Indigenous Knowledge in Agriculture with Particular Reference to Saffron Production in Iran

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Abstract

The terms indigenous knowledge, traditional knowledge and ethnoscience have been used interchangeably to describe the knowledge system of an ethnic rural group that has originated locally and naturally. Indigenous knowledge is an essential cultural and technological element of human societies. It is unique to a particular culture and acts as the basis for local decision making in agriculture, health, natural resource management and other activities. It is embedded in community practices, institutions, relationships and rituals. Indigenous people view the world they live in as an integrated whole. Their beliefs, knowledge, arts and other forms of cultural expression have been handed down through the generations. Food production in these societies is focused more on long term sustainability rather than on short term yield increase and hence, enhanced biodiversity. This helps to reduce ecological and economic risks, promotes diet diversity and allows proper temporal and spatial distribution and utilization of resources. An attempt was made to review the indigenous knowledge associated with agriculture with an emphasis on saffron production in South Khorasan. First, technological, socio-economic and cultural aspects were considered in a context of a production system and then a case study was preformed in some areas with a long history in saffron production. Based on the analysis of the data obtained and comparison made with the conventional scientific findings, production practices were identified and recognized.

INTRODUCTION

Background

Recent years have seen the emergence of environmental considerations as a crucial factor in agricultural technology design, development and performance. In the context of sustainable agriculture, indigenous knowledge which deals with the farmers adaptive strategies to the natural, physical and socio-economic environments of an agroecosystem, has gained prominence (Bonny and Vijayaragavan, 2001). It is estimated that there are 190 million indigenous people in Asia; some 70 million live in India and 30 million in South-East Asia (Bengwayan, 2003).

Indigenous people view the world they live in as an integrated whole. Their beliefs, knowledge, arts and other forms of cultural expression have been handed down through the generations. Their many stories, songs, dances, paintings and other forms of expressions are therefore important aspects of indigenous cultural knowledge, power and identity.

This type of knowledge is unique to a particular culture and society. It is the basis for local decision making in agriculture, health, natural resource management and other activities. It is embedded in community practices, institutions, relationships and rituals and is essentially a tacit knowledge that is not easily codifyable. Indigenous knowledge provides the basis for problem-solving strategies for local communities, especially the poor and is an underutilized resource in the development process (World Bank, 1998). These practices are virtually always more "low-tech", using relatively plentiful and cheap labor more intensively than relatively scarce and expensive capital and are based on low input and inexpensive approaches (Ouedraogo and Bertelsen, 1997). Indigenous knowledge is adapted to the natural, social and cultural environments and also to the immediate needs of the local communities, hence, their strong ecological and participatory nature.

Today there is recognition for the crucial role that indigenous knowledge plays in decision-making, the manner in which indigenous organizations facilitate the identification and prioritization of community problems, and the importance of searching for solutions which results in local-level experimentation and innovations (Warren, Slikkerveer and Titilola, 1989; de Kruijf and Voliebenstien, 1995).

Traditional Agriculture and Indigenous Knowledge

About 60 percent of the world's cultivated land is still farmed by traditional and subsistence methods and this type of agriculture has benefited from centuries of cultural and biological evolution that has adapted it to local condition (Altieri, 1995).

Basically production in traditional agriculture is based on sustainability in long terms rather than maximizing the yield in short terms (Gliessman, 1998). Maintaining sustainability of production on marginal and low input lands, and increasing the biodiversity in order to reduce the economic risk and facilitate a better distribution of labor temporarily and spatially, are the foundations of traditional agriculture. Most of traditional agroecosystems have evolved in the center of diversity of agricultural crops and therefore they are rich not only in terms of local races and genotypes but also in farming practices, cultures of food production and food consumption habits and other social, technical and cultural identities.

Traditional farming systems commonly support a high degree of plant diversity in the form of polyculture or agroforestry patterns (Gliessman, 1998). The strategy of minimizing risks by planting several species of plants and varieties of crop stabilizes yields over the long term, promotes diet diversity and maximizes returns even under low levels of technology and limited resources. Most peasant systems are productive despite their low use of chemical inputs and generally agriculture labor has a high return per unit of input. Also in these systems, favorable rates of return between inputs and output in energy terms are realized (Altieri, 2002; Koocheki, 1996c).

