Original Research Article

An Adoption of Selected Ecological Agricultural Practices by the Farmers

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A B S T R A C T

The main purpose of the study was to determine the adoption of selected ecological agricultural practices by the farmers and the factors influencing the adoption in district Kanpur Dehat. Two blocks were selected randomly from the district and three villages were selected on random basis from each block, thus a total of six villages were selected from two blocks, 20 respondents were randomly selected from each village thus a total of 120 respondents in total were interviewed on a structural schedule. The majority (70 per cent) of the farmers were middle-aged, higher proportion (74 per cent) of the farmers had cropping intensity above national average, the majority (65 per cent) of the farmers of the study area had low GO contact, highest proportion (53 per cent) of the farmer has medium favorable attitude towards ecological agriculture. Majority (86 per cent) of the farmers had very low to low composite adoption of selected ecological agricultural practices, ecological nutrient management practices (84 per cent) and ecological pest management practices (79 per cent), while none had high adoption of composite ecological agricultural practices, ecological nutrient management practices and ecological pest management practices. Among ecological nutrient management practices, adoption of cow dung ranked first followed by farm yard manure, Compost, Crop residue/weed fertilizer, Green manure and others. Among ecological pest management practices, adoption of proper weeding and eradication of insect/disease attacked plants/plant parts ranked first followed by Crop rotation, Use of quality seed, Pest resistant varieties and others. An overwhelming majority (83 per cent) of the respondent farmers had low to medium training exposure; these facts implied that extension educational programs including training need to be arranged by the concerned agencies for the farmers in order to achieve desired benefit in respect of ecological nutrient management practices.

Keywords
Ecological nutrient management, Ecological pest management.

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Introduction

Until about four decades ago, crop yield in agricultural systems dependent on internal resources, recycling of organic matter, built-in biological control mechanisms and rainfall patterns. Agricultural yield were modest, but stable. Production was safeguarded by growing more than one crop or variety in space and time in a field as insurance against pest outbreaks or severe weather.

Inputs of nitrogen were gained by rotating major field crops with legumes. In turn rotations suppressed insects, weeds and diseases by effectively breaking the life cycles of these pests. But as agricultural modernization progressed, the ecology-farming linkage was often broken as ecological principles were ignored and/or overridden. A growing number of people have
become concerned about the long-term sustainability of existing food production systems. Today lack of rotations and diversification take away key self-regulating mechanisms, turning monocultures into highly vulnerable agro ecosystems dependent on high chemical inputs. However excessive reliance on monoculture farming and agro industrial inputs, such as capital-intensive technology, pesticides, and chemical fertilizers, has negatively impacted the environment and rural society. Nowadays "ecological diseases" have been grouped into two categories: diseases of the ecotype, which include erosion, loss of soil fertility, depletion of nutrient reserves, Salinization and alkalization, pollution of water systems, loss of fertile croplands to urban development, and diseases of the biocoenosis, which include loss of crop, wild plant, and animal genetic resources, elimination of natural enemies, pest resurgence and genetic resistance to pesticides, chemical contamination, and destruction of natural control mechanisms.

Under conditions of intensive management, treatment of such "diseases" requires an increase in the external costs to the extent that, in some agricultural systems, the amount of energy invested to produce a desired yield surpasses the energy harvested. Modern agricultural practices negatively affect pest natural enemies, which in turn do not find the necessary environmental resources and opportunities in monocultures to effectively and biologically suppress pests. Fertilizers, on the other hand, have been praised as being highly associated with the temporary increase in food production observed in many countries. National average rates of nitrate applied to most arable lands fluctuate between 120-550 kg N/ha. But the bountiful harvests created at least in part through the use of chemical fertilizers, have associated, and often hidden, costs. A primary reason why chemical fertilizers pollute the environment is due to wasteful application and the fact that crops use them inefficiently. The fertilizer that is not recovered by the crop ends up in the environment, mostly in surface water or in ground water. High nitrate levels are hazardous to human health and studies have linked nitrate uptake to methaemoglobinemia in children and to gastric, bladder and oesophageal cancers in adults. Chemical fertilizers can also become air pollutants, and have recently been implicated in the destruction of the ozone layer and in global warming. Their excessive use has also been linked to the acidification/salinization of soils and to a higher incidence of insect pests and diseases through mediation of negative nutritional changes in crop plants. It is clear then that the first wave of environmental problems is deeply rooted in the prevalent socioeconomic system which promotes monocultures and the use of high input technologies and agricultural practices that lead to natural resource degradation. Second wave of environmental problems indicates that as long as transgenic crops follow closely the pesticide paradigm, biotechnological products will do nothing but reinforce the pesticide treadmill in agro ecosystems, thus legitimizing the concerns that many scientists have expressed regarding the possible environmental risks of genetically engineered organisms.

