economic models for youth in the villages so that youths get attracted in agriculture and overall rural situation improves. If agriculture is the backbone of economy, agronomists are the backbone of agriculture, since they deal with wider aspects of the farm. Sustainability and productivity of the farm depends upon practicing of integrated approaches like dairy, poultry, goat/sheep, apiculture, piggery, mushroom production, etc., in addition to the crop component. Agronomist can become the mentor of the rural youth and retain them on the farm by educating to practice integrated farming system approaches.

Keywords: ARYA, IFS, Youth and Enterprises

YOUTH are the most potent segment of the population of a country. They are the hopes of tomorrow and the backbone of rural community. Youth possess dynamic energies, creative activities and adventurous spirit by virtue of their age and enthusiasm. India is a land of youth and constitutes a numerically dominant, resourceful and also adventurous segment of the population. At present, 35 per cent of the population is in the age group of 15-35 years, out of which 75 per cent live in rural areas. But the migration of rural youth to the cities is around 45 per cent, which is quite alarming (Anonymous 2016). The major reasons for youth moving to urban centre include: lack of basic amenities, unemployment and lack of interest in farming since agriculture suffers due to several factors such as natural disasters (drought, storms, etc.), smaller land holdings that are unable to compete against

commercialized agriculture of larger holdings and not getting suitable market price for agricultural produce. The future of agriculture depends on the contribution of youth. In this context to prevent the exodus of young farmer and rural youth to cities and towns, the ICAR has recently designed four programmes viz., Farmer First, Student READY, Mera Gaon Mera Gaurav and ARYA.

Rural youth in agriculture

Global population is projected to reach 9 billion by 2050. The number of young people (aged 15 to 24) is also expected to increase to 1.3 billion by 2050, accounting for almost 14 per cent of the projected global population. Most of the population is from developing countries of Africa and Asia, where more than half of the population still live in rural areas (UNDESA, 2011).

Rural youth continue to face challenges related to unemployment, underemployment and poverty. Despite the agricultural sector's ample potential to provide income-generating opportunities, rural youth are moving away from farming due to lack of policy support. Access to both information and education are crucial for youth to successfully participate in the agricultural sector.

In addition to knowledge of crop production and processing techniques, young farmers need access to information about finance, land and market as well. During 2012, close to 75 million young people worldwide were out of work, resulting escalation in global youth unemployment rate. Furthermore, among those young people who were working, over 200 million were earning less than USD 2 per day. Asia alone is home to 60 per cent of the world's youth, while 18 per cent of them live in Africa. In 2010, India registered the highest number of youths in the world at 234 million or 19 per cent of the country's total population. China registered the second highest at 225 million or 17 per cent. According to National Youth Policy of India, India's 35 per cent population is between the age group of 15 to 35 years and the youth population projected is 570 million by 2020.

The figures of 2011 census indicate that nearly 74 per cent of the population is literate. School drop outs accounts to nearly 25 per cent at Primary levels, 46 per cent at Middle School and 60 per cent at High School level wherein 50 per cent of the population is below the age of 25 years. These dropout children join labour market and majority of them are engaged in agriculture. The National Policy on Farmers placed in Parliament during November 2007, includes the goal of introducing measures which can help to attract and retain youth in farming, processing of farm products for value addition & higher returns and making farming intellectually stimulating and economically rewarding'.

Challenges ahead in agriculture are food security, increase in production cost, non availability of number as well as quality labour, access to sustainable funding, strong community involvement & support and migration of youth from rural to urban areas. As per estimate

during 2011-12, migration in India is 50 per cent, while it is 90 per cent in China.

Definition of Youth: As defined by the UNO 'Those aged between 15 to 24 years are considered as youth. As on 2012, the youth make up 1.8 billion or 18 per cent of the total world population. Many countries have their own age definition of youth, depending on specific socio-cultural, economic and social factors. Youth is defined under the law as 'Young men and women'. It is 12-24 years in Taiwan, 14-28 in Kyrgyzstan, 15-25 in Thailand and 16-30 years in the Philippines. People in the age group of 15-35 years are defined as young in India according to National Youth Policy and accounts to 57 crores during 2016. At present, 35 per cent of the total population is in the age group of 15-35 years, out of which 75 per cent lives in rural areas. The migration of rural youth to cities is around 45 per cent in the country, which has several implications for the future of Indian agriculture.

