# Poverty Alleviation through diversifying towards high value crops in Pakistan

Asif Ali Abro, Mahapara Sadaqat

Applied Economics Research Centre, University of Karachi, Karachi

## Abstract

Pakistan is a country of about 163.76 million people. More than 68 percent of Pakistan's population lives in rural areas where the main occupation is agriculture. It is the source of the livelihood of almost 44.7 percent of the total employed labor force in the country. With the present contribution to GDP at 21.8 percent, agriculture sector is the mainstay of the rural economy around which socio-economic privileges and deprivation revolve. Diversification towards high value and labor intensive crops can provide adequate income and employment to the farmers. Crop diversification towards high value crops indicates that greater attention must be devoted to this avenue for rural income growth and offer an opportunity to augment income, generate employment opportunities, empower women farmers, and alleviate poverty. The government of Pakistan should take several initiatives for agricultural development in general and crop diversification in particular. These initiatives are to launch a technology mission for the integrated development of horticulture in Pakistan, infrastructure support for horticultural development with emphasis on post-harvest management, strengthening agricultural marketing, mandatory Crop Loan Insurance and Seed Bank Scheme will lead to crop diversification and increase the production, productivity of crops and increase the income of farmers.

*Keywords*: Crop diversification, High value crops, Poverty alleviation, major crops, minor crops, horticultural development.

#### **1.0 Introduction**

Pakistan is a country of about 163.76 million people. During 2008-09, more than 68 percent of Pakistan's population lives in rural areas where the main occupation is agriculture. Inspite of structural shift toward industrialization, agriculture sector is still the largest sector of the economy with deep impact on socioeconomic setup. It is the source of the livelihood of almost 44.7 percent of the total employed labor force in the country. With the present contribution to GDP at 21.8 percent, agriculture sector is the mainstay of the rural economy around which socio-economic privileges and deprivation revolve. Thus given for its stretched distinct forward and backward linkages particularly with the industrial sector, a large impact on balance of payments and highest share in employment, agriculture sector has assumed an added significance in backdrop global food crunch and food security. No strategy of economic reforms can be realized without sustained and broad based agricultural development which is critical for raising living standards, alleviating poverty assuring food security, generating buoyant market for expansion of industry and services, and making substantial contribution to the national economic growth.

Agriculture has grown at an average rate of 4.1 percent per annum since 2002-03 with variations, from 6.5 percent to 1.1 percent. The fluctuation in agriculture has largely stemmed from a fluctuation in major crops which in turn is the result of the behavior of Mother Nature, pest attacks on crops. The trends in agriculture growth since 2002-03 are given in table -1 and also shown in graph 1

Hence major crops accounting for 33.4 percent of agricultural value added registered stellar growth of 7.3 percent in 2008-09 as against negative 6.4 percent in 2007-08. Minor crops contributing 12.0 percent to overall agriculture declined by negative 1.7 percent in 2008-09 as against 10.9 percent in 2007-08. Major crops, such as wheat, rice, cotton and sugarcane account for 89.1 percent of the value added in the major crops. Thus, the four major crops (wheat, rice, cotton, and sugarcane), on average, contribute 29.8 percent to the value added in overall agriculture and 6.5 percent to GDP. The minor crops account for 12.0 percent of the value added in overall agriculture. Livestock contributes 51.8 percent to agricultural value added- much more the combined contribution of major and minor crops (45.4 %) Source: Economic survey of Pakistan 2008-09.

Agriculture Growth ( Percent)						
Year	Agriculture	Major Crops	Minor Crops			
2002-03	4.1	6.8	1.9			
2003-04	2.4	1.7	3.9			
2004-05	6.5	17.7	1.5			
2005-06	6.3	-3.9	0.4			
2006-07	4.1	7.7	-1.0 10.9			
2007-08	1.1	-6.4				
2008-09	4.0	7.3	-1.7			
2009-10 (P)	2.0	-0.2	-1.2			
Sources: Federal Bureau of Sta	tistics, P= (Provisional)					



Gra	ph	-1
-----	----	----

Six major crops (wheat, rice, sugarcane, maize, gram and cotton) account for 76.37 percent of total cropped acreage while other minor crops account for 23.63 percent of the crop acreage in 2008-09, which shows that there is room for diversification towards high value crops at some extent to increase the income of poor masses. The trends in income per hectare of major and minor crops are given table-2 and a graph 2, which shows that average income per hectare of minor crops are higher than average income per hectare of major crops to minor crops will increase the income of poor farmers and alleviate poverty from the masses.