These systems are not dependent on gender and the role of women in most cases is more pronounced. Activity of women in farming practices such as vegetable production saffron harvesting and processing and animal husbandry has been reported to be more than men in Iran (Mahsaii Zadeh, 1995).

Traditional System of Saffron Production in Iran

Agriculture has a long history in Iran and it has been evidenced (Flanner, 1962) that farming first evolved simultaneously with domestication of goat and sheep in western part of Iran about 10,000 years ago. Farmers managed their traditional agroecosystems for centuries based on sustainability of yield with reliance on locally available resources. Their faming systems had certain principles and processes in common (Koocheki, 1994 a,b):

- Holistic view on utilization of natural resources
- Optimal use of local resources with low external inputs
- Genetic and physical diversity
- Soil production and conservation
- Participatory, mutual cooperation and collaboration

Saffron production as a "system" was also evolved on the same criteria. This plant has a long history in Iranian agriculture and it has evolved a unique technical and socio-cultural entity in saffron growing communities and particularly in Southern Khorasan which is the main saffron growing area of the country. Therefore, saffron production system (Figure 1) in Iran can be viewed from the following prospects.

1. Technology. Water scarcity in arid area of Southern Khorasan is the main constraints for crop production. To overcome this problem farmers have developed a unique method of underground water extraction called "Qanat" in local language. This traditional method of groundwater extraction brings water to the surface by gravity and is one of the oldest techniques of water extraction with 3,000 years of history and undoubtedly is the most extraordinary work of ancient man for collecting underground water. This traditional system of water provision was adjusted to the harsh and hostile environmental conditions (Koocheki, 1996b).

Although saffron is a low water demanding plant and its production cycle and vegetative growth coincides with Autumn and Winter, primary irrigations and particularly the first one is very crucial to timeliness of flower emergence and, therefore, availability of water at the beginning of growing season is very important. Qanat was and still, to some extent, is the main source of water for saffron crops in Khorasan. Most of saffron growing farmers are small holders and used to share water from the same Qanat range. Therefore, water share and allocation was based on a very precise calculation and measurement. This type of measurement was based on "bowls", "cups", and "drops", which indicate scarcity of water in the area.

Proximity of saffron to the Qanat outlet which located near the villages was important for two main reasons, first easy access for harvesting and transferring flowers early in the morning and second, facilitation of the primary irrigations. Since facilitation of irrigation for orchards and gardens was for the same reason a priority too, combination of saffron and orchards in an integrative way gave a pleasant view to the villages and surrounding landscape. Therefore, Qanat and the culture that grew up around were integrated with the cultural integrity of saffron and this provided a rhythm to life in the villages (Honari, 1979: Koocheki, 1996b).

Nutrient requirements of saffron were provided by animal manure. This is still a normal practice, despite an easy access to chemical fertilizers. In the old days when saffron production was still produced in the central parts of Iran, part of manure needed was provided by construction of pigeon towers. In each tower thousands of pigeonholes were arranged in such a way that feces could be dropped in the middle of the floor for collection. The earliest of these structures is estimated to have been built more than thousand years ago (Farhadi, 1993; Koocheki, 1995a).

Based on the nature of saffron crop which still receive most of its nutrients from animal manure, not much pests to combat with chemicals, complete labor work for production and processing and the socio-cultural environment surrounding the whole process, production of saffron could be regarded as "organic" although not the certified one based on the present day certification standards (Koocheki, 1995b).

2. Socio-Economic and Cultural. Labor requirements for production practices and processing were provided by the families, hired persons or in some cases sharecropping. The latter feature of traditional agriculture was based on strong socio-economic incentives. A complicated arrangement of division of activities into elements of land, water, seed, labor and draught animals was a rational way of providing incentives for farmers and involved almost the whole community in production and processing practices. Community members often used land in common and gave each other support by sharing or exchanging of labors, animals, fields or farm products. However, this system has been neglected (Koocheki, 1996a).