Importance of youth in agriculture: Young farmers play an important role in ensuring food security if they are encouraged to involve in farming and their challenges are addressed. Youth are willing to adopt new ideas and technologies and therefore agricultural extension services should target youth to transform agriculture. They are ideal catalyst to change the poor image of persons involved in agriculture, especially in the rural communities given their greater possibility to adapt new ideas, concept and technology. Agricultural extension services can be effectively addressed by encouraging and supporting participation of youth in agriculture. Improving youth capacities and increasing their involvement will help in changing the negative perception about farmers as 'uneducated and unskilled'. The participation of rural youth in the development process is essential in order to bring change in socio-economic structure and improving the quality of living of an individual.

Why farm youth opting out of farming?

The reasons for the youth to opt out of farming are : Lack of confidence / interest among youth to pursue agriculture as profession, Lack of risk bearing ability among youth, Lack of social recognition for

farming profession, Not getting marriage alliances, Lack of encouragement by parent's / peer groups to pursue agriculture as profession, Increase in social conflicts, Unwillingness of the elderly members of the family, Division and fragmentation of land, Non feasibility of farm mechanization, Uncertainty of the crops, No access to inputs, Lack of remunerative price for the produce, Non-profitable farming enterprise, Lack of Risk mitigation mechanisms, Huge physical drudgery and Urban-rural differences in terms of infrastructure, communication, health, education & other basic facilities, etc.

Concept of ARYA

National Service Scheme for student youth (NSS), Nehru Yuvak Kendra for non-student youth (NYK), Training of Rural Youth for Self-Employment (TRYSEM), Women and Youth Training Extension Program (WYTEP), Nehru Yuva Kendra Sangathan (NYKS) are the important programmes implemented in India targeting youth

Realizing the importance of rural youth in agricultural development especially from the point of view of food security of the country, ICAR has initiated a programme 'Attracting and Retaining Youth in Agriculture' (ARYA). ARYA project is being implemented in 25 States through KVKs selecting one district from each State. In each district, 200-300 rural youth are identified for their skill development in entrepreneurial activities and establishment of related micro-enterprise units like Apiary, Mushroom, Seed Processing, Soil testing, Poultry, Dairy, Goatry, Carp-hatchery, Vermi-compost etc. KVKs would involve the Agricultural Universities and ICAR Institutes as technology partners. At KVKs also one or two enterprise units will be established so that they serve as entrepreneurial training units for farmers. The purpose of ARYA programme is to establish economic models for youth in the villages so that youth get attracted to agriculture and overall rural situation improves.

The main objectives of ARYA project are: 1) To attract and empower the youth in rural areas to take up various agriculture, allied and service sector enterprises for sustainable income and gainful employment in selected districts 2) To enable the farm

youth to establish network groups to take up resource and capital intensive activities like processing, value addition and marketing and 3) To demonstrate functional linkage with different institutions and stakeholders for convergence of opportunities available under various schemes/program for sustainable development of youth.

Pioneering Attempt: The University of Agricultural Sciences, Bangalore organized a national seminar on "Attracting Youth in Sustainable Agriculture" during August 2011 and initiated young farmers and farm women awards for outstanding contribution in agriculture and published success stories of awardees.

Establishment of youth network: Network of farm youth at various levels (district, state, national) to encourage interactions, exchange of ideas, sharing experiences & mutual learning, inspire and motivate to imitate development taking place elsewhere. The use of ICT can also be encouraged through e-learning, e-training and marketing. The group formed can be encouraged to undertake backward and forward linkages to address their requirements. Youth network would be established with the existing development programmes / schemes of the public and private sectors.

Outcome of ARYA programme: The outcomes are listed hereunder: There was enhanced income for the rural youth and their families; Increased employment opportunities for rural youth and the members of their family; Development of leadership qualities among the rural youth; Improved social status for the youth practicing agriculture and other allied enterprises including the service sector; Introduction of need based innovations among rural youth; Boosting of confidence among rural youth to handle the enterprise independently; Enhanced backward and forward linkages in the farming; Improved infrastructure facilities; Improved communication skills among rural youth; Enhanced quality of production & services and Emergence of small scale/cottage/community based rural industries. Effective convergence of youth oriented programmes were covered by different departments while each Youth developed under the pilot project serve as a model to the other rural youth of the area.