Comparison of Income per Hectare in Major and Minor Crops								
		*Major Crops			Minor Crops			
Year	Total Cropped Area (000) Hectares	Output in (Rs million)	Hectares in (000)	Average income per hectare	Output in (Rs million)	Hectare in (000)	Average income per hectare	
2003-04	22,940	411,836	16,669	24,706	126,372	3,802	33,238	
2004-05	22,780	497,556	17,112	29,076	154,218	3,310	46,592	
2005-06	23,121	464,276	17,150	27,071	168,461	3,523	47,818	
2006-07	23,390	546,418	17,332	31,527	184,121	3,557	51,763	
2007-08	23,600	673,435	17,519	38,440	212,198	3,600	58,944	
2008-09	23,600	967,324	18,086	53,485	244,881	3,600	68,023	

Economic Survey of Pakistan (2008-09)

\*Wheat, Rice, Maize, Gram, Sugarcane and cotton.

Note: Acreage of fodder crops is excluded.





Diversification of agriculture is advocated as one of the important strategies to stabilize and enhance farm income, increase employment opportunities and conserve natural resources. However, the returns from diversification depend on the availability of such infrastructural facilities as irrigation, electricity, transportation, storage, markets, etc. Agricultural diversification encompasses change in production portfolio from low-value to more remunerative and high-value commodities like fruits, vegetables, milk, meat, eggs and fish that expand farm and non-farm sources of income. It not only involves production processes but also new marketing and agri-business-based industrial activities that expand the income sources of rural households and stimulate the overall rural economy. Changes in the share of different commodities in the value of agriculture are used as a proxy of agricultural diversification. Diversification reflects a change in business activities based on the flexible and differentiated response to changing opportunities created by new production technology or markets signals. More specifically, Pingali and Rosegrant (1995) defined diversification as "change in product (or enterprise) choice and input use decisions based on market forces and the principles of profit maximization".

There are two different aspects of diversification. One is to plan under an assumption of perfect knowledge and the second is to minimize the variance of an outcome by attempting to put a floor under the income level or by preventing the occurrence of undesirable outcomes (Dorsey, 1999). Farmers and farm managers, faced price and yield variability, may wish to select a combination of enterprises that reduce the variability of farm income (Mishra and El- Osta, 2002).

Diversification is a frequently used risk management strategy that involves participating in more than one activity. It has the added advantage of mitigating price risk as well as fluctuations in outputs. The advantages of engaging in different production systems at the farm level depends upon the level of within-farm heterogeneity in soil and land resources, biological and economic factors, the extent of the sustainability effects, and the gains in fuller utilization of resources in the diversified production system. Such diversification may be constrained by the skill requirement to manage diverse entrepreneurs (Jill and Erin, 2005). Crop diversification intends to give a wider choice in the production of variety of crops in a given area so as to expand production related activities on various crops and also to lessen risk (Imbs and Wacziarg, 2003).

## 2.0 Literature Review

Anderson *et al.*, (1982) concluded that in Africa, rural road construction has been found to be associated with increases in agricultural production, especially in non-food export crops, expanded use of agricultural credit, increases in land values, proliferation of small shops and expansion of rural markets .Ali and Flinn (1989) used a stochastic profit frontier of modified translog type for Basmati rice farmers in Pakistan's Punjab. Factors significantly contributing towards profit losses included level of education, off-farm employment, unavailability of credit and various constraints associated with irrigation and fertilizer application. Ali and Chaudhry (1990) compared agricultural production efficiency in four irrigated cropping regions of the Punjab province of Pakistan using probabilistic frontier production function using whole farm survey data for the year 1984-85. They found that the gross income of farmers could be increased by 13 percent at the current levels

of resource use, thus increasing profits by up to- 40 percent. This highlighted the need for strengthening the existing extension service to exploit the potential of the available farm technology. Mahmud *et al.*, (1994) concluded that there is an apparent paradox in that many non-cereal crops (e.g., potatoes, vegetables, onions and cotton) are more profitable (both in economic and financial terms) than modern rice cultivation, which was mainly attributed to high risk as well as incompatibility of the existing irrigation system to produce non-cereals in conjunction with rice. Chand (1995) concluded that there is strong evidence that it is not the farm size, but infrastructure like access to motor able road, market and irrigation which determine the extent, success and profitability of diversification through high paying crops like off-season vegetables. Gannon and Liu (1997) concluded that infrastructure development in poorer regions reduced production and transaction costs. Guvele (2001) concluded that crop diversification reduces variability in income in Sudan.