Materials and Methods

The present study was conducted in Kanpur District of Uttar Pradesh. District Kanpur Dehat was purposively selected because this district is directly benefited by Chandra Shekhar Azad University Agriculture and Technology, Kanpur (UP). Another reason for selecting Kanpur as locale of the study was the background, as there were hardly a few studies of this kind conducted in Uttar Pradesh which could work as guidance for workers, planners and administrators of planning and implementation of Information Technologies in respect to farm technologies.
and their activities. Second stage of sampling technique includes selection of development blocks of district Kanpur dehat. Among 10 development blocks of district Kanpur dehat two blocks namely- Bhognippur and Rajpur selected randomly for the study purpose. Three villages were selected on random basis from each block, thus a total of six villages will be selected from two blocks including Dohrapur, Madanpur, Sahjanpur, Kandhi, Auredi and Jainpur. 20 respondents were randomly selected from each village thus a total of 120 respondents selected for the study area.

**Results and Discussion**

**Ecological nutrient management (Nutrient Management without Chemical fertilizers)**

It is evident from the Table 1 that a great majority (84 per cent) of the farmers belonged to very low to low adoption category of ecological nutrient management practices. Nobody belonged to high adoption category of ecological nutrient management practices. These facts implied that extension educational programs including training need to be arranged by the concerned agencies for the farmers in order to achieve desired benefit in respect of ecological nutrient management practices.

**Extent of adoption of ecological pest management practices**

Findings indicated that adoption of ecological pest management practices scores of the farmers ranged from 69.5 to 439 against the possible range of 0 to 1000. The mean, standard deviation and co-efficient of variation were 271.60, 68.83 and 25.34% respectively. The farmers were classified into three categories on the basis of their adoption of ecological pest management practices as shown in Table 2. Majority (74 per cent) of the farmers belonged to low adoption category as compared to 5 and 21 per cent belonged to very low and medium adoption category of ecological pest management practices, respectively. Thus, a great majority (79 per cent) of the farmers belonged to very low to low adoption category of ecological pest management practices. Nobody belonged to high adoption category of ecological pest management practices. These facts implied that training and non-formal educational programs need to be organized by the concerned agencies for the farmers in order to achieve desired benefit in respect of ecological pest management practices.

**Comparative extent of adoption of selected ecological agricultural practices**

Attempt has been made in this selection of compare the extent of adoption of different ecological agricultural practices with the help of Adoption Index (AI). Adoption index for
each for the practices was determined by using the following formula.

\[ AI = A_n \times 0 + A_1 \times 1 + A_m \times 2 + A_h \times 3 \]

Where,

- \( A_n \) = Per cent of farmers having no adoption
- \( A_1 \) = Per cent of farmers having low adoption
- \( A_m \) = Per cent of farmers having medium adoption
- \( A_h \) = Per cent of farmers having high adoption

**Table 1** Salient features and distribution of the farmers according to their extent of adoption of ecological nutrient management practices

| Dimensions of Eco-agril. Practices | Categories          | Range         | Farmers | Mean  | SD    | CV % |
|-----------------------------------|---------------------|---------------|---------|-------|-------|------|
| Ecological Nutrient management practices | Adoption Possible | Observed 88.3-470 | Number 20 | 17 | 242.11 | 78.17 | 32.29 |
|                                   | Very low (up to 166.7) | 0-1000        |          |       |       |      |
|                                   | Low (166.8–333.3)    |               | 81      | 67 |       |      |
|                                   | Medium (above 333.3) |               | 19      | 16 |       |      |
| **Total**                         |                     |               | 120     | 100 |       |      |

**Table 2** Salient features and distribution of the farmers according to their extent of adoption ecological pest management practices

| Dimensions of Eco-agril. Practices | Categories          | Range         | Farmers | Mean  | SD    | CV % |
|-----------------------------------|---------------------|---------------|---------|-------|-------|------|
| Ecological pest management practices | Adoption Possible | Observed 39.5-439 | Number 6 | 5 | 271.60 | 68.83 | 25.34 |
|                                   | Very low (upto 166.7) | 0-1000        |          |       |       |      |
|                                   | Low (166.8–333.3)    |               | 89      | 74 |       |      |
|                                   | Medium (above 333.3) |               | 25      | 21 |       |      |
| **Total**                         |                     |               | 120     | 100 |       |      |
Table 3 Comparative adoption of ecological nutrient management practices