Agriculture enterprises for attracting youth in agriculture: Dairy, Apiary, Poultry, Vermi-composting, Mushroom cultivation, Goatry, IFS- Integrated Farming System, Contract farming, Value addition, etc. are the different enterprises that can attract youth to become an successful entrepreneur.

Dairy: Milk production in India is one of the traditional business since there is always a demand for the milk, curd, buttermilk and number of other dairy products which can be sold at every corner of the world throughout the year. Dairy is also encouraged by the government and other organizations and is an eco-friendly business, which never pollutes the atmosphere. It does not require much skill to manage. Besides this, it also brings a great opportunity for the unemployed and educated as well as the illiterate youth. If it is practiced with proper planning and management, it gives maximum returns. This business is successful in every type of climate and weather. There are many government schemes and loan facilities available for starting a dairy farming.

Apiary: Apiary is one of the component of farming especially in the integrated farming system. It not only generates additional income to farm family by means of honey but also through increased crop yields by way of pollination. The economics of bee cultivation for 100 bee unit is as follows.

Investment : Bee boxes Rs. 3,50,000 (Rs 3,500 / box x 100 boxes) Miscellaneous Expenses = Rs 1,75,000 (including worker wages, traveling cost, etc), totalling to Rs. 5,25,000.

Income: Assuming 40 kg of honey is produced per box in a year. Total yield per year will be 4000 Kg Honey (40 kg x 100 Box). If we consider approximate cost of honey per kg as Rs. 350/- then Total income = Rs 350 x 4000 kg = Rs. 14,00,000 (14 lakh rupees approximately).

Net Profit: The Net Profit realised would be Rs. 10,00,000 (14,00,000-5,25,000). For this, one should have love towards nature, dedication and patience (Venuta Krishna *et al.*, 2014).

Vermi-composting - A profession for youth

A success story: Prateek Bajaj, a youth of 21 years old with the urban background, who has just completed Bachelor Degree in Commerce, is one of the known personality among the youth and farmers in agriculture based entrepreneurship development in Bareilly District of Uttar Pradesh. His love for nature and soil has tickled his mind towards the idea of vermin-composting as a profession of his life. He dreamt to be a well-known entrepreneur in agriculture. He first came to know about vermi-composting while attending training in dairying at Krishi Vigyan Kendra, IVRI Izzatnagar during 2015. He was very much surprised to see the utilization of dung and waste of dairy in different form at Krishi Vigyan Kendra. Initially he had started vermi-composting with three beds by following flooring method. He made three beds each of 30x2 feet size and earned Rs.41,600.00 from his enterprise which he had started after his first trial (Manai Elena, 2016).

Mushroom farming: Today, mushroom farming is one of the major sources of employment for number of people. Millions of people are in fact earning a great profit by cultivating mushroom. Many people, with low capital, less space and minimum care are performing small-scale commercial mushroom business & are also earning reasonable a good income. In commercial mushroom farming, one can easily obtain an yield of about 10 to 15 kg of button mushroom per square foot. The market rate is quite high for fresh mushroom and is more than Rs.150.00 and more depending on consumers demand. Taking an average of 10 kg button mushroom yield per square foot and selling it at average price of Rs.150.00 mushroom per kg, one can earn about Rs.1500.00 per sq. foot. Amazing is it? However, mushroom farming income depends on management skill, care and management of the unit. If one is cultivating oyster mushroom than button mushroom then he can obtain about 12 kg of oyster mushroom yield per square foot. In the market, oyster mushroom price per kg is as high as Rs.200.00.

Goat farming as a lucrative business: There are so many benefits of goat farming, since less space is required for the goat farming in comparison to the other

animal husbandry like rearing of buffaloes, cows etc. One can manage more goats in very less place and goats need very less food than other animals, hence there is less feeding expenses. Goat can be reared in any type of climate and conditions. Goat matures at the age of one year, later can be used for breeding or selling in the market for meat. Hence, the flow of income starts early. Goat farming has many uses like the milk is used for drinking, meat to eat, hair to make fibres and their skin is used in many musical instruments. Goat breed three times in two years and one can raise more number of goats in short time starting with few goats. It is easy to maintain and run the goat business.