Smith *et al* (2001) concluded that in poor rural areas infrastructure expanded job opportunities for the less advantaged by reducing the costs to access product and factor markets. Estache (2003) concluded that Infrastructure helped poorer individuals and underdeveloped areas to get connected to core economic activities, thus allowing them to access additional productive opportunities.

Kar *et al* (2004) concluded that crop diversification in upland areas serves as a good measure to mitigate drought as well as increase water use efficiency, while increasing the overall yield of the cropping system in India.

Joshi, P.K (2005) evaluated that Indian agriculture is gradually diversifying in favor of high value food commodities, and the production in particular of fruits, vegetables, milk, meat, poultry, and fish has increased remarkably. His study showed that agriculture diversification towards high value food commodities augmented income, generated employment opportunities, empowered women farmers and conserved natural resources. Promoting agricultural diversification towards high value commodities, doing value addition through their processing and creating appropriate markets for them can be used as effective measures to alleviate rural poverty, generate rural employment and conserve natural resources in the niche areas. Birthal, P.S et al (2007) concluded that agriculture diversification towards high-value crops can potentially increase farm incomes, especially in a country like India where demand for high-value food products has been increasing more quickly than that for staple crops. Van den Berg et al (2007) concluded that diversification into high-value vegetable crops and away from rice will enable Chinese farms to sustain a reasonable income level given present farm-size distributions. Ashfaq, M et al (2008) evaluated that the main factors affecting diversification in Pakistan were size of land holding, age of respondent, education level of respondent, farming experience of respondent, off farm income of respondent, distance of farm from main road and distance of farm from main market and farm machinery. Rahman, Sanzidar (2008) concluded that crop diversification should be a desired strategy for agricultural growth in Bangladesh. Development of the rural infrastructure is also essential as this will not only improve technical efficiency but may also synergistically promote diversification by opening up opportunities for technology diffusion, marketing, storage and resource supplies.

## 3.0 PATTERNS OF CROP DIVERSIFICATION

## 3.1 Crop Diversification in the Pakistan Perspective

With the advent of modern agricultural technology, especially during the period of the Green Revolution in the late sixties and early seventies, there is a continuous surge for diversified agriculture in terms of crops, primarily on economic considerations. Historically Diversification has been slowed during last two decades in Pakistan, the share of different crops to total cropped area in 1990 and

2000 are summarized in table -2.

The crop pattern changes, however, will be outcome of the interactive effect of many factors which can be broadly categorized into the following five groups:

a) Resource related factors covering irrigation, rainfall and soil fertility.

b) Technology related factors covering not only seed, fertilizer, and water technologies but also those related to marketing, storage and processing.

c) Household related factors covering food and fodder self-sufficiency requirement as well as investment capacity.

d) Price related factors covering output and input prices as well as trade policies and other economic policies that affect these prices either directly or indirectly.

e) Institutional and infrastructure related factors covering farm size and tenancy arrangements, research, extension and marketing systems and government regulatory policies.

Share of Different crops in Total Cropped Area 1990 and 2000 (Agriculture Census Data)								
	All farms		< 0.5 ha		2 to under 5 ha		20 ha and above	
	1990	2000	1990	2000	19 <b>9</b> 0	2000	1990	2000
Total cropped area (000 ha)	21,340	23,422	297	212	6,981	7,659	3,455	3,103
Grains	58	59	69	73	61	61	53	50
Wheat	38	40	41	43	39	41	35	36
Cotton	13	14	7	6	12	13	15	14
Wheat Cotton	51	54	48	49	51	54	50	50
Pulses	5	5	1	1	3	4	8	11
Sugarcane	3	4	1	1	4	4	3	4
Oilseed	2	2	0	1	2	2	3	2
Fodder	13	11	14	14	14	12	9	7
Vegetables	2	2	3	2	2	2	3	4
Orchards	2	2	2	1	1	1	4	4
Other crops	1	1	1	1	1	1	1	1
Source: Agriculture Census (1	990 and 200	)0)						

#### Table-2

Note: Agriculture Census not conducted in 2010.