| Practices                  | % of farmers having | Adoption Index (AI) | Rank Order |
|----------------------------|---------------------|---------------------|------------|
|                            | No adoption (A_n)   | Low adoption (A_1)  | Medium adoption (A_m) | High adoption (A_h) |          |          |
| 1. Cowdung                 | 2                   | 18                  | 42               | 38               | 216      | 1         |
| 2. Poultry excreta         | 98                  | 2                   | 0                | 0                | 2        | 8         |
| 3. Farm yard manure        | 4                   | 20                  | 46               | 30               | 202      | 2         |
| 4. Compost                 | 10                  | 12                  | 46               | 32               | 200      | 3         |
| 5. Quick compost/Oil cake | 95                  | 2                   | 3                | 0                | 8        | 6         |
| 6. Liquid organic fertilizes| 99                 | 1                   | 0                | 0                | 1        | 9         |
| 7. Water hyacinth          | 99                  | 1                   | 0                | 0                | 1        | 9         |
| 8. Green manure            | 47                  | 48                  | 5                | 0                | 58       | 5         |
| 9. Crop residue/weed fertilizer | 42             | 32                  | 21               | 5                | 89       | 4         |
| 10. Biofertilizers         | 95                  | 3                   | 2                | 0                | 7        | 7         |

Table 4 Comparative adoption of ecological pest management practices

| Practices                              | % of farmers having | Adoption Index (AI) | Rank Order |
|----------------------------------------|---------------------|---------------------|------------|
|                                        | No adoption (A_n)   | Low adoption (A_1)  | Medium adoption (A_m) | High adoption (A_h) |          |          |
| 1. Pest control by hand/hand net       | 100                 | 0                   | 0               | 0                | 0        | 10        |
| 2. Putting tree branches in the field  | 90                  | 4                   | 1               | 0                | 6        | 7         |
| 3. Light trap                          | 80                  | 8                   | 2               | 0                | 12       | 5         |
| 4. Bot. pesticides (neem, nishinda, biskatali, garlic, extract etc.) | 70             | 20                  | 9               | 1                | 41       | 4         |
| 5. Use of quality seed                 | 30                  | 50                  | 15              | 5                | 95       | 3         |
| 6. Pest control by ash                 | 98                  | 2                   | 0               | 0                | 2        | 8         |
| 7. Beneficial insects                  | 99                  | 1                   | 0               | 0                | 1        | 9         |
| 8. Pest resistant varieties            | 90                  | 9                   | 1               | 0                | 11       | 6         |
| 9. Crop rotation                      | 1                   | 36                  | 53              | 10               | 172      | 2         |
| 10. Proper weeding and eradication of insect/disease attacked plants/plant parts | 5                | 3                   | 29              | 63               | 240      | 1         |

The possible range of adoption scores of each ecological agricultural practice was 0 to 100. Based on this consideration, adoption score of 0, up to 33.3, 33.4 to 66.7, and above 66.7 were considered as no, low, medium and high adoption respectively for each practice. Thus, the possible range of adoption indices (AIs) of the practices could range from 0 to 300, where 0 indicated no adoption and 300 indicated highest adoption. In order to have a comparative understanding, based on descending order to adoption index (AI), risk
order was made among ecological nutrient management practices and ecological pest management practices separately as shown in Tables 3 and 4.

**Comparative adoption of ten ecological nutrient management practices**

Among ten ecological nutrient management practices, adoption of cow dung ranked first followed by crop residue/weed fertilizer, compost, poultry excreta, farm yard manure, water hyacinth, quick compost/oil cake, green manure, and liquid organic fertilizers.

Nobody used bio-fertilizers in their pulses crop fields.

Among ten ecological pest management practices, adoption of proper weeding and eradication of insect/disease attacked plants/plant parts ranked first followed by use of quality seed, crop rotation, pest control by ash, pest control by hand/hand net, putting tree branches in the field, botanical pesticides (neem: *Azadirachta indica*, Nishinda: *Vitex negundo*, biskatali: *Polygonum orientale*, garlie: *Allium sativum* extract etc.), beneficial insects and light trap.

Nobody used pest resistant varieties in their crop fields.

Majority (86 percent) of the farmers had very low to low composite adoption of selected ecological agricultural practices, ecological nutrient management practices (84 percent) and ecological pest management practices (79 percent), while none had high adoption of ecological nutrient management practices and ecological pest management practices. Among ecological nutrient management practices, adoption of cow dung ranked first followed by farm yard manure, Compost, Crop residue/weed fertilizer, Green manure and others. Among ecological pest management practices, adoption of proper weeding and eradication of insect/disease attacked plants/plant parts ranked first followed by Crop rotation, Use of quality seed, Pest resistant varieties and others.

Therefore, it may be concluded that necessary motivational programmes need to be taken by the concerned authorities so that the farmers could increase their land under ecological agricultural practices gradually. Unlike chemical fertilizers, organic fertilizers usually have low content of plant nutrient. This goes against the use of organic fertilizers. Therefore, research should be conducted to explore organic fertilizers having high content of NPK and other nutrient.

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