Culturally, saffron has been a constant ingredient of many Iranian cuisines and inclusion of saffron in foods has been regarded prestigious. During the feasts, festivals and holly ceremonies, dishes were decorated and flavored by saffron. This valuable spice was offered as precious gifts and sometimes was included in dowry of newly married couples. Saffron was also associated with arts such as paintings, miniatures and textiles. Saffron color has been used in verdigris as an inhibitor in Persian miniature paintings and also for preservation of old manuscripts (Barkeshli and Ataie, 2002).

MATERIALS AND METHODS

To study indigenous knowledge associated with saffron production and utilization in the southern part of Khorasan province, a preliminary investigation was conducted on 25 farms in five major growing areas with a long history of saffron production. At present 92% of saffron in the country is produced in Khorasan and this commodity is the basic cash crop of the area and 85,000 households are engaged with saffron production for their livelihood (Kafi et al., 2003). For this purpose interview and discussion were performed with elderly local informants and a questionnaire, which contained questions concerning different aspects of production and utilization, was developed and used.

Based on the outputs, coefficient of variation for different practices and type of uses was calculated. Fidelity Level (FL), or the percentage of informants claiming use of saffron for the same major purposes was also calculated. Since some uses which received high FL values might have been know to only a fraction of the informants, an appropriate correction factor, the Relative Popularity Level (RPL), was introduced. This correction factor was calculated on the basis of the relation existed between FL of one particular type of use with that with the highest FL. The corrected Fidelity Level, or Rank Order Priority (ROP) for a given type of use was then calculated by: ROP = FL* RPL.

Therefore, ROP value was used to classify different type of uses (Fiedman et al., 1986).

RESULTS AND DISCUSSION

In Table 1 Coefficient of Variation for different farming practices and uses is shown. Results showed that type of uses was diverse amongst the areas, which indicates that there is a high variability between different areas in terms of use. Coefficient of Variation for the whole area was also high for type of uses (38%) compared with those for manure application (19%) or irrigation (21%). As expected, there are not many irrigation practices or manure application techniques but type of uses could be very different in different areas. Farming practices are also very diverse amongst the areas. This could be associated with sustainability and there are evidences in the literature (Alcorn 1993; Alteieri, 1999), which indicate the importance of diversity in sustainability of production.

Methods of planting was not much variable amongst the areas. Farmers normally plant saffron either in hills or in the rows and tendency towards row planting is increasing. However, the number of corms used in each hill varies from 5 to 15 corms. This has also been reported elsewhere, though 4-5 corms for mechanical planting is practiced (Mollafilabi, 2003). For selection of corm size, 68% of farmers use large corms and this has been believed to promote stand establishment in the first year. However, medium size corms were preferred by 17.8% of farmers. Sadeghi (1996) reported that corms with more than 5 grams could produce flowers in the first year and corms with less than 4 grams are not recommended. Corms are normally between 1-20 grams. Method of irrigation was mainly flood irrigation and 98% of farmers consider the first irrigation after summer dormancy as the most crucial one for timeliness of flower emergence. There were normally different views on intervals of irrigation afterwards and this practice varied between 10 to 30 days. However, Alizadeh (2003) reported that a 15-day interval gave a better result than longer periods of 30 or 60 days. He concluded that water requirement for saffron is 300 mm or 3000 m^3 annually. This amount of water, part of which is provided by winter rainfalls, gave the highest economic return for saffron compared with other crops.

Application of manure was the dominant practice for provision of nutrients to the plant and 90% of farmers emphasized the importance of animal manure for saffron. However, 43% of the respondents used chemical fertilizers. There are reports in the literature which indicate the application of cow manure to be very variable from 20 to 80 tons per hectare depending on the nature of soil, cost and availability of manure (Mollafilabi. 2003). Results of application of chemical fertilizers have also been reported to be promising (Sadeghi, 1980).