Obviously, these factors are not watertight but inter-related. For instance, the adoption of crop technologies is influenced not only by resource related factors but also by institutional and infrastructure factors. Similarly, government policies - both supportive and regulatory in nature - affect both the input and output prices. Likewise, special government programmes also affect area allocation and crop composition. More importantly, both the economic liberalization policies as well as the globalization process are also exerting strong pressures on the area allocation decision of farmers, essentially through their impact on the relative prices of inputs and outputs. Although the factors that influence the area allocation decision of farmers are all important, they obviously differ in terms of the relative importance both across farm groups and resource regions. While factors such as food and fodder self-sufficiency, farm size, and investment constraints are important in influencing the area allocation pattern among smaller farms, larger farmers with an ability to circumvent resources constraints usually go more by economic considerations based on relative crop prices than by other non-economic considerations. Similarly, economic factors play a relatively stronger role in influencing the crop pattern in areas with a better irrigation and infrastructure potential. In such areas, commercialization and market networks co-evolve to make the farmers more dynamic and highly responsive to economic impulses.

What is most notable is the change in the relative importance of these factors over time. From a much generalized perspective, Pakistan's agriculture is increasingly getting influenced more and more by economic factors. This need not be surprising because irrigation expansion, infrastructure development, penetration of rural markets, development and spread of short duration and drought resistant crop technologies have all contributed to minimizing the role of non-economic factors in crop choice of even small farmers. What is more, the reform initiatives undertaken in the context of the ongoing agricultural liberalization and globalization policies are also going to further strengthen the role of price related economic incentives in determining crop composition both at the micro and macro levels. Obviously, such a changing economic environment will also ensure that government price and trade policies will become still more powerful instruments for directing area allocation decisions of farmers, aligning thereby the crop pattern changes in line with the changing demand-supply conditions. In a condition where agricultural growth results more from productivity improvement than from area expansion, the increasing role that price related economic incentives play in crop choice can also pave the way for the next stage of agricultural evolution where growth originates more and more from value-added production.

#### 4.0 CHALLENGES, OPPORTUNITIES AND PROSPECTS OF CROP DIVERSIFICATION **4.1 Constraints in Crop Diversification**

Crop diversification in the country is taking the form of increased areas under commercial crops including vegetables and fruits since independence. However, this has gained momentum in the last decade favoring increased area under vegetables and fruits and also to some extent on commercial crops like sugar cane, cotton and oilseeds crops. The major problems and constraints in crop diversification are primarily due to the following reasons with varied degrees of influence:

- Sub-optimal and over-use of resources like land and water resources, causing a negative impact on the environment and sustainability of agriculture.
- Inadequate supply of seeds and plants of improved cultivars.
- Fragmentation of land holding less favoring modernization and mechanization of agriculture.
- Poor basic infrastructure like rural roads, power, transport, communications etc.
- Inadequate post-harvest technologies and inadequate infrastructure for post-harvest handling of perishable horticultural produce.
- Very weak agro-based industry.
- Weak research extension farmer linkages.
- Inadequately trained human resources together with persistent and large scale illiteracy amongst farmers.
- Host of diseases and pests affecting most crop plants.
- Poor database for horticultural crops.
- Decreased investments in the agricultural sector over the years.

# 4.2 Globalization and Crop Diversification

With the advent of WTO and Pakistan being a member and signatory to GATT, the scenario of the agricultural sector will not be the same as that of past. With the liberalization of trade and providing the market access of agricultural produce between the different countries, the country will be required to promote much more diversified agriculture. For crops on which we have substantial area and production, specially food grains, the import market has to be insulated through increased productivity which gives us a kind of comparative advantage and also a level playing field so that large scale importation is contained and farmers interests are protected. Crop diversification in the areas of certain tropical fruits and also a few vegetables also need support for both production and post-harvest handling in terms of their export opportunity. Accelerated growth in fruits and vegetables production is also required for improved nutrition of the country's population. In future, with improved living standards along with increased purchasing power, more and more people will look for nutritional and quality foods which will also call for greater crop diversification. There are some production areas such as food crops, plantation crops, poultry, dairy, sugar, cotton and oilseeds in which Pakistan has made its mark. There are some in which its emerging strength is already evident sericulture, marine and inland fisheries for example. No country grows such a wide range of fruits, vegetables, and flowers and in such abundance as Pakistan and yet it has no record worth mentioning in horticultural exports. The rich variety when processed and marketed can help Pakistan take care of the health needs of its population besides being major export commodities.