A success story: Imamsab Nadaf (40), a native of Antargangi village, Sindagi taluk of Vijapura District in Karnataka has successfully taken the goat farming. As a diploma-holder in computer science, he worked in the Gulf for few years, before returning to India in 2009. He proclaim's at first, I was not sure what business to do. Later, a friend advised me to start farming as we had agricultural land,' he said. Initially, he took to lemon and pomegranate cultivation. After three years, I switched over to goat farming in 2012 by spending Rs.2.1 lakh to purchase 62 lambs, he said. Two years later, he earned a profit of Rs.6.5 lakh from selling goats. Today, he is rearing more than 500 goats worth Rs.7 lakhs. Mr. Nadaf believes that goat farming is a lucrative business. If a farmer raises at least 10 goats in his farm, this would give him additional revenue even at the time when his crop fails due to vagaries of nature. The earning not only comes from selling goats, but also from its droppings as it is considered as a good source of organic manure.

Integrated Farming System (IFS): The growth rate of agriculture in the recent past is very slow in spite of the rapid economic growth in India. According to the Economic Survey of India, 2008, the growth rate of food grain production decelerated to 1.2 per cent during 1990-2007, lower than the population growth of 1.9 per cent. It is projected that in India population will touch 1370 million by 2030 and to 1600 million by 2050. To meet the demand, we have to produce 289 and 349 MT of food grains during the respective

periods. The current scenario in the country indicates that area under cultivation may further dwindle and more than 20 per cent of the currently cultivable area will be converted for non-agricultural purposes by 2030. The operational farm holding in India is declining and over 85 million out of 105 million are below the size of 1 ha. Due to ever increasing population and decline in per capita availability of land in the country, practically there is no scope for horizontal expansion of land for agriculture. Only vertical expansion is possible by integrating farming components requiring lesser space and time and ensuring reasonable returns to farm families. The Integrated Farming Systems (IFS), therefore assumes greater importance for sound management of farm resources to enhance the farm productivity and reduce the environmental degradation, improve the quality of life of resource poor farmers and maintain sustainability. In order to sustain a positive growth rate in agriculture, a holistic approach is the need of the hour. Farming system is a mix of farm enterprises in which farm families allocate resources for efficient utilization of the existing enterprises for enhanced productivity and profitability of the farm. These farm enterprises are crop, livestock, aquaculture, agro-forestry, agri-horticulture and sericulture. In such diversified farming, though crop and other enterprises coexist, the thrust is mainly to minimize the risk, while in IFS, a judicious mix of one or more enterprises along with cropping there exist a complimentary effect through effective recycling of wastes and crop residues. This encompasses additional source of income to farmers. IFS activity is focused around a few selected interdependent, inter-related and interlinking production system based on crops, animals and related subsidiary enterprises.

Integrated farming system approach is not only a reliable way of obtaining fairly high productivity with considerable scope for resource recycling, but also concept of ecological soundness leading to sustainable agriculture. With increasing energy crisis due to shrinking of non-renewable fossil-fuel based sources, the fertilizer nutrient cost has increased steeply with gradual withdrawal of fertilizer subsidy. It is expected to have further hike in the cost of fertilizers. This will leave the farmers with no option but to fully explore

the potential alternate sources of plant nutrients atleast for the partial substitution of the fertilizer nutrients for individual crops and in the cropping systems. Farming is a process of harnessing solar energy in the form of economic plant and animal products. 'System' implies a set of interrelated practices and processes organized into functional entity, *i.e.*, an arrangement of components or parts that interact according to some process and transforms inputs into outputs.

Possible output of integrated farming system: Since Integrated Farming System (IFS) is an interrelated complex matrix of soil, water, plant, animal & environment and their interaction with each other enable the system to be more viable and profitable over the arable farming system, which leads to quality food production. To strengthen the food chain, it is essential to eliminate nutritional disorder which has been realized on account of deficiency of mineral nutrients and vitamins in food being consumed. Horticultural and vegetable crops can provide 2-3 times more energy production than cereal crops on the same piece of land and will ensure the nutritional security on their inclusion in the existing system. Similarly inclusion of bee-keeping, fisheries, sericulture, mushroom cultivation on account of space conservative also give additional high energy food without affecting production of food grains. The integration of these enterprises will certainly help the production, consumption and decomposition in a realistic manner in an ecosystem.