Plant protection was not diverse because in general there are not serious pests and diseases, except rodents and weeds. Rashed (1980) reported 20 dominant weeds species for saffron in South Khorasan. Weeds are normally controlled by hand weeding or other farming practices but recently different types of herbicide are available.

Harvesting of flowers was performed by hand and there is still not any other alternative. Almost all farmers preferred picking flowers before sunrise. Normally flowering period is between 10 to 20 days depending on the area. Separation of flower parts is also carried by hands and depending on the quality of the product desired, this practice varies. Some separate stigma directly, others prefer to keep the whole part together. For storage, tight wooden or glass jar is preferred.

In Table 2 type of uses are presented. As it is shown, most of the respondents use saffron as a hot medicine and the order of use in descending manner are: hot medicine, food color and spice, additive in tea, medicine for bone remedy and additive in bread. Other parts of this plant are also used for different purposes. More than 75% of farmers use saffron leaves in the form of hay as animal feed and only in 14% direct grazing was preferred. Although plant residue of saffron is not a complete feed for animals, its feeding value has been reported to be satisfactory (Valizadeh, 1988). Other parts of flower including stamens and petals are also used for dye and a type of Jam is made from the petals but these are not of significant importance.

To conclude, traditional knowledge of farmers are important in saffron production and processing and there are diverse type of practices, which could be recognized, documented and if necessary modified to new technologies. However, the importance of saffron production in the area in terms of economic, social and cultural values should not be neglected and must be protected. Since saffron is a family based crop and the involvement of local communities in production and processing is significant, care should be taken not to substitute this important social issue with those of modern technology driven norms and values.

However, it must also be born in mind that traditional knowledge like any other phenomenon is in a constant state of change and as each generation matures, skills perceived as immediately useful are gained while others with lesser perception of immediate value may be lost. Thus the body of traditional knowledge is never static but rather dynamic in its shape and substance (Balick, 2003). Now indigenous knowledge is in danger of disappearing not only under influence of global processes of rapid change, but also because the capacity and facilities needed to document, evaluate, validate, protect and disseminate such knowledge are lacking in the developing countries. Finally, after all as it has been pointed out by David Dickson (Dickson, 2003) "Let's not get too romantic about traditional knowledge". Western-based formal knowledge remains just one knowledge system among many. In many countries, it exists alongside non-formal indigenous (local, traditional or ecological) knowledge systems. More research needs to be done on indigenous knowledge system and methods need to be developed for dealing with it. Finally, although indigenous knowledge has originated quite independently of (and not in competition with) science, and generally also quite independent of western culture, these two should be seen as two systems of knowledge that can supplement, rather than compete, with each other.

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Tables

Table 1. Coefficient of variation for type of uses and farming practices (%)

Practices and uses	Torbat- Hydariah	Ghaen	Sadah	Kazar	Birjand	Whole area
Type of use	41	68	31	18	22	38
Corm selection	35	37	32	19	20	31
Methods of planting	12	16	17	21	33	34
Irrigation	15	52	41	14	18	21
Manure or fertilizer application	21	24	29	38	22	19
Plant protection	32	38	30	27	28	38
Flower harvest	42	44	27	11	30	23
Use of plant parts	38	31	27	24	35	27

Table 2. Type of uses

	Fidelity	RPL	ROP
Food color and spice	57	88.8	50.7(2)
Hot medicine	64	100.0	64.2(1)
Medicine for bone remedy	36	38.9	9.7(4)
Additive in tea	32	50	16(3)
Additive in bread	14	22	3(5)

<u>Figures</u>

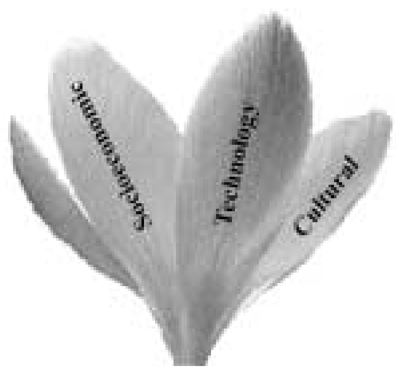

Fig. 1. Saffron Production System