## 4.3 Emerging Technology and Crop Diversification

It is being increasingly realized that agriculture in Pakistan is no longer a subsistence activity carried out by peasant cultivators, but rather an enterprise and manufacturer of biomass using land, water, genetic material and the latest in technology. The agriculture of the twenty first century will increasingly be farmers' entrepreneurship harnessing technologies to optimize returns from his land and investments he makes on it. Biotechnology and genetic engineering in crops with focus on primary productivity and also on many quality traits will go a long way to improving the yield and quality of many important crop plants. With the advent of such emerging technologies and consequent scope for increased economic returns, the diversification in favor of such crops (fruits, vegetables, oilseeds, and pulses) at some extent will be the future focus. Many other related technologies and their adoption will also inject an added dimension in crop diversification. Decision support systems, governmental policies, geographic information system, application of information technology leading to market information etc, will also lead to crop diversification primarily on economic considerations and augment the income of poor farmers.

## 4.5 Research and Developmental Support for Crop Diversification

Future agriculture in Pakistan will be much more knowledge and skill based rather than the traditional subsistence agriculture. In the wake of globalization and opening up of the global market, there will be much more opportunity for entrepreneurship development in agriculture. This also calls for paradigm shifts in research and technology development and also the transfer of technology for successful crop diversification. The research system not only needs to address the issues connected with continuance and indulgence and knowledge in the areas of emerging technologies but also create a cadre of scientists through the continuous

upgrade of skills and human resource development. The researchers also need to popularize the technologies, impart knowledge and skills to the extension functionaries for the transfer of technologies to the farmers. This knowledge-based farming will call for much more interaction between the researchers, extension workers and farmers. The fruits of the innovative technologies should reach the farmers at the earliest and also spread in the quickest possible time.

# 5.0 GOVERNMENT POLICIES AND STRATEGIES FOR CROP DIVERSIFICATION

Considering the importance of crop diversification in the overall developmental strategy in Pakistan's agriculture, the government of Pakistan should take several initiatives for agricultural development in general and crop diversification in particular. These initiatives are as follows:

- To Launch a Technology Mission for the Integrated Development of Horticulture in Pakistan: The programme will establish effective linkages between research, production, extension, postharvest management, processing, marketing and exports and bring about a rapid development of agriculture in the region.
- Infrastructure Support for Horticultural Development with emphasis on Post-harvest Management.
- Strengthening Agricultural Marketing: Greater attention to be paid for development of a comprehensive, efficient and responsive marketing system for domestic marketing as well as exports by ensuring proper quality control and standardization.
- Mandatory Crop Loan Insurance Scheme: Agriculture development is declared a priority area by the government for economic growth, food security and poverty alleviation. The farming sector is prone to natural hazards, so majority of the farmers have to bear losses in cases of natural calamities. Non-availability of crop insurance is also one of the major impediments in bank's extension of credit to farming community. The introduction of crop insurance was a long outstanding issue, as many schemes were developed in the past by the Government and insurance sector, however, none of them could be materialized. Therefore, to safeguard the interest of majority of farmers in such situations, the government of Pakistan introduced Crop Insurance Scheme. Crop Loan Insurance Scheme for five major crops viz. wheat, rice, cotton, sugarcane and maize from Rabi Crop 2008-09. The government would bear the cost of premium on account of subsistence farmers up to maximum 2% per crop. It is dire need of time that crop loan insurance might be extended for the minor crops which are high value commodities in nature and have risk factor that will help to alleviate poverty in Pakistan.
- The Federal Seed Certification and Registration Department (FSC&RD) is engaged in providing seed certification coverage to public and private sector seed companies of Pakistan along with seed quality control services through its 31 seed testing laboratories and monitoring of seed quality in the market as well.
- Seed Bank Scheme: About 7-8 percent of certified seeds produced in the country will be kept in buffer stock to meet any eventualities arising out of drought, floods or any other form of natural calamities.

All these measures will lead to crop diversification and increase the production and productivity of crops.

## **6.0 CONCLUSION**

Crop diversification towards high value crops indicates that greater attention must be devoted to this avenue for rural income growth and offer an opportunity to augment income, generate employment opportunities, empower women farmers, alleviate poverty. The higher price for fruits and vegetables is largely caused by rising demand and higher quality of products including horticultural exports. Policy reforms and infrastructure improvements can contribute to higher farm-gate prices and, hence, rural income growth. The sustainable and equitable agricultural growth in Pakistan will arise through agricultural diversification towards more remunerative commodities and technological breakthroughs. It is pertinent to target these growth sources to achieve sustainable and equitable growth in the economy of Pakistan. The government of Pakistan should take several initiatives for agricultural development in general and crop diversification in particular. These initiatives are to launch a technology mission for the integrated development of horticulture in Pakistan, infrastructure support for horticultural development with emphasis on post-harvest management, strengthening agricultural marketing, mandatory Crop Loan Insurance and Seed Bank Scheme will lead to crop diversification and increase the production, productivity of crops and increase the income of farmers.