Likewise, it is a pre-requisite in farming system to ensure the efficient recycling of resources particularly crop residues, since 80-90 per cent of the micronutrients remains in the biomass. In the Indo-Gangetic plains, where rice straw is not recycled in an effective way and even in Punjab where rice cultivation is practised in 2.6 m ha produces about 16 m tonnes of paddy straw which is destroyed by burning. To curtail such precious resource loss, the use of second generation machinery for efficient crop residue management to conserve moisture, improve soil micro-organism activities, regulate soil temperature, check soil erosion, suppress weed growth and on decomposition improves soil fertility. Its

beneficial effect can also be accrued by incorporating with the soil. The crop residue can be used as floor thatch for cattle shed, composting, growing mushroom and also for dry fodder. Multiple use of water for raising crops, fruits, vegetables and fishery may also enhance the water productivity. Likewise, in villages, the sewage water can be purified through Hydrilla biomass before its release to fish pond. Besides, the community land in the villages, which are accessible to better use must be used for productive purpose. Therefore, adoption of concepts like social forestry, water harvesting and recycling fishery, and stall feeding to the animals (goatery/piggery) will add to the profit margin with other numerous indirect benefits of employment and improved ecology of the area. Such types of enterprise integration generate additional income varying from Rs.20,000-25,000/ha under irrigated and Rs.8,000-12,000 under rainfed ecosystem for the youth who practice. The income enhancement due to integration of processing and on-farm value addition is upto 50 per cent, yield improvement on account of improved soil health ranges from 0.5-1.0 t/ha, cost reduction by Rs.500-1,000/ha and employment generation by 50-75 man days/household have also been observed.

Present status of farming system research: The preliminary investigations clearly elucidated that integration of agricultural enterprises *viz.*, crop, livestock, fishery, forestry etc. have great potential towards improvement in the agricultural economy. These enterprises not only supplement the income of the farmer by increasing the per unit productivity but also ensure the rational use of the resources and further create employment avenues. Following suitable crop choice criteria with deep and shallow root system, inclusion of legume crop as catch, cover & fodder crops and adoption of bio-intensive complimentary cropping system along with other enterprise will certainly prove as a self-sustained production system with least cost of production. The farming system is governed by various forces *viz.*, physical, environmental, socio economic conditions, political forces under various institutional & operational constraints government favourable policies etc., may keep the food security intact and livelihood fully protected.

In traditional Chinese system, the animal houses were constructed over a pond so that the animal waste falls directly into the water fuelling the pond ecosystem, which the fish could then feast on for food. Not only the fish were harvested but the pond water, with extra nutrients was used for irrigating in crops. The maximum return (Rs.79,064/ha) was earned from fisheries + piggery + poultry as compared to Rs.5,33,221 from the rice-wheat system registering 48.6 per cent gain. This also generated additional employment of about 500 man days/ha/annum.

For poor, it starts small with ducks and chickens; then a few goats are kept for milk or fattening and to slaughter for a day of sacrifice; next a milch cow; then a bullock for ploughing in cooperation with another one buffalo family; then two bullocks. These can be used to plough the own fields or can also be hired to others - a very lucrative business in the planting season. In India, one would add a milch buffalo at the apex of desirable animals on the farm. In the Vietnamese concept, the pigs will be the second step in the ladder. The concept means to start with small livestock and the household will slowly get out of poverty. The poorest households kept only poultry and these households were those mostly dependent on common property resources for their living (e.g. use and sale of firewood from the forest). A similar stratification has been reported in several studies from Asia. Survey on farming systems in the country as a whole revealed that milch animals; cows and buffaloes irrespective of breed and productivity is the first choice of the farmers as an integral part of their farming system. However, from economic point of view, vegetables and fruits (mango and banana in many parts of the country) followed by bee keeping, sericulture, mushroom and fish cultivation was the most enterprising components of any of the farming systems prevalent in the country. The average yield gaps between 27 predominant and 37 diversified farming systems were examined across the agro-climatic zones through detailed survey on characterization of on-farm farming systems. Diversification of farming system by integration of enterprises in varied farming situations of the country enabled to enhance total production in terms of rice equivalent yield ranging

from 9.2 per cent in eastern Himalayan region to as high as 366 per cent in Western-plain and Ghat region when compared to prevailing farming systems of the region. A number of success stories on IFS models including Sukhomajari Watershed of Chandigarh, Fakot Watershed in hilly areas of Uttarakhand, Jayanthi models for all the situations of Tamil Nadu, WTCER model for coastal and irrigated alluvial lands of Orissa, Darshan Singh Model for irrigated conditions of Punjab, PDCSR model for western Uttar Pradesh and many more in different parts of the country suggest that farmers' income can be increased by manifolds through diversification of enterprises in a farming system mode for sustainability and economic viability of small and marginal category of farmers.