#### **7.0 REFERENCES**

- Ali, M. and J.C. Flinn (1989). Profit efficiency in basmati rice production. American Journal of Agricultural Economics, 71:303-310.
- Ali, M. and M.A. Chaudhry, (1990). Inter-regional farm efficiency in Pakistan's Punjab: A frontier production function study. Journal of Agricultural Economics, 41: 62-74.
- Anderson, G. W., C. G. Vandervoort, C. M. Suggs, and C. Clapp-Wincek. 1982. Rural roads evaluation summary report. AID Program Evaluation Report 5. USAID, Washington, DC.
- Ashfaq, M. Hassan , S. Naseer, M. Baig, Irfan and Asma, J.(2008). Factors affecting farm diversification in Rice- Wheat. Pak.J.Agri.Sci., Vol. 45(3),2008.
- Birthal, P.S., P.K. Joshi. Roy, Devesh and Thorat, Amit. (2007). Diversification in Indian Agriculture towards high value crops: The Role of small holders. IFPRI Discussion Paper 00727, November, 2007.
- Chand. R. (1995). Agricultural Diversification And Small Farm Development In Western Himalayan Region, National Workshop on Small Farm Diversification: Problems and Prospects", NCAP, New Delhi.
- Dorsey, B. (1999). Agriculture intensification, diversification and commercial production among smallholder coffee growers in Central Kenya. Economic Geography 75(2):178-195.
- Estache, A., (2003). On Latin America's Infrastructure Privatization and its Distributional Effects, Washington, DC: The World Bank, Mimeo.
- Gannon, C., Liu, Z. (1997). "Poverty and Transport". Washington, DC: The World Bank.
- Government of Pakistan (2009). Economic Survey of Pakistan 2008-09. Economic Advisor Wing, Finance Division, Islamabad, Pakistan.
- Guvele, C.A. (2001). Gains from crop diversification in the Sudan Gezira scheme. Agricultural Systems, 70: 319-333.
- Imbs, J. and Wacziarg. 2003. Stages of diversification. The American Economic Review 93(1):63-86
- Jill, L.C. and O.S.Erin. (2005). Land use and income diversification: Comparing traditional and colonist population in the Brazilian Amazon. Agricultural Economics, 32(3):221-237.
- Joshi, P.K (2005). Crop diversification in India: Nature, Pattern and drivers. Interenational Food Policy Research Institute, IFPRA- South Asia, New Delhi.
- Kar, G., Singh, R., Verma, H.N. 2004. Alternative cropping strategies for assured and efficient crop production in upland rainfed rice areas of Eastern India based on rainfall analysis. Agricultural Water Management, 67: 47-62.
- Mahmud, W., Rahman, S.H., Zohir, S., (1994). Agricultural growth through crop diversification in Bangladesh. Food Policy in Bangladesh Working Paper No. 7. International Food Policy Research Institute (IFPRI), Washington, D.C.
- Mishra, A. and H. El-Osta. (2002). Risk management through enterprise diversification: A farm level analysis. Paper presented at AAEA meetings in Long Beach, CA, USA. July 28-31.
- Pingali, P.L. and M.W. Rosegrant (1995). Agricultural commercialization and diversification: processes and policies. Food Policy 20(3): 171-186.
- Rahman, Sanzidar. (2008).Whether crop diversification is a desired strategy for agricultural growth in Bangladesh. Agricultural Economics Society 82nd Annual Conference Royal Agricultural College, Cirencester, 31st March to 2nd April; 2008.
- Smith, D., Gordon, A., Meadows, K., Zwick, K., 2001. Livelihood Diversification in Uganda: Patterns and Determinants of Change across Two Rural Districts. Food Policy 26, 421-435.
- Van den Berg, M.M., Hengsdijk, H., Wolf, J., Ittersum, M.K.V., Guanghuo, W., Roetter, R.P. 2007. The impact of increasing farm size and mechanization on rural income and rice production in Zhejiang province, China. Agricultural Systems, 94: 841-850.