Productivity enhancement by IFS: In view of serious limitations of horizontal expansion of land for agriculture, only alternative left is vertical expansion through various farm enterprises requiring less space and time but with high productivity ensuring periodic income especially for the small and marginal farmers.

The highlights about the research investigations carried out in India towards farming system outcome are discussed to conceptualize its significance towards farming community livelihood. In a study conducted at ICAR Research Complex, Goa, it was revealed that rice-brinjal crop rotation is the best in terms of productivity and profitability owing to higher yield of the brinjal. The system yielded a total productivity of 11.22 t/ha rice grain equivalent yield with a net return of Rs.46,440/ha. Further, with the integration of mushroom and poultry (based on the resources availability within the system), the system productivity was increased to 21,487 kg/ha especially with rice-brinjal rotation leading to an additional returns of Rs.30,865/ha with integration. In addition, the system approach was found to be sustainable as indicated from the changes in soil organic carbon and reflected by sustainability yield index.

In Tamil Nadu, the IFS increased the net return on an average of Rs.31,807/ ha/ year over the arable farming (Rs.19,505/ ha/ year). While in Goa, when coconut was integrated with crop, vegetables, mushroom, poultry and dairy it was able to enhance Rs.17,518/

ha/ annum over the coconut cultivation alone. In Madhya Pradesh, the integrated farming gave a margin in net return of Rs.17,198/ha/year over the arable farming. In Uttar Pradesh, the average enhancement in return was Rs.45,736/ ha/ annum over the existing crop-based farming system.

Singh *et al.* (2017) conducted studies of various farming systems on 1 ha of irrigated and 1.5 ha of rainfed land in Haryana and found that under irrigated conditions, mixed farming with crossbred cows yielded the highest net profit (Rs.20,581/-) followed by mixed farming with buffaloes (Rs.6,218/-) and lowest in arable farming (Rs.4,615/-). In another study conducted with 240 farmers of Rohtak (wheat-sugarcane), Hisar (wheat-cotton) and Bhiwani (gram-bajra) districts in Haryana representing different crop rotations of respective zones revealed that maximum returns (Rs./ha) of 12,593, 6,746 and 2,317 were obtained from 1 ha with buffaloes in Rohtak, Hisar and Bhiwani, respectively. The highest net returns from Rohtak was attributed to the existence of a better soil fertility and irrigation facilities coupled with better management compared to other zones. The employment generation in terms of total man days, Rohtak had the highest employment potential followed by Hisar and Bhiwani. The employment potential under mixed farming was predominantly from livestock rather than crop production.

Another study involving cropping, poultry, pigeon, goat and fishery was conducted under wetland conditions of Tamil Nadu by Jayanthi *et al.* (2001) for three years. The results revealed that integration of crop with fish (400 reared in 3 ponds of 0.04 ha each), poultry (20 babbok layer bird), pigeon (40 pairs), and goat (Tellichery breed-20 female and 1 male in 0.03 ha deep litter system) recorded higher productivity, higher economic returns of Rs.1,31,118 (mean of 3 year). Integration of cropping with fish and goat created additional 207 man days/annum. The resources were recycled in such a way that fish were fed with poultry, pigeon and goat dropping. Similarly, remaining poultry, pigeon and goat manures were composted, crop residue of banana and sugarcane were used as mulch to the crops.

Contract farming can revive India's agriculture: Contract farming works informally in the Indian economy. Although it benefits farmers by providing assured market transactions for an acceptable quality of produce, the lack of a written contract adversely affects the interests of farmers who are vulnerable to exploitation by those with capital in their possession. For a long time, there was no comprehensive policy to regulate the actions and clauses of agreements in contract farming. Public good requires those steps to increase competition and create market-related incentives for both contractors and farmers. Farmers should be more connected to the market (mandis) in order to get proper information and inputs at the right time. e-NAM (National Agriculture Market) has so far not able to enrol many mandis in the country which leaves out a significant proportion of them. Also, e-auctions are still conducted by commission agents. The government needs to train farmers to auction their produce themselves and to participate in e-NAM. Mutual trust and confidence in farm-firm relationships are important conditions for contract farming arrangements. The Model Contract Farming Act, 2018, aims to create a regulatory body to enforce contracts. Experience shows that neither parties want law enforcement to intervene, with marginal farmers being affected the most. Village level courts, subsidised legal support and minimum prices will ensure a fairer settlement.

Under the current system, the farmer is paid only after the crop has been harvested and sold, leaving him at the mercy of the company's discretion. Instead, there should be a database of companies readily available to farmers for information and background of the companies they engage with. The imbalances in market power, opportunistic behaviour and other unfair practices have all acted as a drag on contract farming. Risk-sharing clauses and transparent contract terms must be enforced to enable better coordination. The results from several contract farming models show that net profits for contract farmers were more than double those for non-contract farmers. The share of marketing and transactional costs to total cost was much lower for contract farmers. Contract farming has the potential to revive agriculture if it is properly

implemented. Though the draft Model Contract Farming Act, 2018, does address many of these issues, it has not been mandatory for states to adopt it, as agriculture is in the concurrent list. Some constitutional amendments would be desirable to implement enabling changes on the ground.

Value addition unit in amla - A success story: Young farmer Mr. Elango is the entrepreneur of “AAVAP”. The products of his unit are amla, squash, candies, mouth freshner, etc., started during the year 2012. Simple manufacturing process. Easy availability of raw material and low production cost are the reasons for selecting the project. Technical guidance was provided by KVK, Needamangalam. Less labour requirement, Non involvement of middleman and No extra cost on outlet rent are the strengths of his business. Apart from these, fluctuation in the cost of raw materials, limited expansion of production and marketing and lack of storage facility are the weakness of his business.

ARYA scheme indicates the crucial role of agricultural scientists to retain the educated youth irrespective of gender in agriculture. Educating the farmers about various new technologies starting from varietal selection to management of nutrients, weed, water and pest & diseases is essential to double the present farm income. Optimistic use of resources or less dependence on external inputs and management of biotic and abiotic stresses with on farm available inputs enhance the net profit of farmers. Further, use of bio-agents and plant based products ensures the eco-friendly farming. Moreover, agricultural scientists not only plan the year round cropping but also the subsidiary enterprises. Integrated farming is the best examples of integration of animal components with crops *viz.*, dairy, poultry, sheep / goat farming, apiary and mushroom cultivation which acts as input or catalyst to enhance crop production. Apart from this, the output of these enterprises will make cash flow in farming throughout the year to bring sustainability in cash flow.

Adoption of Integrated Farming System ensures the employment of family labour throughout the year and reduces the dependency on hired labour. Involvement of food component in the farming meet the dietary and nutritional needs of the farm family. Hard work and clean environment make farmers physically and mentally fit. Practicing organic farming and recycling of on-farm resources in befitting manner will ensure sustained growth and safe environment. There are many enterprises that attracts the youth into farming and the role of scientist and the policy makers is crucial in retaining the strong, healthy and knowledgeable work force - the youth in retaining agriculture.

REFERENCES

- ANONYMOUS, 2016, An analysis of the draft National Youth Policy. www.youth-policy.com.
- JAYANTHI, C., RANGASAMY, A., MYTHILI, S., BALUSAMY, M., CHINNUSAMY, C. AND SANKARAN, N. 2001, Sustainable productivity and profitability to integrated farming systems in low land farms. In: Extended summaries, pp. 79-81. (Eds: A.K. Singh, B. Gangwar, Pankaj and P.S. Pandey), National Symposium on Farming System Research on New Millennium, PDCSR, Modipuram.
- MANAIG ELENA, M., 2016, Vermicomposting efficiency and quality of vermicompost with different bedding materials and worm food sources as substrate, *Res. J. Agril. Forestry Sci.*, **4** (1) : 2320 - 6063.
- SINGH SATPAL, SINGH GOPAL, RAHUL SIDDARTH N., KUMAR ANKIT, PRATAP BHANU, BANKOTI PRIYANKA AND PANDEY RAVI KUMAR, 2017, Effect of different substrates on the growth and yield of oyster mushrooms (*Pleurotus djamor*), *Int. J. Agril. Sci.*, **9** (4) : 0975 - 3710.
- UNDESA. 2011, World Population Prospects - UNDESA. <https://population.un.org>
- VENATA KRISHNA, K., PRASHANTH, Y., YOGESWARUDU, B. AND MAURYA, K. K., 2014, Pollination efficiency of honeybees in sunflower (*Helianthus Annuus L*), *J. Agril. Life Sci.* **1** (2) : 2375 - 4222.

(Received : July, 2019 Accepted : September, 2019)